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Abstract

Both theoretical predictions of Keynesian view and a large body of empirical studies on developed countries suggest that business cycle fluctuations can be partially smoothed by counter-cyclical fiscal policies. Our paper extends this strand of literature by considering the nexus between output fluctuations and government size in the context of Chinese fiscal federalism. Using a sample of 29 Chinese provinces for the period of 1994-2007, we fail to provide consistent evidence for the stabilizing effect of fiscal policies. In particular, we find that under the tax assignment system (fen shui zhi), neither the central government's fiscal transfers nor the provincial budgetary and extra-budgetary revenues help reduce economic volatility. Such results are shown to be robust across different model specifications, volatility measures and estimation techniques.

Keywords: business cycles; government size; fiscal federalism; China

JEL classification: E32, E62, H5

1. Introduction

Plainly, the ongoing financial crisis has offered useful lessons for the role of government spending and taxes in the macroeconomic stabilization. Traditional Keynesian view suggests that business cycle fluctuations can be partially smoothed by counter-cyclical fiscal policies, which work through automatic stabilizers and discretionary actions. Empirically, this proposition implies that there should be a negative statistical association between government size and economic volatility, for which a number of authors provided supportive evidence from the data of developed countries, such as Galí (1994), van den Noord (2000), Fatás and Mihov (2001), Andrés, Doménech and Fatás (2008) and Debrun, Pisani-Ferry and Sapir (2008). Nonetheless, significantly less attention has devoted to the stabilizing effect of governments in the case of developing countries. Such a paucity of studies is somewhat surprising in view of the fact that with vulnerable structure of production and underdeveloped social security system, developing countries are generally subject to more sharp and painful economic fluctuations.

Our study extends this strand of literature by considering the experience of China, which is not only the biggest developing economy, but has also engaged in market-oriented reforms since the late 1970s. The style of China is of paramount interest at least, for three major reasons. First, it is well known that in launching various political movements, such as Great Leap Forward (1958-1960) and Cultural Revolution (1966-1976), the Chinese government had played a role as an 'engine', rather than a 'stabilizer' of sharp economic fluctuations experienced over Mao era. Thus, it seems natural to ask to what extent such a role has been altered as the reforms proceed. Does the empirical regularity that government spending and

taxes help reduce output volatility hold in the case of China today?

Second, even during the post-Mao era, the path of China's rapid emergence is by no means a smooth one. Substantial boom/slump fluctuations in aggregate economic activity could be observed over the three past decades, which were often associated with the retreat and revival of determination to reform (Qian and Weingast 1996, Qian 2000, and Lin, Cai and Li 2003). Accordingly, a concern facing Chinese policymakers emerges: how to balance the dynamics of output growth against macroeconomic stability? It appears to be a critical politico-economic issue for which Chinese leadership was less concerned before.

Third, perhaps more interestingly, over the transition period the central- provincial fiscal relationships in China have witnessed dramatic changes due to various decentralized arrangements, especially the revenue-sharing reform over the 1980s and tax assignment reform in 1994 (*fen shui zhi*). As a matter of fact, China's current fiscal system has features corresponding to fiscal federalism, which creates strong incentives for local political authorities to promote the economic growth in their own jurisdictions. However, the division of taxing powers and expenditure responsibilities in a decentralized fashion also triggers marked divergence in macroeconomic objectives between local and central political powers. Indeed, it is widely believed that in seeking eagerly high growth rates, local authorities, which usually see the macroeconomic stability as a public good best left to others, are primarily responsible for cyclical pattern of China's growth (Yang 2004). Thus, an important question arises: Do the fiscal policies adopted by different levels of government have consistent stabilizing effects on business cycles?

To shed light on these major concerns, the current paper attempts to quantitatively

investigate the nexus between output fluctuations and government size for Chinese provinces (or province-level regions). To the best of our knowledge, there have been very few empirical studies addressing this issue at sub-national level, with a notable exception of Fatás and Mihov (2001), which show supportive evidence for the stabilizing role of fiscal policies across US states.

The remainder of the paper is structured as follows. The next section summarizes main features of government size and central-provincial fiscal arrangements in China. Section 3 outlines national and provincial trends in output volatility. The path of China's economic expansion is also compared with those of a large range of countries. Section 4 provides an econometric investigation on the effects of fiscal policies adopted by central and provincial governments on business cycle fluctuations. Different measures of output volatility and government size, control variables, model specifications and estimation techniques are considered to check the robustness of results. The last section concludes.

2. Government Size and Fiscal Arrangements in China

Given the fact that China's fiscal reforms in the post-Mao era have been discussed in great depth by a number of studies, such as Ma and Norregaard (1998), Zhang(1999), Wei (2000), Wang and Hu (2001), and Zhang and Gong (2005), we do not intend to add a comprehensive presentation on this issue. For our purposes, we focus however on some general trends in 'government size', as well as the central-provincial fiscal arrangements around the 1994 tax assignment reform. Such a description, albeit partial, seems helpful to understand our further empirical analysis.

First, China witnessed a steady decline in government size relative to GDP expansion during 1978-1994. As shown in Figure 1, both the total (center plus provinces) government budgetary revenue and provincial counterparts had shrunk substantially compared to GDP over that period. The relative size of central government also followed a falling trend after the redesigning of fiscal contract system in 1984. Indeed, this phenomenon, referred to as 'decline of state capacity' by Wang and Hu (2001), consists of a strong motivation for implementing the tax assignment reform in 1994. Clearly, as can be seen from the figure, since the inception of 1994 reform, the government size relative to GDP, judged both from central budget and provincial budget, has not only stopped to decline, but also risen through time.

[Figure 1 around here]

Second, regarding the center-province relationship, the provincial fiscal powers were greatly weakened owing to the reform. As illustrated in Figure 2, the share of provincial budgetary revenue in total budgetary revenue has declined sharply from 78% in 1993 to 44% in 1994 and since then remains relatively stable over the following years. Meanwhile, the share of provincial budgetary expenditure has not been directly affected by the tax assignment. By contrast, it appears to rise gradually during the three past decades.

[Figure 2 around here]

Third, as a consequence of the 1994 reform, the dramatic changes in central-provincial fiscal status lead to a marked imbalance of provincial budget. To finance widened deficits, provinces depend almost entirely upon the fiscal transfers from the center. In Figure 3 we set

out the major trends in fiscal transfers over the period of 1990-2007, for which the data are available. As displayed in the figure, the net central transfers, which refer to the transfers (grants) less remittances, have come to play an important role both in provincial budget and national economy. On average, the net transfers account for 41% of provincial budgetary expenditure, and 5% of provincial GDP over 1994-2007.

[Figure 3 around here]

Finally, prior to the 1994 tax assignment, the extra-budgetary funds[1], which refer to the funds without being included in the official budget, had already exhibited some important rearrangements in 1993. As illustrated in Figure 4, the extra-budgetary revenue and expenditure declined sharply compared to GDP in 1993. This dramatic change is due mainly to the fact that the revenue collected from state-owned enterprises, which was the primary source of extra-budgetary revenue before the reform (accounting for around 75% of the total extra-budgetary revenue), has been included in the formal budget since 1993. In addition, as shown in the figure, the fall in relative size of extra-budgetary funds managed by center is much more pronounced than the fall in those managed by provinces. Consequently, the ratio of central budgetary funds relative to GDP has been virtually negligible since 1993, whereas the provincial counterparts remain a non-trivial portion of GDP (around 3%) and thus, their role in local economic activity seems worth investigating.

[Figure 4 around here]

3. Output Growth Volatility

Although during the era of market-oriented reform China has yet to experience a typical business cycle according to the definition of NBER, the path of its economic emergence is by no means a smooth one. Indeed, the fluctuations of China's output around its long term trend have come to attract considerable scholarly interest, such as Imai (1996), Oppers(1997), Brandt and Zhu(2000), Zhang and Wan(2005), Gong and Lin (2008), and Laurenceson and Dobson (2008). In Figure 5, we show the annual growth rates of China's real GDP, its deviation from the period average, as well as the output gap calculated from the widely used Hodrick-Prescott filter (see Data appendix for details on its calculation). In spite of the absence of a proper 'contraction' characterized as a period of negative growth, a marked cyclical pattern of GDP expansion can be readily observed.

[Figure 5 around here]

In addition, business cycle fluctuations in China declined through time. For our purposes, Table 1 describes the GDP growth path of Chinese provinces during the pre- and post-1994 tax reform periods. If we look at the coefficient of variation, which is defined as the ratio of standard deviation to mean, such a falling trend in volatility is quite significant. Indeed, all Chinese provinces exhibited larger variability of growth rates over the first period than the second. Similar results can also be obtained by using the standard deviation of output gap as an alternative measure of volatility (not reported), with only two exceptions: Guangdong and Neimeng[2].

[Table 1 around here]

Apparently, this phenomenon is due mainly to China's transition program. As argued some authors, such as Brandt and Zhu (2000), and Laurenceson and Dobson (2008), the high volatility in real output, along with serious inflation in the early stage of the reform can be explained by combined effects of the dual-track price system, decentralization of decision-making authority, and the restructuring of the state sector. Because these factors had either dissipated or substantially changed by the early 1990s, Chinese economy has become less volatile since then. Moreover, the political crisis in 1989 that had people doubt the orientation of the reform is another important source of shock. As shown in Table 1, the year of 1989 was followed by spectacular slowdown in economic growth. As a matter of fact, China recorded the two lowest GDP growth rates in 1989 and 1990 over the post-1978 period, namely 4.2% and 4.1%, respectively. They are vastly inferior to the three-decade average: 9.88%.

As a final step, we compare the cyclical fluctuations of Chinese economy with those of a broad range of countries. Table 2 shows the average growth rates of real GDP and their variability measure for major developed and developing economies around the world, as well as some aggregates of countries over the period of China's reform: 1978-2007. Clearly, although the economic fluctuations are generally sharper in developing countries than developed countries, China is an important exception. It has not only marked the most rapid economic growth rates among selected countries, but stood out in terms of the smoothness of growth path as well. Such an extraordinary stability of Chinese economy compared to international experience appears to be a puzzle (Laurenceson and Dobson 2008) and in particular, the role of China's fiscal policies that most Keynesian economists consider vital to

dampening economic fluctuations is still unclear.

[Table 2 around here]

4. Econometric Issues

4.1. Cross Section Analysis

Our empirical analysis relies on a sample of 29 provinces of mainland China over the years of 1994-2007[3], namely the period under the aforementioned *fen shui zhi* system. Focusing on this period is owing mainly to the data availability. In addition, it seems noteworthy that according to Qian (2000), China has also reached the second stage of China's reform since 1994, which is explicitly oriented toward a 'socialist market system'.

As a first step, the regressions are conducted in a cross-section framework. The generic form of empirical model can be expressed as follows:

$Output\ volatility_i = \beta_0 + \beta_1 \cdot \overline{government\ size_i},\ \ i = 1...29$ (province).

Following most existing studies, such as Galí (1994) and Fatás and Mihov (2001), the benchmark specification is to regress the standard deviation of provincial real GDP growth (*sd_growth*) on the logarithm of average ratio of provincial government expenditure (budgetary plus extra-budgetary) to GDP over the period of 1994-2007, denoted as *Exp_9407*[4].

The regression is carried out by means of Ordinary Least Squares (OLS) procedure, adjusting standard errors for the presence of heteroskedasticity[5]. The results are reported in the column (1) of Table 3. As predicted Keynesian statement, the coefficient of government size is negative and significant at 10% level. But the R-squared, 0.0609, is much smaller than

the range of 0.2 to 0.4, which are typically obtained in the related studies (for example Galí 1994, and Fatás and Mihov 2001).

[Table 3 around here]

Next, given the current fiscal arrangements in China, it is tempting to discern the stabilizing role of different levels of government. As discussed previously, after the fiscal reform of 1994, the consolidated provincial expenditure is principally financed out of three non-trivial parts: provincial budgetary revenue, extra-budgetary revenue and net transfers received from the center. Apparently, these funds may not have the same effects on output stabilization. In particular, there is no unequivocal answer to the question whether Chinese provincial and central authorities have consistent attitude toward the balance between the rapidity and stability of economic growth[6]. To address this concern, we introduce all these spending items simultaneously into the model as distinct government size measures. Similarly, they are expressed as the logarithms of average ratios to provincial GDP, denoted as *Rev_b_9407*, *Rev_e_9407* and *Transfer_9407*. We also conduct the variance inflation factor (vif) analysis, which suggests that there is no severe multicollinearity among the three variables.

As can be seen from the column (2) of Table 3, despite the negative signs, the three government size measures are not only individually insignificant by *t* test, but also jointly insignificant by *F* test at conventional level.

Nonetheless, the parsimonious specification may suffer from bias due to omission of relevant variables. To deal with this problem, four determinants of economic volatility are included as controls. The first variable is the degree of economic openness of a province

vis-à-vis the rest of the world. As documented in Rodrik (1998), more open economies tend to be more volatile because of the exposure to external risk. In this study, the sum of imports and exports scaled by GDP (*Openness_9407*) is used as a measure of openness. The second one is related to the financial development. It is generally recognized that the financial intermediation is one of primary substitutes for fiscal stabilization (see Debrun, Pisani-Ferry and Sapir 2008). Here, the share of value-added of financial sector in GDP (*Fin_dev_9407*) is used as a proxy of the degree of financial development. The third one is a standard indicator of production concentration: Krugman specialization index (*Spec_9407*)[7]. In theory, the more concentrated (or specialized) the production of a region, the more volatile the regional economy owing to industry-specific shocks. The last control is the growth rate (*Growth_9407*). As discussed in Fatás and Mihov (2001), economies with smaller governments might grow faster, whereas higher rates of growth are often associated to more volatile growth path. Finally, note that in the framework of cross section analysis, all these control variables are expressed as the period average over 1994-2007.

Columns (3) and (4) of Table 3 contain the results from this augmented specification. Although the fitness of the model is substantially improved (with R-Squared rising from 0.06 to 0.63), and most controls enter the procedure significantly with expected signs, it turns out that both the consolidated and decomposed government expenditures are insignificantly associated with economic volatility[8].

In the following, we turn to the possible endogeneity issue. It is argued that if fiscal policies help stabilize output fluctuations, volatile economies are likely to opt for large governments (Rodrik 1998). From an econometric viewpoint, there appears to be a reverse

causality between independent variable and dependent variable, which might yield biased OLS estimates. To tackle this problem, we focus on the decomposed expenditure model[9] and instrument *Rev_b_9407*, *Rev_e_9407* and *Transfer_9407* by the period average of urbanisation rate, dependency ratio, logarithms of real GDP and real GDP per capita (in 1978 price), which are standard determinants of government size and commonly used in that context (see Fatás and Mihov 2001, and Debrun, Pisani-Ferry and Sapir 2008)[10]. As shown in Column (5) of Table 3, while the associated *P*-value of Sargan test suggests that the hypothesis of exogeneity of instruments cannot be rejected at conventional level, the IV estimates of government size are still insignificant.

Next, to accommodate the transitional dynamics of economic growth, we use the standard deviation of aforementioned output gap as an alternative volatility indicator[11]. As shown in columns (6) and (7) of Table 3, our main findings on government size coefficients do not change significantly.

Finally, as Fatás and Mihov (2001) point out, traditional Keynesian view emphasizes merely the smoothing role of fiscal policies on disposable income and private consumption without making clear predictions about the effects on the volatility of aggregate GDP, which contains the government spending. In the light of this contention, the last two columns of Table 3 reproduce OLS regressions with two alternative measures of private output volatility: standard deviation of personal income growth (*sd_in*), and standard deviation of household consumption growth (*sd_con*)[12]. As before, all the three government size variables remain statistically insignificant, with an exception for the estimate of budgetary revenue-to-GDP ratio shown in Column (9), which is significant at 10 % level but with a positive sign,

indicating that the larger provincial budgetary revenue size, the more volatile the household consumption.

4.2. Panel Analysis

To check further the robustness of our findings, we next explore the link between government size and business cycles in a panel framework. It is argued that the panel approach allows controlling for the unobserved individual (here, provincial) heterogeneity. At this juncture, it seems noteworthy that at least two significant determinants of output volatility, geography and institutional quality, which are recently documented by Malik and Temple (2009), have not been explicitly observed in this study but, can be viewed as provincial specific characters. From an econometric viewpoint, omitting these provincial heterogeneous factors, the preceding cross section analysis may lead to biased estimates.

We first divide the entire sample into three sub-periods: 1994-1998, 1999-2003 and 2004-2007[13]. Then, as a starting point, the standard deviation of the rate of GDP growth over each sub-period is regressed on the government size measures and a set of controls averaged over each sub-period. Moreover, to deal with nationwide common effect (for example an exchange rate adjustment), two period dummies for years of 1999-2003 and 2004-2007 are included in the analysis.

The regression results are shown in Column 1 of Table 4. According to the Breusch-Pagan (Breusch and Pagan 1980) test which suggests the existence of significant provincial effects, and the Hausman test which suggests the uncorrelation between provincial unobserved effects and other explanatory variables, the random-effects estimator is preferred

to pooled OLS and fixed-effects estimator. Despite the good fit of the model, the government size coefficients are still statistically indifferent from zero.

[Table 4 around here]

To check the sensitivity of these results, we also run the regressions with alternative volatility indicators. As can be seen from columns (2)-(5) of Table 4, relying on estimators chosen out of Breusch-Pagan test and Hausman test, our main findings on insignificance of government size measures remain robust, with an exception of the significant coefficient of extra-budgetary revenue-to-GDP ratio in income volatility model[14]. The associated sign is, however, positive, indicating destabilizing effect of provincial extra-budgetary revenue on private income smoothing.

5. Conclusions

Both theoretical predictions of Keynesian view and a large body of empirical studies on developed countries suggest that business cycle fluctuations can be partially smoothed by counter-cyclical fiscal policies, which work through automatic stabilizers and discretionary actions. Our paper extends this strand of literature by considering the nexus between output fluctuations and government size in the context of Chinese fiscal federalism. Using a sample of 29 Chinese provinces for the period of 1994-2007, we fail to provide consistent evidence for the stabilizing effect of fiscal policies. In particular, we find that under the tax assignment system, neither the central government's fiscal transfers nor the provincial budgetary and extra-budgetary revenues help moderate output volatility. It implies that in sharp contrast with

the experiences of most developed countries, China's central and provincial authorities have not used public spending as a main policy tool for dampening economic shocks. Such results are shown to be robust across different model specifications, volatility measures and estimation techniques.

Eventually, we ought to note that the behavior of China's government toward fluctuations has substantially changed in the wake of the current economic crisis. At the time of writing (May 2010), it seems that the aggressive programs of economic stimulus adopted by China's central and local governments have achieved good outcomes: China weathered the global recession better than many other countries, and according to preliminary data released by the National Bureau of Statistics of China, the annual growth target for 2009, 8%, has been even overfulfilled to 8.7%. However, one may reasonably speculate that our findings based on the experience of the pre-crisis period are helpful to understand the current situation: the absence of fiscal stabilizing mechanism over the preceding years made the speed and the depth of China's response to the first wave of global financial tsunami unanticipated. Consequently, these unprecedented discretionary actions unleashed immediate and powerful stimulus to the sentiment of investors and consumers. In addition, as points out Naughton (2009a, 2009b), besides Keynesian initiatives, China's successful handling of the crisis is also attributed to the old-fashioned government planning. The latter contains credit plans, industrial policy, even media control and mobilisation through the Communist Party. Arguably, these measures, which are obviously unusual for a mature market economy, might also contribute to the extraordinary stability of China's growth path during the past decades.

Data Appendix

Consumer Price Index (CPI). Data come from *China Statistical Yearbook*, various issues..

Dependency ratio. It is defined as the ratio of non-working-age population (aged 0-14 as well as 65 and over) to the working-age population (aged 15- 64). The data come from *China Statistical Yearbook*, various issues.

GDP, GDP growth rates, **GDP per capita, value-added of financial sector** and **household consumption.** All data come from *China Statistical Yearbook* (for years of 2005-2007), and *Data of Gross Domestic Product of China: 1952-2004* (for years of 1994-2004). The latter reports the revised data from the First National Economic Census conducted in 2004.

Foreign trade. The variable refers to the value of provincial commodities trade. It is sorted according to the origin and destination of commodities. Data come from *China Statistical Yearbook*, and are originally reported in US dollar. We use the annual average exchange rate to convert the data into RMB.

Krugman specialization index. Following Krugman (1991), the degree of dissimilarity of production structure between two economies, say *i* and *j*, can be measured as:

$$Spec_{ij} = \sum_{k=1}^{K} \left| s_{ik} - s_{jk} \right|,$$

where s_{ik} (s_{jk}) represents the share of industry k in the economy of region i (j). By construction, *Spec* takes a minimum value of zero if region *i* has an industrial structure identical to region *j*, and takes a maximum value of 2 if it has no sectors in common with region *j*.

In this paper, the index is calculated to measure the specialization of provincial GDP

relative to national GDP. For the years of 1994-2004, the GDP is classified into eight one-digit industries: 'Primary', 'Industry', 'Construction', 'Transport, Storage and Post, Telecommunications', 'Wholesale, Retail trade, and Catering services', 'Finance and Insurance', 'Real estate' and 'Others'. For the years of 2005-2007, the GDP is classified into nine one-digit industries: 'Primary', 'Industry', 'Construction', 'Transport, Storage and Post', 'Wholesale and Retail trades', 'Hotels and Catering services', 'Financial intermediation', 'Real estate' and 'Others'. The source of China's GDP data has been explained previously.

Output gap. The variable refers to the cyclical component of the logarithm of actual GDP (constant 1978 yuan) around its trend obtained with the Hodrick-Prescott filter and a smoothing parameter (lambda) equal to 100.

Personal income. The variable is composed of two parts: 'disposable income of urban households' and 'net income of rural households'. According to *China Statistical Yearbook*, the former is obtained as:

disposable income = total household income - income tax - personal contribution to social security - subsidy for keeping diaries for a sampled household.

The latter is obtained as:

net income = total income - taxes and fees paid - household operation expenses - taxes and fees depreciation of fixed assets for production - gifts to nonrural relatives.

Provincial budgetary revenue, extra-budgetary revenue and **net transfers from center.** All data come from *Finance Yearbook of China*, various issues. In particular, the net transfers from center is calculated as 'transfers from center' less 'local remittances to center'. Because the data on fiscal transfers in 1994 are missing, we follow Wang and Hu (2001) and take a broader measure of net transfers, which are supposed to equal the difference between the provincial budgetary expenditure and provincial budgetary revenue.

Urbanization rate. It's defined as the ratio of urban population to the total population. The data come from *China Statistical Yearbook*, various issues.

Notes

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[1] As stressed Ma and Norregaard (1998), along with extra-budgetary funds, off-budgetary funds are another major source of local public finance in China. They are particularly collected by township and village governments without the authorization from higher levels of government. However, no official figures on off-budgetary funds are available.

[2] The declining volatility of China's output is also reported by Laurenceson and Dobson (2008), which rely on quarterly GDP data and different de-trending procedures.

[3] Chongqing and Tibet are excluded from the sample due to lack of data. Readers are referred to Data appendix for further information on the dataset.

[4] As argued in Fatás and Mihov (2001), the use of logarithm is justified on grounds of having non-linear relationship between government size and output volatility. However, we have not found significant difference in empirical results by using level data.

[5] As usual, all the regressions in this paper include a constant term, which is not reported in the tables.

[6] For instance, using a sample of Chinese provinces over 1980 to 1992, Zhang and Zou (1998) show that the economic growth rates are positively correlated with central government development spending, but negatively correlated with provincial counterparts.

[7] By construction, the Krugman specialization index varying between 0 and 2 is positively

correlated with the degree of production concentration. See Data appendix for the calculation formula.

[8] Only the openness coefficient turns to be insignificant, but similar results are reported by many authors, such as Fatás and Mihov (2001), Andrés, Doménech and Fatás (2008), and Debrun, Pisani-Ferry and Sapir (2008).

[9] As the space is limited, we have not shown the regression outcomes for the consolidated expenditure model, but the main results from various specifications are not significantly different from those for the decomposed expenditure model.

[10] The fitness of the first stage of IV regression is rather high for the budgetary revenue and central transfers. The R-squared are 0.72 and 0.90 respectively. But the one for extra-budgetary revenue is relatively low, with R-squared equaling 0.24.

[11] To have a sufficiently long time span, the output gap is first obtained from the data of the entire period of 1978-2007, and then we calculate the standard deviation for the years of 1994-2007.

[12] The growth rates of personal income and household consumption are deflated by Consumer Price Index.

[13] Alternatively, we have also divided the sample into two sub-periods: 1994-2000 and 2001-2007. The main findings on the insignificance of government size measures remain however unchanged.

[14] As shown in columns (3) and (4) of Table 4, because of the insignificance of random effects suggested by Breusch-Pagan test, the pooled OLS seems to be a preferred estimator for the income volatility model.

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Bio

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Table 1

Economic Growth of Chinese Provinces over 1978-2007

Provinces	g (%) (1978-2007)	g (%) (1978-1993)	g (%) (1994-2007)	σ of g (1978-2007)	σ of g (1978-1993)	σ of g (1994-2007)	Coefficient of variation (1978-2007)	Coefficient of variation (1978-1993)	Coefficient of variation (1994-2007)
Beijing	10.58	9.64	11.66	3.47	4.35	1.45	0.33	0.45	0.12
Tianjin	10.99	9.01	13.24	4.47	5.05	2.01	0.41	0.56	0.15
Hebei	10.93	10.09	11.89	3.8	4.72	1.94	0.35	0.47	0.16
Shanxi	10.44	9.33	11.71	4.62	5.78	2.15	0.44	0.62	0.18
Neimeng	11.93	9.81	14.36	5.08	4.49	4.6	0.43	0.46	0.32
Liaoning	9.61	8.94	10.38	4.15	5.19	2.23	0.43	0.58	0.21
Jilin	10.2	9.57	10.91	4.67	5.92	2.37	0.46	0.62	0.22
Heilongjiang	8.43	7.13	9.92	2.45	2.4	1.46	0.29	0.34	0.15
Shanghai	10.49	8.92	12.29	3.53	4.01	1.52	0.34	0.45	0.12
Jiangsu	13.15	13.25	13.03	5.02	6.59	2.08	0.38	0.50	0.16
Zhejiang	13.62	13.94	13.26	5.08	6.47	2.7	0.37	0.46	0.20
Anhui	10.22	9.26	11.31	5.16	6.6	2.23	0.50	0.71	0.20
Fujian	13.01	13.39	12.57	4.49	5.46	2.96	0.35	0.41	0.24
Jiangxi	10.19	9.98	10.44	3.36	4.03	2.35	0.33	0.40	0.23
Shandong	12.06	11.41	12.81	3.75	4.65	2.12	0.31	0.41	0.17
Henan	11.17	10.6	11.81	4.23	5.24	2.47	0.38	0.49	0.21
Hubei	10.53	10.11	11.01	3.81	4.79	2.12	0.36	0.47	0.19
Hunan	9.65	8.88	10.54	2.78	3.27	1.72	0.29	0.37	0.16
Guangdong	13.45	13.61	13.27	4.61	5.83	2.56	0.34	0.43	0.19
Guangxi	9.95	9.19	10.83	3.88	4.61	2.54	0.39	0.50	0.23
Hainan	10.99	12.47	9.29	7.34	9.46	2.78	0.67	0.76	0.30
Sichuan	9.98	9.25	10.81	2.8	3.21	1.94	0.28	0.35	0.18
Guizhou	9.97	10.2	9.7	4.09	5.37	1.67	0.41	0.53	0.17
Yunnan	10.17	10.51	9.78	3.7	4.72	1.9	0.36	0.45	0.19
Shaanxi	10.49	9.77	11.32	3.78	4.87	1.47	0.36	0.50	0.13
Gansu	9.68	8.89	10.59	4.25	5.62	1.05	0.44	0.63	0.10
Qinghai	8.73	7.33	10.33	5.09	6.43	1.83	0.58	0.88	0.18
Ningxia	9.53	8.83	10.33	3.28	4.11	1.6	0.34	0.47	0.15
Xinjiang	10.36	11.11	9.51	2.5	2.77	1.83	0.24	0.25	0.19
China	**9.88**	**9.87**	**9.90**	**2.73**	**3.44**	**1.55**	**0.28**	**0.35**	**0.16**

Data source: *China Statistical Yearbook*, various issues

Notes: a. g: average annual growth rate of GDP, in constant price.

b. σ: standard deviation.

Table 2

International Comparison on Variability of Growth Rate of Real GDP

	Average annual growth rate of real GDP over 1978-2007 (%)	Standard deviation	Coefficient of variation
-Brazil	2.81	3.33	1.19
-Canada	2.87	1.95	0.68
-China	**9.88**	**2.73**	**0.28**
-France	2.19	1.16	0.53
-Germany	2.04	1.48	0.72
-India	5.71	2.88	0.50
-Italy	2.01	1.40	0.70
-Japan	2.56	1.92	0.75
-Russia	0.40	7.42	18.64
-United Kingdom	2.44	1.67	0.69
-United States	3.03	1.77	0.59
-Low/middle income (including China)	4.18	1.75	0.42
-Low/middle income (excluding China)	3.32	1.69	0.51
-OECD	2.71	1.11	0.41
-World	3.05	1.06	0.35

Data source: World Development Indicators 2007, World Bank

Notes: a. For Russia: data available over 1990-2007.

b. According to World Bank, low/middle income economies amount to all developing economies.

Table 3

Output Volatility and Government Size : Cross-Section Estimations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Estimation method	OLS	OLS	OLS	OLS	IV	OLS	IV	OLS	OLS
Dependent variable	sd_growth	sd_growth	sd_growth	sd_growth	sd_growth	sd_gap	sd_gap	sd_in	sd_con
Exp_9407	**-0.0063**	**-**	**0.0070**	**-**	**-**	**-**	**-**	**-**	**-**
	(0.0030)*		(0.0046)						
Rev_b_9407	**-**	**-0.0065**	**-**	**0.0048**	**0.0112**	**-0.0024**	**-0.0336**	**-0.0035**	**0.0505**
		(0.0038)		(0.0073)	(0.0373)	(0.0130)	(0.0575)	(0.0291)	(0.0291)*
Rev_e_9407	**-**	**-0.0026**	**-**	**0.0018**	**0.0005**	**0.0022**	**0.0214**	**0.0141**	**0.0090**
		(0.0092)		(0.0043)	(0.0108)	(0.0076)	(0.0190)	(0.0156)	(0.0178)
Transfer_9407	**-**	**-0.0015**	**-**	**0.0025**	**0.0029**	**-0.0023**	**0.0023**	**-0.0063**	**0.0021**
		(0.0018)		(0.0021)	(0.0040)	(0.0029)	(0.0056)	(0.0063)	(0.0054)
Openness_9407	-	-	**-0.0028**	**-0.0031**	**-0.0048**	**0.0051**	**0.0199**	**-0.0079**	**-0.0279**
			(0.0027)	(0.0039)	(0.0160)	(0.0070)	(0.0248)	(0.0185)	(0.0205)
Fin_dev_9407	-	-	**-0.1828**	**-0.1787**	**-0.2037**	**-0.3515**	**-0.2495**	**-0.0245**	**-0.0285**
			(0.0329)***	(0.0426)***	(0.1343)	(0.0811)***	(0.1947)	(0.1347)	(0.1366)
Spec_9407	-	-	**0.0256**	**0.0242**	**0.0210**	**0.0487**	**0.0663**	**-0.0196**	**-0.0445**
			(0.0086)***	(0.0100)**	(0.0182)	(0.0196)***	(0.0385)*	(0.0314)	(0.0306)
Growth_9407	-	-	**0.4522**	**0.4645**	**0.5015**	**0.3273**	**0.3161**	**0.1525**	**0.3766**
			(0.1253)***	(0.1314)***	(0.1607)***	(0.1462)**	(0.3089)	(0.2790)	(0.2226)*
R-Squared	0.0609	0.0699	0.6262	0.6288	0.6127	0.6771	0.5310	0.2099	0.3018
P-value for *F* test	-	0.1744	-	0.4626	0.2883	0.7894	0.6807	0.3876	0.2120
P-value for Sargan test	-	-	-	-	0.7903	-	0.2723	-	-
Nb. Observations	29	29	29	29	29	29	29	29	29

Notes: a. Huber-White robust Standard errors are in parentheses, with *** Significance at the 1% level; ** Significance at the 5% level; and * Significance at the 10% level.

b. *F* test for the joint significance of three government size measures: *Rev_b_9407*, *Rev_e_9407* and *Transfer_9407*.

Table 4

Output Volatility and Government Size : Panel Estimations

	(1)	(2)	(3)	(4)	(5)
Estimation method	Random effects	Random effects	Random effects	Pooled OLS	Random effects
Dependent variable	sd_growth	sd_gap	sd_income	sd_income	sd_con
Revenue_b	**-0.0002**	**-0.0008**	**0.0065**	**0.0064**	**0.0300**
	(0.0051)	(0.0061)	(0.0212)	(0.0212)	(0.0206)
Revenue_e	**0.0055**	**-0.0012**	**0.0284**	**0.0285**	**0.0209**
	(0.0041)	(0.0038)	(0.0157)*	(0.0157)*	(0.0133)
Transfer	**0.0017**	**-0.0017**	**-0.0083**	**-0.0083**	**0.0001**
	(0.0016)	(0.0021)	(0.0071)	(0.0071)	(0.0052)
Openness	**0.0038**	**0.0006**	**0.0024**	**0.0025**	**-0.0139**
	(0.0041)	(0.0047)	(0.0159)	(0.0159)	(0.0105)
Fin_dev	**-0.0951**	**-0.1864**	**0.1172**	**0.1170**	**0.0234**
	(0.0422)**	(0.0797)**	(0.1112)	(0.1110)	(0.1630)
Spec	**0.0172**	**0.0252**	**-0.0367**	**-0.0366**	**-0.0504**
	(0.0091)*	(0.0199)	(0.0268)	(0.0268)	(0.0352)
Growth	**0.2466**	**0.0453**	**-0.0771**	**-0.0769**	**0.2088**
	(0.0583)***	(0.1226)	(0.1640)	(0.1639)	(0.1759)
Period_1999-2003	**-0.0049**	**-0.0042**	**-0.0592**	**-0.0592**	**-0.0086**
	(0.0022)**	(0.0034)	(0.0058)***	(0.0058)***	(0.0065)
Period_2004-2007	**-0.0159**	**0.0003**	**-0.0203**	**-0.0204**	**-0.0150**
	(0.0031)***	(0.0039)	(0.0137)	(0.0137)	(0.0091)*
R-Squared	0.5865	0.6476	0.2368	0.5249	0.1691
P-value for Hausman test	0.8370	0.4967	0.2054	-	0.8798
P-value for Breusch Pagan test	0.0995	0.0655	0.4624	-	0.0939
P-value for *F* test	0.2644	0.7890	0.2417	0.2496	0.1314
Nb. Observations	87	87	87	87	87

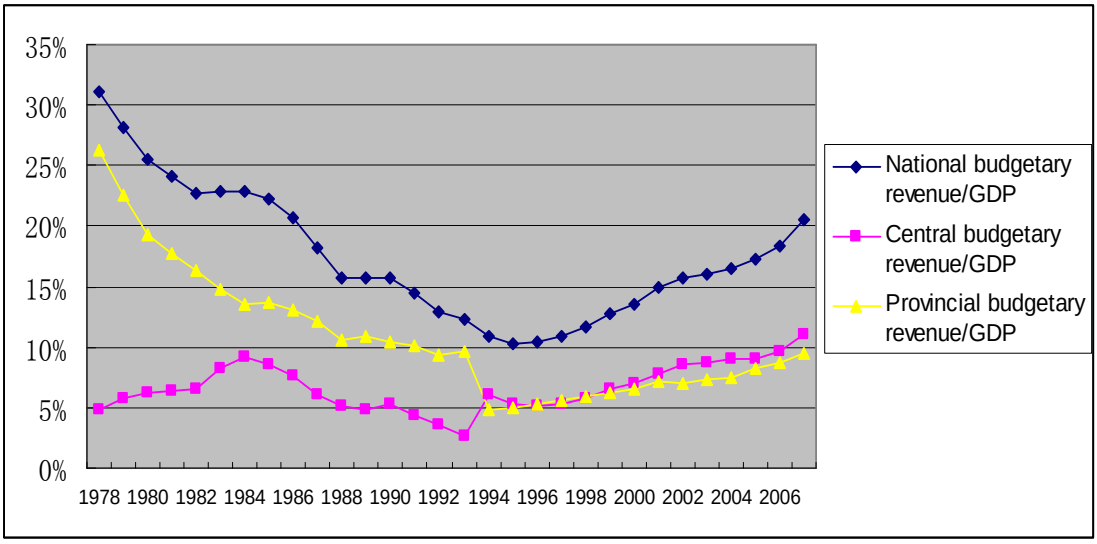
Notes: a. Huber-White robust Standard errors are in parentheses, with *** Significance at the 1% level; ** Significance at the 5% level; and * Significance at the 10% level.

b. Between R-Squared for the random-effects estimations.

c. *F* test for the joint significance of three government size measures: *Revenue_b*, *Revenue_e* and *Transfer*.

Figure 1

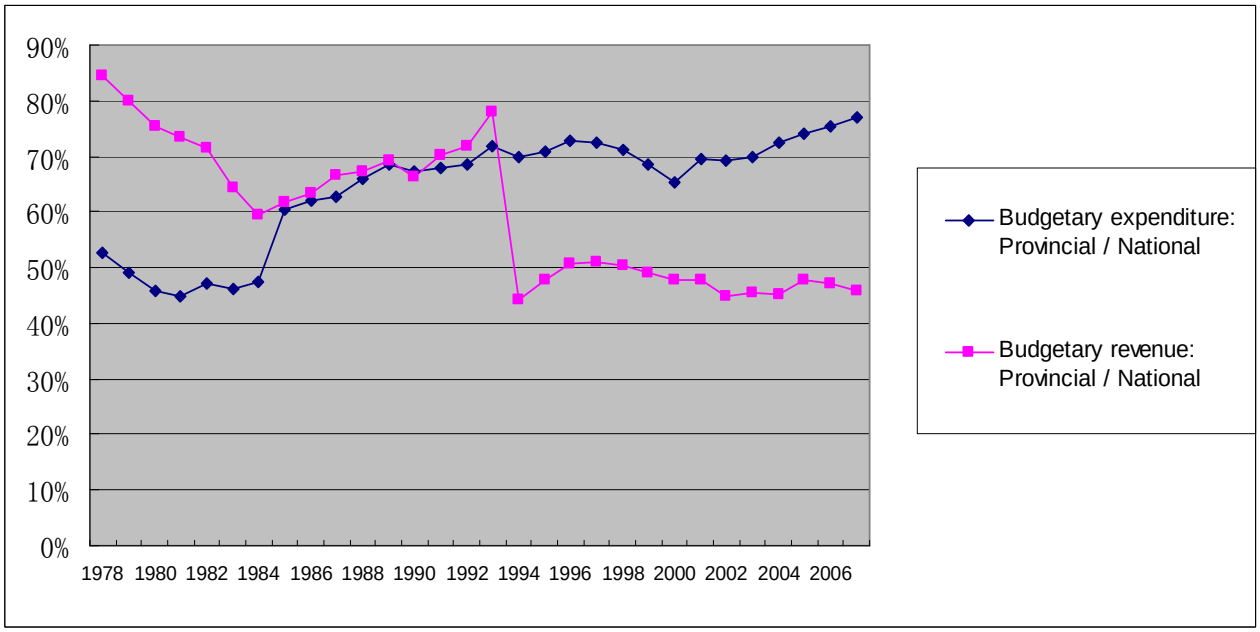
Budgetary Revenue Size Relative to GDP



Data source: *Finance Yearbook of China*, various issues

Figure 2

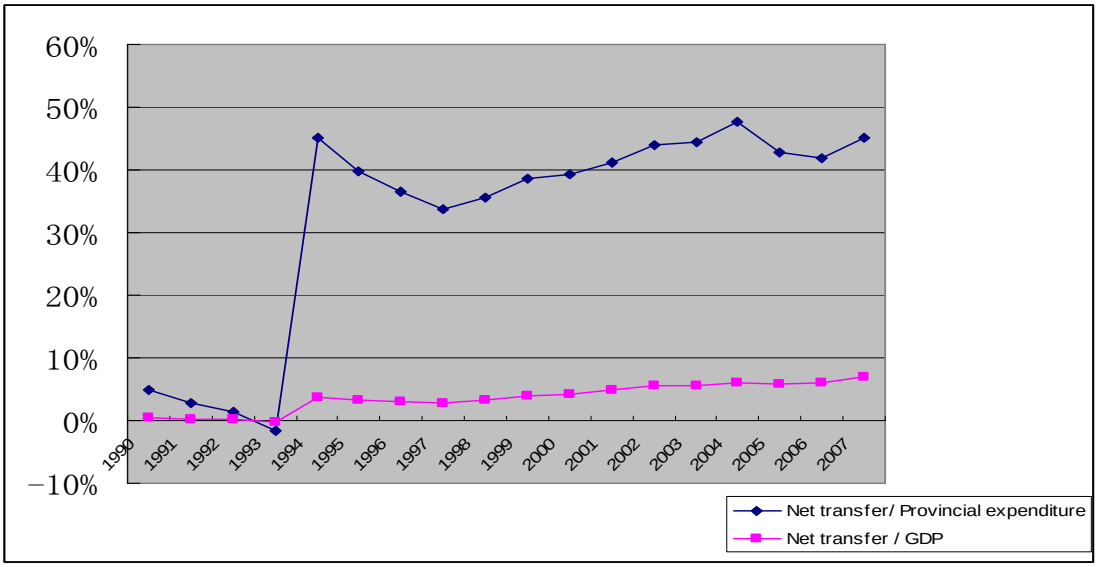
Trends in Provincial Government Size



Data source: *Finance Yearbook of China*, various issues

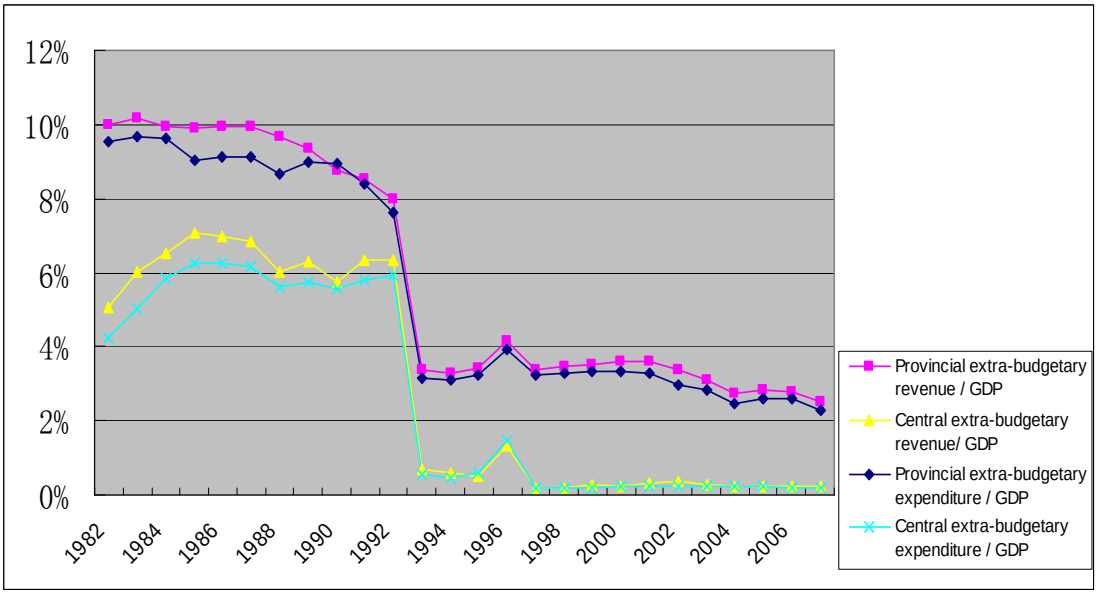
Figure 3

Trends in Net Fiscal Transfers



Data source: *Finance Yearbook of China*, various issues

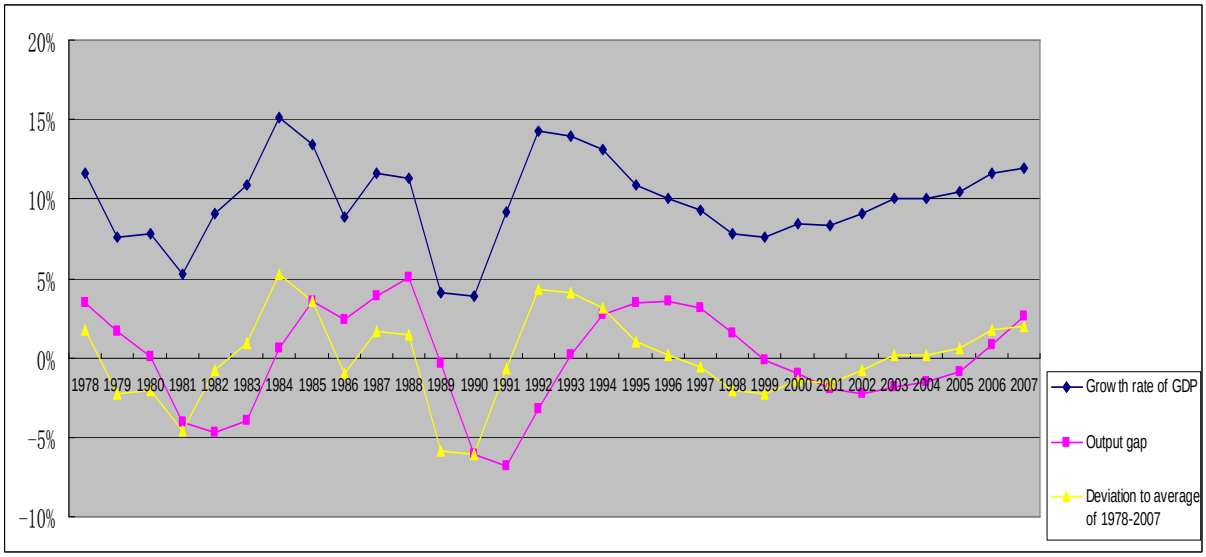
Figure 4 Size of Extra-budgetary Funds Relative to GDP



Data source: *Finance Yearbook of China*, various issues

Figure 5

China's Real GDP Growth and Its Volatility during 1978-2007



Data source: *China Statistical Yearbook*, various issues