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# Tax-sharing System, Transfer Payment and Regional Risk Sharing:

# Evidence from China

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# Tax-sharing System, Transfer Payment and Regional Risk Sharing: Evidence from China[1]

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## Abstract

This paper investigates the regional risk sharing and the amount of shocks smoothed via fiscal transfer and tax-sharing system in China over 1995-2005. In a perfect economy, the households can smooth consumption across regions through various channels and mechanisms in the face of exogenous shocks of income, so that there is no significant fluctuation of households' disposable income across regions. We use standard consumption smoothing model and Asdrubali et al. (1996)'s risk sharing decomposition method. The empirical results show that: (1) The degree of risk sharing across provinces of China is relatively low; (2) Intra-national risk sharing decreases recent years because of the tax-sharing and transfer payment, i.e., the contemporary fiscal system of China do not smooth provincial income variation highly.

**Key Words**: Consumption Smoothing, Regional Intra-national Risk Sharing, Tax-Transfer System

**JEL:** H2 R5

## 1 Introduction

The main purpose of this paper is analyzing the degree of risk sharing among provinces in China and impacts of tax-sharing system and transfer payment system upon the risk sharing, when there exist external economic shocks. In fact, given differences in natural resources, opportunities and sequences for opening to the outside and difference in local financial abilities, average incomes and consumption per capita differ greatly in different areas of China. Particularly in some undeveloped area, permanent incomes of residents and local public good are short for covering loss caused by natural disasters and other external shocks, which leads to obvious decline of local consumption and national welfare. For decreasing this

income difference, Chinese central government has always been striving to smooth income for local people and realize balanced growth of national economy by implementing various systems and policy reforms including financial systems. This article try to examine how financial systems featuring in tax-sharing and transfer payment systems by influencing income variance of local areas over the past ten years.

Theoretically, *Regional Risk Sharing* can be used to reflect correlation of regional incomes within one country. The first topic for research on risk sharing is household consumption smoothing. Based on *Life Cycle – Permanent Income Hypothesis*, and with external shocks from employment, health, education and other fields, families usually carry out *Intertemporal Smoothing* for household consumption by various means so as to avoid large consumption changes in different periods. Besides, consumers may smooth all *Natural States* of consumption in the same period by virtue of different kinds of market and non-market methods (such as commercial insurances), which is consumption smoothing with risk sharing effect (Cochrane, 1991; Mace, 1991; et al.）.

At present, a great many studies have extended the study of household consumption risk sharing to inter-country and inter-region risk sharing (Atkeson and Bayoumi, 1993). In the regional risk sharing researches, every region within one country is considered as an individual, and regional consumption and income fluctuations are deemed as basically the same on condition that there is risk sharing system among regions (such as transfer payment system from central government to the region and perfect national capital market). Therefore, analysis on regional risk sharing is to analyze varying modes of consumption and incomes in different regions in a country. Unlike inter-household consumption researches, regional risk sharing researches are usually on the basis of macro regional statistics. As production at regional level fluctuates heavier than inter-country production, it is more important to study risk sharing system among different regions within one country.

According to the literatures, there are several channels for regional risk sharing. The most important channel in China is probably the tax-sharing and transfer payment system. China has a powerful central government that plays an important role in development of local economy. In particular, after reform of tax-sharing system in 1994, to eliminate poverty and improve social welfare, China established a relatively standard central-local tax revenue sharing system and gradually established various transfer payment and revenue reallocation systems. This kind of financial system influences variances of incomes and consumption of local residents to a large extent. Thus, the keystone of this research lies in verification of regional risk sharing level in China on one hand, and in verification of actual influences of Chinese financial and tax systems upon regional risk sharing on the other hand. Apparently, this research relates much to policies: If very little regional consumption in China is smoothed by current financial and tax system, China shall continue to adjust the system to reach balanced regional development and social fairness. This is also the motivation for China to advocate "harmonious society", and shows directions for deepening financial and taxation reform.

The basic method used in this paper first is to set up panel data models based on

consumption, outputs, tax revenues, transfer payments and other variables of all the regions over the past ten years. Then we will verify regional risk sharing degree in China and influences of Chinese financial tax system upon regional risk sharing through different settings of models. Finally, we propose suggestions for establishing an effective tax revenues-transfer payment system. This paper is organized as follows. Section 2 reviews literatures on regional risk sharing and tax revenues-transfer payment systems. Section 3 set up two econometric models for regional risk sharing and risk sharing via financial channel. Section 4 provides specific information about data used in this article. Section 5 explains results of regressions. The last section is conclusion.

# 2 Literature Review

As this paper focuses on verifying regional risk sharing degree in China and influences of Chinese financial systems upon regional risk sharing, we concentrate on literatures about Chinese regional risk sharing and influences of Chinese financial systems. What are we interested is how local regions deal with uncertainty of future incomes, as they have greatly different natural and social environment. One possible answer is to establish regional mutual aid mechanism[1], raise funds in national capital market and transfer payments from central government, etc. This is regional risk sharing, which disperse loss of one region caused by uncertainty to other regions across the country. Complete regional risk sharing means all external shocks are smoothed, which is the theoretical benchmark for our analysis. Deviations from complete risk sharing can be used to interpret the deviation of the allocation of consumption and incomes from the Pareto optimal allocation.

As many researches show, there are many channels for regional risk sharing. For instance, Asdrubali, Sorensen and Yosha (1996) set a standard variance decomposition model ("ASY model") to analyze inter-state consumption and incomes risk sharing patterns in America in 1963-1990. They used national accounting data to build a data set, and quantifying inter-state risk sharing in USA by decomposing the variance of a gross state product into variance of several kinds of income variables. They found that only partial inter-state risk sharing was achieved, specifically 39% smoothed by capital market, 13% smoothed by federal government, and 23% smoothed by credit market, while 25% of the shocks could not be smoothed. They further decomposed the channels of federal government into risk smoothing by the federal government into tax revenues, transfer payment, grant to states, etc.

ASY model pointed out several regional risk sharing channels. First, one region could share risk by having assets of other regions via developed capital market. Second, transfer payment by the central government has certain effectiveness of income smoothing. Third, a region can adjust its assets portfolio in credit market by means of loans or lending, etc. Based

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[1] Such as the horizontal transfer payment system implemented in Germany, i.e. rich states carry out financial transfer directly to poor states. Refer to Yang Zhigang (2003) and Buettner (2002).

on these risk sharing channels, lots of academic researches were carried out on inter-state risk sharing in USA and inter-country risk sharing in EU. For example, Athanasoulis and van Wincoop (2001) used growth model to analyze uncertainty of income growth on state level in America, and found that risk sharing brought potential benefits to American economy in financial market and policies during 1963-1990. Sorensen and Yosha (1998) analyzed EU and OECD inter-country income smoothing and risk sharing during 1966-1990, and found smoothing degrees of GDP shocks differed along with frequencies. They indicated that the reasons for smoothing might be governmental budget deficits, corporate deposits or inter-government debit and credit.

In many countries, central governments offer risk sharing for residents' incomes in different regions with a view of regional income re-allocation by financial system, usually, by means of tax revenues – transfer payment system. In addition to ASY model, many empirical researches have proved this kind of financial mechanism with risk sharing function *(Fiscal Risk-sharing Mechanism)*. Specifically, Sachs and Sala-i-Martin (1991) verified risk sharing provided by US federal government for its states through federal transfer payment and tax revenues, and found tax revenues and transfer payment of the federal government had large impact on state income shocks during 1970-1988. Averagely, if the income of a state drops by 1 dollar, the tax revenue of the state will decrease by 35 cents, and the transfer payment given by the federal government will increase 30 cents. von Hagen (1992) found the risks shared by the federal government were much less. From 1981 to 1986, if the income of a state lowered by 1 dollar, its tax revenue dropped 8 cents, while the transfer payment increased 2 cents, which means 10 cents from external shock were absorbed by financial system of the federal government. Bayoumi and Masson (1995) deemed that tax revenues and transfer payment system used by the federal government for its states could be used for analyzing long-term financial flows and influence of financial system on commercial cycles for a short term, and thus risk sharing degree depended on system structure of the country. von Hagen (1998) reviewed various empirical researches on regional insurance effects of American, Canadian, European and Japanese financial systems. Grant and Padula (2001) used survey data collected from American consumers to verify whether accumulative tax revenue system could provide insurances, and reached different results in different settings.

In China, the tax-sharing system reform in 1994 also included establishment of transfer payment, i.e. the central government provided regional income re-allocation function via tax sharing- transfer payment system to smooth regional income fluctuations and give similar macro-economic risk for all the regions. For instance, in case there is an external shock on income of a province, the financial arrangement by the central government will make the province pay less tax while gaining more transfer payment. However, few empirical researched are conducted on influences of Chinese financial systems upon regional risk sharing (Tochkov, 2007), while most of the researches are about influences of transfer payment and financial decentralization upon regional economy. For example, in opinions of Ma and Yu (2003), generally speaking, the transfer payment did not have the effectiveness of reducing regional gaps due to unfair allocation of funds of transfer payment. Zhang and Zou

(1998), Zhang and Gong (2004), and Yin (2004) found that Chinese local financial decentralization did not effectively drive regional economic growth and were not good for shrinking regional gaps.

The main purpose of this article for analyzing influences of financial systems on regional risk share is to examine importance of the government (relative to market mechanism) to income and consumption smoothing for local residents. Different countries may have different consumption smoothing modes and risk sharing channels, because of huge differences in their financial markets and financial systems. As China is a country where the central government has relatively strong power for finance control and the financial market needs to be improved, the most significant risk sharing channel in China is probably the financial decentralization system which features in tax sharing and transfer payment. Unlike a great lot of literatures on EU inter-country and US inter-state risk sharing, this research will verify Chinese regional risk sharing and influences of Chinese financial and tax systems upon regional income insurances during 1995-2005.

# 3 Models

## 3.1 Regional Risk Sharing and Consumption Smoothing

This section uses regional risk sharing model (Mace, 1991) to estimate risk sharing and consumption smoothing levels of regions in China in the face of certain external income shocks. The model supposes a country is divided into I regions, i=1, ……, I. Every region has a representative family, the income and consumption of which represent the average income and consumption per capita in the region. State variable $s_\tau$ means the uncertainty of each period, and every period t has S states, $\tau =1, 2,……,S$. $\pi_t(s_\tau)$ is the probability of state $s_\tau$, while $\sum_{\tau=1}^{S}\pi_t(s_\tau)=1$. The life-cycle expected utility of the regional representative family in region i is:

$$\sum_{t=0}^{\infty}\beta^t\sum_{\tau}^{S}\pi_t(s_\tau)U(c_{it}(s_\tau),b_{it}(s_\tau))$$

Where, $c_{it}(s_\tau)$ is the consumption of region i's representative family during period t under state $s_\tau$, $b_{it}(s_\tau)$ is the preferential external shock on family i under state $s_\tau$, $\beta$ is discount factor, and 0<$\beta$<1. The national economic budget constraint is:

$$\sum_{i=1}^{I}y_{it}(s_\tau)=\sum_{i=1}^{I}c_{it}(s_\tau)$$

If CRRA utility function is used, we may estimate the following metric model after a

series of deduction:[1]

$$\Delta \log(c_{it}) = \alpha + \lambda \Delta \log(c_t^a) + (1-\lambda)\Delta \log(y_{it}) + u_{it} \quad (1)$$

Where, $c_{it}$ is the consumption of family i (region i) during period t, $y_{it}$ is the income of family i during period t, $c_t^a$ is average consumption of all families in period t, and $u_{it}$ is error item. Coefficient $\lambda$ means the degree of risk sharing. The closer $\lambda$ is to 1, the more similar consumption trends of regions and national average consumption trends are, and the higher the risk sharing degree is. Contrarily, the closer $\lambda$ is to 0, the lower the risk sharing degree is. When $\lambda = 1$, the ideal state of complete risk sharing is realized.

## 3.2 Fiscal Channels for Regional Risk Sharing: Tax-sharing and Transfer Payment

This section analyzes how such finance and taxation systems as tax-sharing and transfer payment influences regional risk sharing as a kind of channel. Transfer payment can be deemed as a kind of income insurance given by central government to local governments, so that local governments will be able to ensure average incomes and consumption per capita in regions will not change dramatically under stress of external economic shocks. Most researches on regional (or global) risk sharing channels are based on ASY model, i.e. to decompose variance of regional incomes into variances of several kinds of incomes. This method is adopted in this article, too.

Income of the representative family in region i can be written as:

$$y_{it} = \frac{y_{it}}{y_{it} + transfer_{it} - tax_{it}}(y_{it} + transfer_{it} - tax_{it})$$

Where, $y_{it}$ is as defined in above section, $transfer_{it}$ is the amount of transfer payment received by region i from the central government in period t, $tax_{it}$ is the central tax levied by the central government in region i during period t (all these values are per capita), and $x_{it} = y_{it} + transfer_{it} - tax_{it}$ is the disposable income of region i's representative family in period t. After a series of transforming (Sorensen and Yosha, 1997), the following estimation equation is derived:

$$\Delta \log(y_{it}) - \Delta \log(y_{it} + transfer_{it} - tax_{it}) = \alpha + \beta \Delta \log(y_{it}) + u_{it}$$

Coefficient $\beta$, positive or negative, is the slope of the above regression equation, representing risk sharing degree through fiscal channel. For instance, if the growth of disposable income exceeds growth of national income of the region, $\beta$ is smaller than 0,

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[1] Refer to Crucini and Hess (1999) for details about deduction process and relevant inference.

and the above equation can be transformed into:

$$\Delta \log(y_{it} + transfer_{it} - tax_{it}) = \alpha^* + \beta^* \Delta \log(y_{it}) + u_{it} \quad (2)$$

Where, $\beta^*$ means the regional income shock that is not smoothed by net transfer payment ($transfer_{it} - tax_{it}$), and risk sharing degree is 1-$\beta^*$. When $\beta^*$=1, the net transfer payment does not share risks at all; when $\beta^*$=0, the net transfer payment shares all the risks of certain income shocks of the region; when 0<$\beta^*$<1, the net transfer payment does not share regional risk; when $\beta^*$<0, the net transfer payment enlarges the shock on income of the region. Especially, if smoothing effects of tax revenue and transfer payment upon regional incomes are considered separately, $transfer_{it}$ and - $tax_{it}$ can be used to replace $transfer_{it} - tax_{it}$ of equation (2) respectively. In this case, the estimation coefficients show influences of tax revenue and transfer payment upon regional risk sharing degree respectively. In addition, since different regions may have different degrees of fiscal risk sharing, dummy variables can be added to equation (2) before regression:

$$\Delta \log(x_{it}) = v_t + \beta_1 D \Delta \log(y_{it}) + \beta_2 (1-D) \Delta \log(y_{it}) + u_{it} \quad (3)$$

Where, D=1 if region i is coastal, or D=0 if region i is inland. $\beta_1$ and $\beta_2$ shows proportions of risk unshared in costal and inland regions respectively.

# 4 Data

China implemented tax-sharing and transfer payment system from 1994, before which, the Financial Contracting System was adopted. Because Chinese financial system changed essentially during these two periods and it is difficult to obtain precise data for the period before 1994, the time series of the data set used in this article is from 1995 to 2005. This panel data set includes variables of regional consumption, gross domestic product, tax revenues paid to the central government, amounts of transfer payments received from the central government and other characteristic variables for 30 provinces, autonomous region, and municipalities[1] of China. In this article, consumption data and gross domestic product are used to describe variance of incomes and consumptions of the regions and data structures

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[1] Excluding Chongqing, Hong Kong, Macao. As Chongqing becomes a municipal city in 1997, it is included into Sichuan for study.

of tax revenues and received transfer payments are used to reflect variable of Chinese financial system. Specific definitions and sources of variables and data used in this article are as follows:

## 4.1 Regional Incomes and Consumption Data

*Regional GDP.* In regional risk sharing model, definition of regional incomes is important as local consumption of residents may be influenced by their incomes. Generally, regional incomes may be reflected by using regional GDP, regional national incomes and regional disposable incomes. For few data of various types of residents in regions are obtained from Chinese statistic system, we use regional GDP as the variable of the regional income, which is often adopted by other researches in this field.

*Regional consumption.* Regional consumption reflects consumption level of a region. In this article, two types of regional consumption indexes are used, namely "regional final consumption" and "regional residents' consumption". Regional final consumption is the final consumption expenditure of permanent units in the region (the sum of residents' consumption, governmental consumption and other consumptions), while residents' consumption only includes consumptions of permanent residents in the region. As the regional population included in this data set is also the permanent population, the consumption per capita calculated from regional consumption and population is relatively reasonable. Data of regional GDP and consumption are mainly from China Statistic Yearbooks, Comprehensive Statistical Data and Materials on 50 Years of New China and provincial statistic yearbooks over past years.

## 4.2 Regional Tax Revenue, Transfer Payment and Other Financial Data

*Regional tax revenue.* Regional tax revenue includes central tax and local tax collected by central and local governments in that region. Variables "tax revenue of central tax authority" and "tax revenue of local tax authority" reflects tax revenues obtained by different administrations from that region. These data are from China Tax Statistic Yearbooks, National Tax Statistics and other statistics and materials of tax authorities over past years.

*Transfer payment received by the region from central government.* Chinese transfer payment system is complicated, and its basic structure, allocation methods and funds use system change a lot since 1994. As a whole, Chinese transfer payment now is divided into financial transfer payment, special transfer payment and tax revenue return & system subsidiary. However, due to lack of specific data about various transfer payment items at the moment, we only calculate the total transfer payment to every region. We use an index to calculate net transfer payments to regions by the central government: The amount of the said net transfer payment comes from the transfer payment paid by the central government minus the amount paid by local government to the central government. These data are from budgets and final accounting tables of provinces and cities in Finance Yearbooks of China for years.

## 4.3 Regional Price Index and Other Variables

*Regional price index.* Shown by some researches, series of fluctuation may occur when nominal GDP is used for estimation. Thus we need to use regional price indexes to adjust regional GDPs for the same year. Two types of price indexes are used in this article: Regional

CPI and regional GDP deflator[1].

　　*Regional population.* Population of a region by the end of the year is considered as the region's population and used to calculate average GDP and consumption per capita. These data are obtained from China Statistic Yearbooks over these years, and are statistics about regional permanent population.

　　*Constructed dummy variable*. To analyze whether different regions have different degrees of risk sharing, we introduce a dummy variable in this article: whether the province is coastal. This dummy variable is controlled in regression, and can be used to analyze whether coastal provinces share risks better than inland provinces.

# 5 Results

This article is to test risk sharing among 30 provinces and autonomous regions in China during 1995-2005. We first use consumption-income framework to verify how regional consumption changes under income shocks from the outside, and then analyze to which extent Chinese tax-sharing system and transfer payment influence regional risk sharing.

　　Regional final consumption is the sum of all types of consumption in the region's economy. Regional resident consumption is the total value of household consumption in the region. We divide these two types of consumption by the total population of the region in the same year, and get the result as the region's consumption per capita. Then these two types of consumption are regressed in the equation (1). Results of which are shown in Table 1. Line 1 shows the regression results of final consumption per capita calculated as the dependent variable with the panel model of fixed effect. As intercepts are unobvious, line 2 uses mle method for regression and all parameters of the model are obvious. Line 3 and 4 are models which use resident consumption per capita as the dependent variable, and use panel model of fixed effect and mle method respectively to obtain regression results. Every regressive model is very obvious. Most importantly, coefficient $\lambda$ of national average consumption $c_t^a$ is

0.7270, 0.6474, 0.8188 and 0.7294 in four regressive models respectively. Hausman Test shows $\lambda$ is obviously smaller than 1. This means regional consumption smoothing mechanism in China is still deficient, and regions cannot realize complete risk sharing in the face of certain risks. Especially compared with developed countries, regional risk sharing is very weak in China. For example, Crucini and Hess (1999) found through empirical models that: The regressive coefficient $\lambda$ of consumption smoothing is 0.88 among provinces in Canada, 0.93 among counties in Japan, and 0.81 among states of USA[2]. Almost all the coefficients in those countries are higher than the empirical result of this article. [3]

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[1] Relevant data are obtained from www.macrochina.com.cn.
[2] Risk sharing degree among states of USA is comparatively similar to the degree of provinces of China. From views of Xing (2007), market segmentation degrees are similar in China and USA, which may explain why China and USA have similar regional risk sharing degrees. In addition, types of data and methods used in this article are not exactly the same with those used by Crucini and Hess (1999), which also impacts results to some extent.
[3] In their studies, estimation coefficient of OECD countries is 0.40, much smaller than that result of this article and other

Next, we analyze how Chinese financial systems influence regional risk sharing. We use regional annual GDP as income of the region in the same year, plus net transfer payment from the central government, minus central tax collected by the central government from the region, and the result is the disposable income of residents in that region. Divide the disposable income by the region's population of the same year, and we get the region's disposable income per capita in that year. Since the state's financial systems can adjust regional incomes and the adjustment will smooth income variation of the region, these financial systems are influential in regional risk sharing. Similarly, regional GDP plus net transfer payment or regional GDP minus central tax, we'll get smoothing degrees, which show regional risk sharing by means of transfer payment or tax-sharing system between the central and local respectively. We have estimated risk sharing degrees in these three situations by using equation (2), results of which are listed in Table 2.We can find that: Firstly, in the face of external shocks during 1995-2005, after taking into consideration the transfer payment and tax-sharing system, financial income and expenses channel enlarged regional gaps, and the risk sharing degree reduced by 0.50%; secondly, if only transfer payment from the central to local is considered, the transfer payment also enlarged regional gaps and the risk sharing degree reduced by 4.48%; thirdly, if only central taxes collected by the central government from local regions are considered, regional risk sharing degree rose by 5.57%, probably because the central government levied higher tax in rich coastal areas than in poor inland regions (refer to Figure 1). Obviously, instead of well smoothing regional incomes well, Chinese financial transfer payment worsens regional risk sharing. One possible reason is that the current transfer payment includes tax return to local governments, and richer regions have larger amount of tax return. This temporary expedient of incremental reform[1] jeopardizes fairness of financial and taxation systems heavily. Of course, this is already taken into account for current financial arrangements. That's why tax return to local governments did not increased obviously, compared with other items of transfer payment over these years.

Based on another study on influences of Chinese financial systems on regional risk sharing (Tochkov, 2007), although financial income and expenses channel, transfer payment and tax-sharing system smoothed some external shocks during 1980-2001, they expanded 5.48% and 6.48% external shocks and smoothed 3.14% external shocks respectively during 1995-2001. This is similar to the results we obtained. Compared with our study, American financial system has higher effect on regional income smoothing (refer to Sorensen and Yosha, 1997). Specifically, transfer payments from the federal government directly to individuals smoothed 9.9% external shocks on states, direct financial aids from the federal government smoothed 2.2%, while taxation system smoothed just 1.1%. Nevertheless, it is now difficult for transfer payment to individual to influence regional risk sharing, as the social insurance system in China needs to be improved.

We also analyze risk sharing degrees of coastal regions and inland regions via financial channels; refer to Table 3 for regression results. As found through our study: First of all,

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studies. This shows inter-country risk sharing degree is smaller than regional risk sharing degree within one country.
[1] Ensure local financial incomes after the reform are not lower than those before the reform.

overall financial system shared 5.06% risks in coastal areas, while expanding regional gaps by 2.46 for inland regions; secondly, transfer payment has non-smoothing effect, the percent of which is 2.54% in coastal regions, lower than 5.16% in inland regions; particularly, tax-sharing system smoothed 7.99% of external shocks in coastal areas, while smoothing only 3.10% in inland areas. This makes it clearer that Chinese financial and taxation systems is more beneficial to rich coastal regions for risk sharing, rather than reducing regional gaps. Many discussions think the regional inequality in China is partially because the absolute amount of transfer payment from the central government is larger in rich areas than in poor areas, which is a matter of fact. Although the proportion of transfer payments to region's GDP is smaller in rich coastal regions than in poor inland regions (Figure 1), rich provinces are stronger to smooth incomes as they have high financial strength and their markets are sufficient enough to ensure incomes.

At last, price levels may influence accounting of economic variables. Actual GDP and actual consumption obtained from calculation with different price indexes may influence results of this article. Thus, we use regional CPI's and GDP deflators to adjust GDP's, transfer payments, tax revenues and other data of regions before regression. However, results showed this adjustment has little effect.

# 6 Conclusion

Based on regional data, this paper tests the degree of regional risk sharing in China and influences of Chinese financial systems upon regional risk sharing. We adopt risk sharing model and ASY model, both of which are classical in the field of risk sharing. By regressions and calculations, we found: (1) Regional risk sharing in China is insufficient, and only a small portion of consumption variation is smoothed in the face of certain external shocks; (2) As a whole, financial channels reduces regional risk sharing degree, which means current financial transfer payment system does not well smooth income variation among regions in China.

Financial arrangements among Chinese governments have a strong fiscal federalism feature, and financial relations among governments of different levels are determined through tax-sharing and transfer payment systems. However, financial expenses of these governments and public services provided by them differ greatly, because tax return accounts for a larger proportion out of transfer payment since tax-sharing system reform, and they almost counteract the transfer payment system established for the purpose of equality. Besides, the current transfer payment system is lack of openness and consistency for a long time. Various items for implementing the transfer system are not only dispersing but also lowly efficient. Especially for regional risk sharing, our empirical results show current financial systems reduce degree of risk sharing, rather than offsetting shocks on incomes of regions. Therefore, next step for financial reform is not only to increase transfer payments from the central government to undeveloped regions, but also to further enhance separation of finance and

governance for central and local governments with a view of smoothing regional consumptions, shrinking regional gaps and constructing a harmonious society. This separation includes giving local governments' higher power for independence finance, giving local government more local tax revenues, building horizontal regional transfer payment system, etc.

However, our study has shortages. Firstly, any empirical models have measurement errors. Especially in China, overestimation or underestimation may occur since data on provincial level are usually less precise than national data. The solution is to adopt longer period of time (it's a regret that Chinese tax-sharing and transfer payment systems have a short history of more than ten years, and the available period of time is relatively short) or use more complicated estimation methods. Moreover, different regions may have different variances. For example, some regions are agricultural provinces, while some may be industrial provinces. Composition of national economic departments may differ largely in different provinces, which may cause sharp differences of variances of income or consumption fluctuation. Generally speaking, the solution is to estimate two stages. Study in future needs to adopt longer period of time and use reasonable models to estimate regional risk sharing and reveal more effects of policies in the background of Chinese financial system.

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Figure 1 Proportions of Transfer Payments from and Taxes Turned Over to Central Government of GDP:
Coastal Areas and Inland Areas
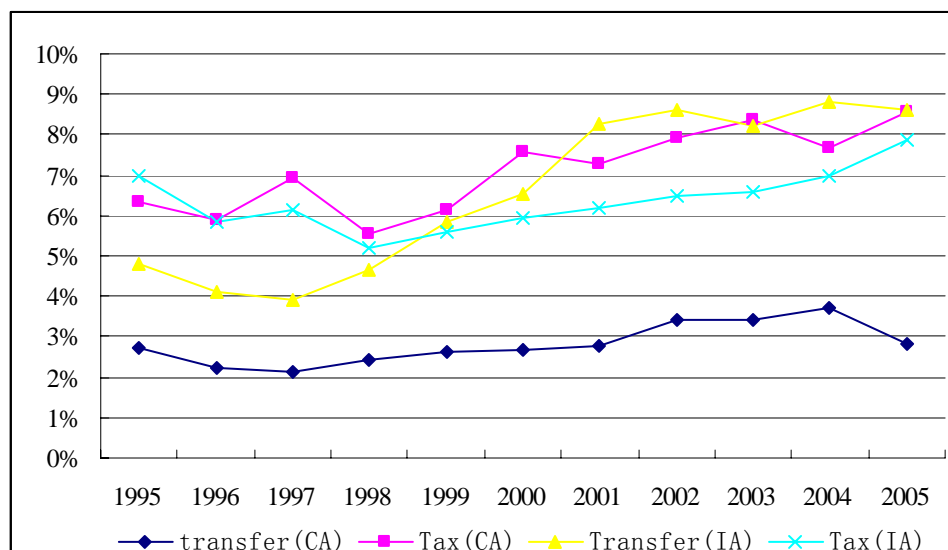


Notes: CA is coastal area and IA is inland area.

Table 1 Estimations of Regional Consumption Smoothing and Risk Sharing

| Model | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| dlnpchc | fe | mle | fe | mle |
| dlnapctc | 0.7270 | 0.6474 | 0.8188 | 0.7294 |
| | (0.1022) | (0.0695) | (0.0831) | (0.0700) |
| dlnpcgdp | 0.2569 | 0.3106 | 0.2042** | 0.2187 |
| | (0.0648) | (0.0628) | (0.0682) | (0.0598) |
| _cons | 0.0031* | | -0.0092* | |
| | (0.0098) | | (0.0083) | |
| N | 300 | 300 | 300 | 300 |
| P | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Hausman_P | 0.0004 | 0.0000 | 0.0101 | 0.0005 |

Notes: Regional Final Consumption Per Capita is the dependent variables in model 1 and 2. Regional Household Consumption Per Capita is the dependent variables in model 3 and 4. ** Denoting significance at the 1% and * denoting insignificance. N is sample size. P is P-value. Hausman_P tests significance of coefficient estimation. Standard Deviation is listed in the brackets.

Table 2 Fiscal Risk-sharing Channels

|  | Total | Transfer | Tax |
|---|---|---|---|
| dlnincome | 1 | 2 | 3 |
| dlngdp | 0.9950 | 0.9552 | 1.0557 |
|  | (0.0201) | (0.0145) | (0.0310) |
| _cons | 0.0033* | 0.0088 | -0.0165 |
|  | (0.0026) | (0.0019) | (0.0042) |
| Smoothed Percents | -0.50% | -4.48% | 5.57% |
| N | 300 | 300 | 300 |
| P | 0.0000 | 0.0000 | 0.0000 |

Notes: Model 1 is estimation of regional risk sharing from gross financial channel including tax sharing and transfer payment. Model 2 is estimation of regional risk sharing just from transfer payment. Model 3 is estimation just including central tax. * denotes insignificance. Smoothed Percents is ($\beta^*$-1)*100, i.e. percentages of risk sharing.

Table 3 Estimation with Regional Dummy

| dlnincome | Total | Transfer | Tax |
|---|---|---|---|
| dlngdp | 1.0506 | 0.9746 | 1.0799 |
|  | (0.0393) | (0.0285) | (0.0278) |
| ddlngdp | 0.9754 | 0.9484 | 1.0310 |
|  | (0.0233) | (0.0169) | (0.0165) |
| _cons | 0.0025* | 0.0085 | -0.0066 |
|  | (0.0026) | (0.0019) | (0.0019) |
| Smoothed Percents1 | 5.06% | -2.54% | 7.99% |
| Smoothed Percents2 | -2.46% | -5.16% | 3.10% |
| N | 300 | 300 | 300 |
| P | 0.0000 | 0.0000 | 0.0000 |

Notes: * denotes insignificance. The coefficients of dlngdp are the degrees of smoothing of costal areas, and ddlngdp are the degrees of smoothing of inland areas.