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# Sleeping money: investigating the huge surpluses of social health insurance in China

JunQiang Liu · Tao Chen

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**Abstract** The spreading of social health insurance (SHI) worldwide poses challenges for fledgling public administrators. Inefficiency, misuse and even corruption threaten the stewardship of those newly established health funds. This article examines a tricky situation faced by China's largest SHI program: the basic health insurance (BHI) scheme for urban employees. BHI accumulated a 406 billion yuan surplus by 2009, although the reimbursement level was still low. Using a provincial level panel database, we find that the huge BHI surpluses are related to the (temporarily) decreasing dependency ratio, the steady growth of average wages, the extension of BHI coverage, and progress in social insurance agency building. The financial situations of local governments and risk pooling level also matter. Besides, medical savings accounts result in about one third of BHI surpluses. Although these findings are not causal, lessons drawn from this study can help to improve the governance and performance of SHI programs in developing countries.

**Keywords** Social health insurance · Fund balances · Health program administration

**JEL code** I13

## Introduction

Universal health coverage is high on global health agenda (WHO 2010). Many middle and low-income countries realized universal health coverage in the past decade, like Thailand,

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**Table 1** The surpluses of BHI in urban China

Year	A: Revenues (billion yuan)	B: Expenses (billion yuan)	C: Surpluses (billion yuan)	C/A: Surplus rate (%)
1999	9	7	6	64
2000	17	12	11	65
2001	38	24	25	66
2002	61	41	45	74
2003	89	65	67	75
2004	114	86	96	84
2005	141	108	128	91
2006	175	128	175	100
2007	221	155	244	110
2008	289	202	330	114
2009	342	263	406	119

Source China Labor Statistical Yearbooks, various years

Notes The exchange rate between RMB yuan and US dollar was: 6.83:1 (December 31 2009)

China, Mexico and other countries (Hsiao and Shaw 2007; Yip et al. 2012; Knaul et al. 2012). However, managing social health insurance (SHI) funds tends to be challenging for the fledging administrators in those countries. In China, social health insurance funds are managed by over 7,000 local agencies at county/district level. Suffered from inadequate staff, local political interference, etc., those funds have a long way to go before good governance is achieved.

Take the basic health insurance (BHI) for urban employees for example, as the largest and most mature SHI program in China, BHI is facing a tricky situation. By 2009, the BHI scheme accumulated a surplus of 406 billion yuan (US\$60 billion), enough to pay for 18 months of medical bills (Table 1). SHI is normally designed as a pay as you go (PAYG) system (Wasem et al. 2004). There is no need to keep large reserves, except for a certain percentage for contingencies. Therefore, we are curious about the following questions: why is there so much unused money in the BHI scheme? Are BHI funds truly redundant or are they just being poorly administrated?

Without independent supervision, these huge surpluses open up opportunities for fund fraud and misuse. Wan-Xiang Qu, the vice director of the Bureau of Anti-corruption in China, commented that a huge amount of these surpluses might be misappropriated. He also criticized that the huge BHI surpluses only show that local governments are doing a lousy job in fund administration (Wu and Luo 2009). Also, with a large share of BHI funds sleeping in bank accounts, BHI enrollees cannot enjoy a high level of health care protection, and they have to pay more medical bills out of their own pockets. This caused inefficiency of BHI fund management.

China's case has wide international implications because the poor governance of SHI funding is prevalent in developing countries. Good governance is the essential pathway for transforming health expenditure to positive health outcome (Farag et al. 2013). SHI is technology intensive. It contains a myriad of sophisticated administration tasks, i.e. collecting and managing funds, actuarial analysis, negotiation with providers and so forth. Those tasks require a large number of qualified staff and substantial accumulation of experiences, which are both scarce in developing world. Consequently, when fledging administrators confronting this sophisticated system, problems emerge: corruption, inefficiency, lack of transparency, and therefore poor performance. Ultimately, it leads to the deterioration of health protection.

Fraker and Hsiao (2007) reported that only 22 % of SHI funding in Kenya is used in health care expenditure reimbursement, while 25 % is consumed by administration costs and the remaining 53 % is spent on luxury projects.

Therefore, by investigating the causes of the BHI's huge surpluses, this paper will serve a wide audience by providing lessons for SHI administrators and researchers in developing countries. It will improve our understanding of the development of health programs that are newly adopted in inexperienced countries. Ultimately, it is expected to contribute to the good governance and efficiency of SHI programs. The article is organized as follows. In the following section, brief background about BHI is provided and several hypotheses are formulated concerning the possible causes of BHI surpluses. Then, details of the empirical strategy are given. The article concludes with a discussion on the findings and policy implications.

## Background and hypotheses

Market reform in China dismantled the planned economy along with the free health care system embedded in it (Liu et al. 1998). The old free health care system mainly consisted of two programs: the Labor Insurance Scheme, which covered employees and their dependents in state/collective owned enterprises, and the Government Insurance Scheme, which covered public employees such as government officials and those who worked in public service organizations (shi ye dan wei). BHI evolved from merging these two schemes; it was piloted in 1994 in two Chinese cities and implemented nationwide in 1999. BHI was designed to cover the working population in urban areas, but their dependents are not included in the scheme (Liu et al. 2002; Ramesh and Wu 2009).

Under the BHI scheme, contributions come from employers and employees: the former pay 6 % of their payroll and the latter pay 2 % of their salary. Borrowing the idea from Singapore, China introduced medical savings accounts (MSAs) into BHI design (Yip and Hsiao 1997). Despite some regional variations, 30 % of the employers' contributions and all of the employees' contributions go to these accounts. The rest of the fund is allocated to social pooling funds. In most regions, money in the MSAs is used to cover outpatient costs and to purchase medicines while the social pooling funds are used to cover inpatient bills (Liu 2002). But there is a ceiling capped at four times of the regional average social wage. There is usually a half-year waiting period before benefits are payable. Usually, risk is pooled within a county or a prefecture-level city. Within this pooling boundary, the contribution rates and benefits catalogue are the same.

BHI is administrated by social insurance agencies, mostly at a county or city level. This decentralized administration grants local governments almost full responsibility for the operation of the BHI scheme. First, local governments are required to cover administration costs, which include agency building, staff recruitment, and so on. Second, if the BHI scheme incurs deficits, local governments are required to fill the gap. This localized administration ties BHI closely to local governments.

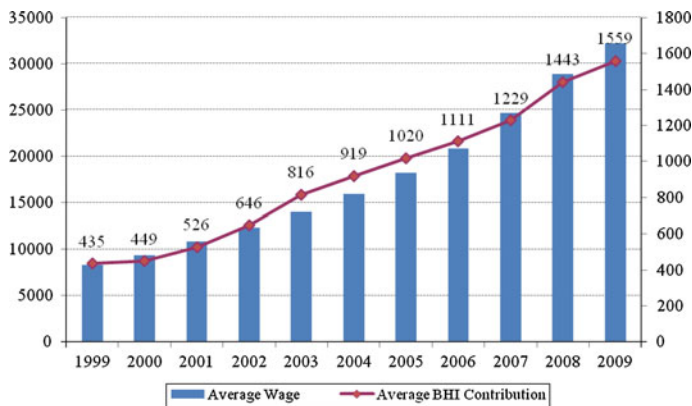
The factors that affect the BHI surplus level are grouped into the following categories: demographic dividend, prosperity bonus, scheme expansion, BHI administration.

*Demographic dividend.* China is experiencing rapid population aging. However, as Table 2 illustrates, the dependency ratio of BHI varied from 0.32 to 0.38 between 1999 and 2009, and this indicator has been going down since 2005. As late as 2009, one worker only needed to support 0.34 retirees under the BHI scheme. The decreased dependency ratio was realized not because local governments adopted measures to discourage employers with large numbers

**Table 2** Aged dependency ratio of BHI

Year	A: Total enrollees (million)	B: Retirees (million)	C: Working population (million)	B/C: Aged dependency ratio
1999	21	6	15	0.37
2000	38	9	29	0.32
2001	73	18	55	0.33
2002	94	25	69	0.36
2003	109	29	80	0.37
2004	124	34	90	0.37
2005	138	38	100	0.38
2006	157	42	116	0.36
2007	180	46	134	0.34
2008	200	50	150	0.33
2009	219	55	164	0.34

Source China labor statistical yearbooks, various years

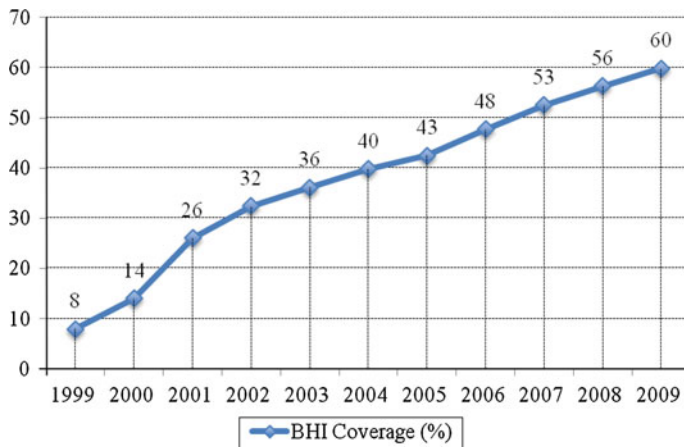


**Fig. 1** Growth of annual wages of urban employed persons (Yuan). Source China labor statistical yearbooks, various years

of retirees from joining the scheme; therefore, selectivity is not a problem here. In fact, large numbers of new entrees (for instance, young migrant workers in some regions) have changed the age structure of the BHI scheme. Since the working population contributes more but spends far less on health care services, we formulate the following hypothesis:

H1: BHI surplus rate has a negative relationship with the dependency ratio.

*Prosperity bonus.* China has experienced boom years for over three decades. Increasing BHI surpluses may also be propelled by rapid economic growth, which is related to an increase in both incomes and BHI contributions. As Fig. 1 indicates, in 2009, the average wage of employed persons in urban work units was 32,244 yuan, 388 % higher than it was in 1999 (8,319 yuan). As BHI contributions come from salary, increases in wages will boost BHI revenues. Figure 1 also shows that the average BHI contribution increased from 435 yuan/person/year in 1999 to 1,559 yuan/person/year in 2009, an increase of 258 %. Even



**Fig. 2** Extension of BHI coverage. *Source* China labor statistical yearbooks, various years. *Notes* BHI coverage = BHI enrollees / (urban employment + retirees). The number of retirees is not reported in statistical yearbooks from 2006 onwards. Therefore we use the number of retirees of the pension program as a replacement

after taking inflation into consideration, wage growth of this scale is impressive. We therefore make the following hypothesis:

H2: Increase in income contributes to the growth of BHI surpluses.

*Scheme expansion.* As Fig. 2 shows, BHI coverage expanded from 8 % in 1999 to 60 % in 2009. BHI coverage may affect the balance through two mechanisms. First, as coverage expands, more people are covered. Thus, sickness risks are pooled on a larger scale and BHI funds will be more secure. Consequently, surpluses rather than deficits are more likely to be created. Second, most new entrees are of working age; they pay more contributions but spend less on health services. As coverage rises, the increase in BHI revenues will exceed the growth of health expenditure. Therefore, we formulate the following hypothesis:

H3: BHI coverage is positively related to BHI surpluses.

*BHI administration.* Agency building is a crucial aspect of BHI administration. Competent agencies and well-trained staff make social insurance agencies smart buyers and bargainers. To be specific, competent social insurance agencies are able to collect more BHI revenues, and they can also produce better management and reduce administration costs, which will ultimately create surpluses. There had been a dearth of qualified staff at each level of the BHI agencies. However, agency building is now high on government's agenda, and BHI agencies have been strengthened more than ever before. Therefore, we propose the following hypothesis:

H4: BHI agency building is positively related to BHI surpluses.

Government financial resources play a vital role in BHI administration. As mentioned above, local governments need to cover the administration costs and fill the gap when BHI funds are in deficit. If a local government has a poor budget record, BHI administrators have little government backup and have to rely on BHI funds only. Therefore BHI funds will be used more completely in those areas than other rich areas. Thus, we propose the following hypothesis:



**Table 3** Summary statistics of average health expenses of urban residents

Year	Mean	Standard deviation
1999	244	86
2000	315	94
2001	342	107
2002	426	151
2003	468	148
2004	516	182
2005	590	198
2006	603	212
2007	675	210

Source China Labor Statistical Yearbooks, various years

H5: Government financial resources are negatively related to the BHI surplus level.

In brief, agency building and government financial conditions are hypothesized to affect BHI surpluses.

*Controlling variable.* The regional difference of medical consumption in urban areas is factor that needs to be adjusted for (Chou and Wang 2009). As indicated in Table 3, some provinces may have higher expenditure (i.e. Shanghai, Beijing), due to residents' preference or price of medical service, and other provinces may have different situations (e.g. inland/western provinces). Medical consumption is related to health insurance reimbursement, and then the surplus level. Therefore, "average health expenses of urban residents" will be incorporated in the model to avoid the "omitted variable bias".

*Unobserved factors.* Due to limited data availability, there are several variables that cannot be detected directly but do affect the balance level of BHI funds. First, the local characteristics of the benefit package determine the quantity and level of BHI balances. Package designing always includes the ceilings, deductibles, co-payment rates, and lists of the drugs and services covered, and this will determine BHI expenditure and then its balance. The second factor is the provider reimbursement methods, but there is no systematic data on regional and temporal variations in payment method distribution. As there is no way to conduct randomized experiments for cross-province analysis, we tried a fixed effects model to fix this problem by assuming that the unobserved factors at the local level remain fixed over time.

## Methods

*Data sources.* Data were collected from official statistics. The unit of analysis was province/year. Although BHI is administrated at a county or city level, only the provincial level data are accessible enough to piece together a complete picture. A panel database ranging from 1999 to 2007 was established which covered the period from the first year of BHI development to the latest year with data.

Most of the data came from China Labor Statistical Yearbooks, Financial Statistics of Local Governments, and China Statistical Yearbooks. Some may have concerns about the quality of official statistics, but according to some scholars' checks and examinations, China's macro-level data are not as flawed as people think (Holz 2003; Chow 2006). In particular,



the data we used in this study are more reliable because they are closely connected to real objects in the physical world. These kinds of data are difficult to fabricate. We also carried out a double check by comparing different sources.

*Measurements.* The dependent variable, BHI surplus rate, was calculated as

$$\text{BHI surplus rate} = \frac{\text{Accumulated BHI surpluses to one year}}{\text{BHI revenues at one year}} \quad (1)$$

The independent variables included dependency ratio, average wage, BHI coverage, the social insurance agency funding, and government financial resources.

*Dependency ratio.* The demographic dividend was estimated using the age dependency ratio, which was defined as the ratio of retirees to working population among BHI enrollees:

$$\text{Dependency ratio} = \frac{\text{Number of retirees among BHI enrollees}}{\text{Working population of BHI Enrollees}} \quad (2)$$

*Average wage.* In order to investigate the effects of economic growth and income increase on the balance level of the BHI scheme, we adopted the average wage of employed persons in urban work units as an indicator.

*BHI coverage.* We measured BHI coverage as

$$\text{BHI coverage} = \frac{\text{Number of BMI enrollees}}{\text{Urban employment} + \text{retirees}} \quad (3)$$

In the statistical analysis, we used the lagged values (with 1 year lag) of BHI coverage because a waiting period of 6 months exists.

*Agency building.* We used the average funding of social insurance agencies as the measurement of agency building. This indicator refers to the financial resources to cover the running costs of BHI agencies, including labor costs, office expenditures, and other costs. Compared with the “average number of staff,” average funding can better measure the administrative capacity of social insurance agencies.

*Government financial resources.* Government financial resources were measured by average government expenditure. Compared with government revenues, the expenditure data reflects government’s available financial resources more completely.

*Control variable.* We adopted medical expenses of urban residents as a control variable. This indicator is released annually by the National Bureau of Statistics in China and can be used to control the local cost of medical care.

*Statistical method.* A panel database ranging from 1999 to 2007 was established. The panel method has the advantage of obtaining more consistent results (Wooldridge 2006). The function is as follows:

$$Y_{it} = \beta_0 + \beta_1 x_{it1} + \dots + \beta_k x_{itk} + \alpha_i + \mu_{it}, \quad i = (1, 2 \dots 31); t = (1999, 2000 \dots 2007). \quad (4)$$

In the above function,  $i$  refers to each of the 31 provinces;  $t$  refers to each of the 9 years from 1999 to 2007;  $\alpha_i$  and  $\mu_{it}$  are two parts of variance ( $\alpha_i$  is province related and does not change

with time, while  $\mu_{it}$  changes over time);  $Y_{it}$  is the BHI surplus rate of province  $i$  at year  $t$ ;  $x_{it1} \dots x_{itk}$  is a set of independent variables; and  $\beta_k$  are the coefficients we are interested in.

## Findings

We conducted the Breusch and Pagan Lagrangian multiplier test, and the results indicated that the fixed effects model was appropriate ( $\chi^2(1) = 189.42$ ,  $p > \chi^2 = 0.0000$ ). In addition, the Hausman test showed that the random effects model was also applicable ( $p > \chi^2 = 0.2753$ ). The fixed effects model was used because we needed to deal with the unobserved factors, but we also provide the random effects results for reference. From Table 4, we can see that most of the independent variables, including the control variable, had the expected relationship with BHI surplus rate. The fixed effects model and the random effect model yielded similar results in terms of both coefficients and significance level. However, these relationships are not causal, and they only represent association. This regression function only explores factors that may affect the surplus level of BHI. We need far more data to reach causal findings.

**Table 4** Statistical results

Dependent variable: BHI surplus rate	Fixed effects	Random effects
Demographic dividend		
Dependency ratio	−0.2749** (0.1270)	−0.3196*** (0.1118)
Prosperity benefits		
Average wage (1,000 yuan)	0.0706*** (0.0071)	0.0658*** (0.0059)
Scheme expansion		
BHI coverage rate (1 year lag)	0.1354*** (0.0477)	0.1501*** (0.0465)
BHI administration		
Social insurance agency funding (1 yuan)	0.0063*** (0.0015)	0.0069*** (0.0014)
Average government financial resources (1,000 yuan)	−0.2399*** (0.0266)	−0.2309*** (0.0207)
Control variable		
Average health expenses of urban residents (1,000 yuan)	−0.3033** (0.1464)	−0.2378** (0.1181)
Constants	0.2558***	0.2767
R <sup>2</sup> : within	0.6423	0.6413
R <sup>2</sup> : between	0.4372	0.4599
R <sup>2</sup> : overall	0.5505	0.5582
Observations	$N = 268$	$N = 268$

\*\*\*  $p < 0.01$ ; \*\*  $p < 0.05$ ; \*  
 $p < 0.1$

First, as expected, the dependency ratio was negatively related to BHI surplus rate, and the significance level was  $p > |t| = 0.031$ . Second, the increase in average wage was positively related to BHI surplus rate. Other things being equal, every 1,000 yuan increase in the average wage meant a 7.06 % growth in BHI surplus. Third, we found that the steady development of BHI also led to an increase in BHI balances. Holding other variables constant, every 1 % extension in BHI coverage meant a 0.14 % increase in the next year's surpluses.

The role of BHI administration in surplus growth is supported by the data. Social insurance agency funding was positively related to BHI surplus rate, which confirmed our hypothesis. Other things being equal, every 1 yuan increase in the social insurance agency funding was related to a 0.63 % growth in the BHI surplus. Also, government financial resources were negatively related to the BHI surplus rate: The richer a local government is, the lower the BHI surplus rate will be. These findings are discussed below.

## Discussion

We propose several possible factors that affect the BHI's huge surpluses: age structure, wage increase, coverage extension, agency building, and government's financial resources. They were quantified and tested with panel data. The related five hypotheses are supported by the statistical results. Although these associations have no causal interpretation, they still can cast light on the dynamics of BHI surplus accumulation. Besides, there are some more factors that may also affect BHI surplus rate, for instance, level of risk pooling, the existence of MSAs, and the role of private insurance.

The level of risk pooling might be a reason for the BHI scheme's high surplus level. Most BHI funds are pooled at a county or city level. This low level of risk pooling always means a small scope of risk pooling and hence produces higher risk for fund operation. Under such a situation, BHI administrators tend to be conservative and to reserve more funds to cope with possible deficits. Thus, surpluses accrue. Also, lower-level risk pooling prevents the distribution of funds between regions, which means that surpluses in one city cannot be offset by another city's deficits.

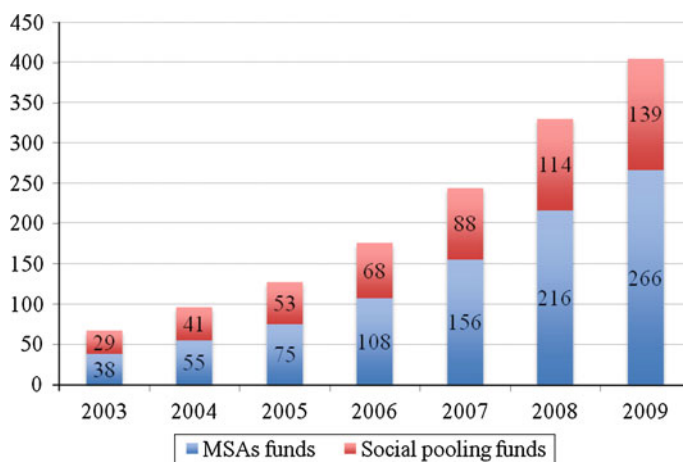
Since systematic data on the level of risk pooling is not available, here we use a concise formal analysis to demonstrate that logic. Assume there are two cities, A and B, which are in a same province (Table 5). The BHI fund in A has a surplus of  $n$  million dollars, and the BHI fund in B has a deficit of  $-m$  million dollars. As indicated in Table 5, if risk pooling is restricted within individual cities, the surplus in A cannot be used to cover the deficit in B, and thus the total surplus is  $n$  million dollars. Conversely, if A and B are pooled at a higher level, then the surplus in A can be offset by B's negative balance. Thus, the total balance would be  $n-m$  million dollars, and it is obvious that  $n - m < n$ . Therefore, considering the

**Table 5** Level of risk pooling and BHI surpluses

	BHI surpluses in A	BHI surpluses in B	Total surpluses
Risk pooling at city level	$n$	$-m$	$n$
Risk pooling at a higher level	$n$	$-m$	$n - m$

Notes 1.  $n$  and  $m$  are both positive numbers

2. There are two conditions in which raising the risk pooling level will not decrease the surplus rate: (1) both A and B have surpluses; (2) both A and B have negative balances. But these two special cases will not harm the overall reasoning



**Fig. 3** Structure of BHI surpluses (billion yuan). *Source* China Labor Statistical Yearbooks, various years

risk pooling level in most areas are only at county or prefectural levels, it might be an origin of BHI's huge surpluses. Therefore, the low level of risk pooling magnifies the overall surplus level by hindering the distribution of funds among regions.

Also, the existence of MSAs is also partly responsible for the BHI scheme's huge surpluses. As mentioned above, employees' contributions (2 % of wages) and 30 % of the employers' contributions ( $30 \times 6\%$  of payroll = 1.8 % of payroll) go to individual accounts. Therefore, on average, 3.8 % of the total contributions go to MSAs and only 4.2 % goes to the social pooling funds. Roughly, MSAs attract 47.5 % of total contributions:  $3.8\% / (3.8\% + 4.2\%)$ . In most cases, the money in MSAs can only be used by individual enrollees (or among family members, but only in few regions); in this way, it prevents the redistribution of funds between the healthy and the sick, the young and the old. Young or healthy enrollees seldom purchase medicines or visit a hospital; thus, there are many balances sleeping in their MSAs. Conversely, of course, unhealthy people always find the money in their MSAs to be far less than they need.

National level data on MSAs is available only from 2003 onward and provincial level data has only recently been made available from 2008. Therefore, we cannot incorporate this variable into the statistical model. However, we can still use national level data to demonstrate the role of MSAs in surplus accumulation. As shown in Fig. 3, the surpluses in MSAs accounted for 43 % of the total surpluses in 2003, but this figure decreased to 34 % in 2009; thus, the share is shrinking but is still significant.

MSAs were introduced to China in 1990s. This design was expected to control the moral hazards from service users (HSU 2010). Before BHI, there were Government Insurance Scheme (GIS) and Labor Insurance Scheme (LIS) in urban areas. Both GIS and LIS suffered from health inflation, because enrollees had little incentive to consume less, given the generous benefit level, i.e. moral hazards (Pauly 1968; Nyman 1999). MSAs were introduced to China from Singapore, which was expected to make enrollees have more consciousness of cost when they consume (Li 2008; Hsiao 2001). Also, by allowing people to purchase medicine at drug stores, price competition among pharmacies (also hospitals) may help control the cost on drugs. Also, MSA was used to soften the resistance to reform. The process of BHI replacing GIS and LIS was painful to many GIS and LIS enrollees. In order to win their support, BHI designers adopted MSAs, which can be considered as somewhat welfare

**Table 6** Prevalence of private health insurance in China

	Year	Percentage (%)
	1993	0.3
	1998	1.9
Source Center for Health Statistics and Information of Ministry of Health (2004, 2010)	2003	7.6
	2008	6.9

to enrollees because they can use this money to cover outpatient cost. So from historical perspective, MSAs' introduction was deliberate.

However, many factors cast doubt on the effectiveness of MSAs funds in paying enrollees' bills in future, for instance, the inflation, administrative cost et al. Facing this, in many localities, administrators of BHI are trying to lessen the restrictions on the use of MSA funds. In places like Shenzhen, MSAs are allowed to cover medical expenses of family members. Also, MSAs can also be used to purchase commercial health insurance. This trend is worthwhile attempt to raise the utilization of MSA funds. In a word, we may need a separate study to evaluate the performance of China's MSAs.

As to private insurance, based on data from National Health Service Survey (NHSS), around 7 % of the population have private (commercial) health insurance in 2003 and 2008 (Table 6). With double insurance coverage, those covered may incur fewer health expenses to BHI. Therefore, private health insurance may contribute to the BHI surpluses. However, the NHSS datasets only provide data on a 5 year interval basis, and the unit of analysis is individual, therefore it is difficult to merge with the panel data of this study. Here the relationship between private insurance and BHI surplus is of hypothesis, and further study is needed.

After reviewing the above factors, this article aims to uncover the causes of the BHI scheme's unnatural surplus rate. These findings and discussions may provide lessons to policy makers and by carrying out relevant remedies, the overall performance of the scheme can be improved.

First, projection analysis of BHI financial prospect should be strengthened. Some of the causes for surplus accumulation may be normal but not permanent. For instance, the dependency ratio will not decline forever as China is aging rapidly in general. The growth of average wages and BHI coverage will slow down. Thus, these factors do not tend to be the real concerns in relation to the BHI's surplus rate. However, wise administrators would monitor the key economic and demographic indicators closely. Both short term and long term forecast analysis should be reinforced, and over-optimism should be avoided.

Second, we should be cautious about factors relevant to the administration. Local government's financial resources are negatively related to BHI surplus. It may imply that richer areas have much more surpluses, vice versa. This can cause disparities of protection to enrollees among regions. To equalize the level of health protection, government may need to promote redistribution of funds among regions.

Third, related to the above second point, the level of risk pooling should be raised to a higher level. Not only can it reduce the surplus rate, but it can realize redistribution of BHI funds among balance rich and poor areas. Besides, at a higher level, BHI will be more resilient to risks.

Fourth, although not conclusive, MSAs are closely related to BHI surplus. Abolishing MSAs may be too radical and disputable, but government still has many options concerning MSAs. On the one hand, they can change the definition of MSAs by allowing family members

to use, and extend benefit catalogue gradually. This will raise the utilization of MSA funds. On the other hand, they can also offer an interest rate for the money in MSAs, through which the inflation problem can be relieved to some degree.

In summary, this study contributes to the literature in two ways. First, by examining a curious case, namely the huge surpluses of the BHI scheme in China, this study can improve our understanding of the fund administration of SHI programs. Mechanisms of balance accumulation and reduction can be drawn from the empirical findings above. In particular, this project responds to those studies that have reflected the impact of MSAs (Shortt 2002; Barr 2001; Yip and Hsiao 1997). Second, SHI is becoming more and more popular in developing countries (Liu 2011). China's case can provide valuable lessons for policy makers to improve the efficiency of SHI schemes in their countries. Only if we have better knowledge of SHI administration and only if the performance of SHI schemes is improved will the role of SHI in promoting equal and adequate access to health service be achieved.

**Ethical standards** This project was approved by the institution review board at author's home institute (detailed in title page).

**Conflict of interest** The authors declare no conflict of interest.

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