

Interregional Risk Sharing and Fiscal Decentralization in China

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Abstract

The growing income inequality among China's provinces has been examined in the context of fiscal decentralization and the lack of an efficient interregional equalization system. However, the role of the fiscal system in providing insurance against idiosyncratic shocks to provincial income has been largely disregarded. This paper estimates the amount of shocks smoothed through taxes and transfers in China based on a comprehensive data set covering the 1980-2001 period. The results indicate that the overall extent of interregional risk sharing via fiscal flows is small relative to the United States, and that it decreased over the reform period making it a possible factor in the process of regional disintegration in China.

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1. Introduction

Fundamental economic reforms in the past 25 years have transformed China from a backward command economy to a dynamic market-oriented economy. However, the transition has been uneven both across time and across provinces. Despite an initial decrease in interregional income inequality, the rate of convergence in income has steadily declined since 1985 (Raiser, 1996). Economic reforms, such as the liberalization of factor markets, were expected to ensure that resource flows from wealthier to poorer provinces increase the degree of economic integration and lead to regional income convergence. Therefore, the growing income gap between interior and coastal provinces in China generated a debate on the extent of economic integration and on the ability of the central government to efficiently reduce income differences through fiscal transfers. Two opposing views have emerged in the empirical literature on the fragmentation of economic space in China and on the impact of fiscal decentralization.

One view holds that Chinese provinces are relatively well integrated, and that the gradual price liberalization and the removal of trade distortions over the reform period deepened the integration process. If the co-movement in prices across provinces is used as a measure of integration, it has been shown that 94% of the short-run price variations between 1985-1998 resulted from sector-specific shocks common to all provinces (Xu and Voon, 2003). Over the same period the importance of province-specific shocks to the price level has declined indicating an increasing degree of interregional market integration in China. Capital flows across provinces could also contribute to a more even regional development, and Raiser (1996) provides evidence for a relatively high capital mobility within China over the 1978-1992 period. In his view, it was the fiscal transfers of the central government that prevented income convergence, especially among interior provinces. In particular, the fiscal transfers disregarded interregional equity considerations and benefited provinces seen by the central government as important for political or military reasons. This conclusion implies that less fiscal transfers from the center and more fiscal autonomy for the provinces would translate into more efficient capital flows and eventually faster interregional income convergence. This is supported by empirical evidence indicating that fiscal decentralization had a positive impact on economic growth in China over the 1970-1993 period and led to conditional convergence in income levels across provinces (Lin and Liu, 2000).

A number of studies have come to the opposite conclusion, namely that the domestic market in China is relatively fragmented, and that low capital mobility as well as fiscal decentralization are responsible for the lack of income convergence. Boyreau-Debray and Wei (2002) found that interprovincial capital mobility in China over the 1978-2000 period was relatively low and decreased over the 1990s. They argue that the increasing inflow of foreign direct investment to a small number of mainly

coastal provinces over the 1990s was responsible for the decreasing financial integration across China. Further empirical evidence shows that between 1987 and 1997 the trade flows between coastal and interior provinces decreased, whereas those between coastal provinces and other countries increased (Poncet, 2002). However, higher levels of trade between regions result in deeper economic integration and more correlated business cycles. Thus, in the case of China the low capital and commodity mobility should be associated with less symmetric fluctuations of income across provinces. In fact, Tang (1998) demonstrated that over the 1990-1995 period the shocks to output and price level were correlated only in the case of some coastal provinces. In addition, he used the ratio of variances of common to specific shocks as a measure of economic integration and concluded that since this ratio was below 0.5 for almost half of the provinces and above 1.0 for only 3 of them, China could not be viewed as one unified economic area. Although the increasing interregional income inequality could have been reduced through fiscal transfers, it was difficult to achieve since the share of the central government in total government revenue declined sharply over the 1980s and early 1990s. This was mainly blamed on provincial governments using loopholes in the tax system such as extra-budgetary revenues and tax exemptions for local enterprises to prevent provincial revenues from being turned over to the central government (Ma, 1997). According to this view, provinces acquired too much fiscal autonomy during the process of fiscal decentralization, and the resulting decline in the center's revenues weakened the ability of the central government to achieve macroeconomic stabilization and income equalization. The key consequence was that both the net transfers from rich provinces to the center and from the center to poor provinces decreased between 1983 and 1991, and the equalizing effect of fiscal transfers declined (Ma, 1997; Knight Li, 1999). Moreover, Zhang and Zou (1998, 2001) showed that over the same period the increasing degree of fiscal decentralization was associated with slower economic growth. They argued that fiscal decentralization limits the resources of the center to invest in key infrastructure projects which contribute more to economic growth than those implemented by each province.

Despite the differences in their results, all studies on interregional integration and fiscal reforms in China have in common that they focus on factor flows or redistribution of income via fiscal transfers, but disregard another important effect. The fiscal system enables different provinces to share macroeconomic risks, and thus provides insurance against unanticipated idiosyncratic shocks to provincial income. This is achieved, for instance, if a province affected by an adverse asymmetric shock turns over less taxes to the central government and receives net transfers from other provinces through the budget of the central government. In contrast to the permanent redistribution of wealth to reduce the income inequality across regions in the long run, risk sharing via fiscal channels provides smoothing of transitory asymmetric shocks to provincial income.

The insurance effect of the fiscal system in China deserves attention for at least two reasons. First, the extent of interregional risk sharing depends on the institutional structure of fiscal relations between the center and the provinces, because the type of fiscal arrangements determines how transitory shocks to provincial income are reflected in taxes and transfers between the center and the provinces. In transition economies, the centralized management of all tax revenues has been replaced by a new fiscal system that provides more regional autonomy and uses taxes and transfers as instruments for macroeconomic stabilization. In China, this process involved experiments with different revenue-sharing agreements between the center and the provinces over the entire period of economic reforms. This makes China an ideal case for exploring the degree of interregional risk sharing associated with various types of fiscal contracts. As a result, alternative approaches to fiscal decentralization could be compared and evaluated with respect to their insurance effect which can prove helpful for designing optimal fiscal arrangements in transition economies.

The second reason for the importance of risk sharing via fiscal channels is that it could be an indicator of the degree of economic development and integration across regions. The smoothing of adverse idiosyncratic shocks to provincial income by fiscal transfers contributes to higher correlation of income fluctuations across provinces, and this in turn is a sign of economic integration. Since many restrictions on goods, capital and labor flows across provinces were lifted only gradually during the reform period in China, it can be argued that underdeveloped or non-existent factor markets were not able to provide adequate insurance against adverse shocks to provincial income. Fiscal transfers may have initially compensated for these missing insurance effects, but their role would decline as markets develop and trade and factor flows across provinces increase during transition. On the other hand, in the case of weak economic integration and infant factor markets, as in most interior provinces in China, insurance effects via fiscal transfers may still play a crucial role in smoothing income fluctuations. Therefore, the differences in the degree of interregional risk sharing between the initial and the later periods of reform as well as between coastal and interior provinces are crucial for the analysis of economic development and regional integration in China.

The empirical literature has analyzed the insurance effects of the fiscal system across regions of the USA, Canada, the European Union and Japan (for an overview, see von Hagen, 2000). The key objective of this paper is to draw attention to inter-provincial risk sharing in transition economies, in particular China, and to provide an empirical estimate of the fraction of provincial income shocks smoothed via taxes and transfers. Furthermore, the paper examines how alternative approaches to fiscal decentralization affected the extent of risk sharing over different periods of reform. Lastly, in contrast to previous studies on China, the current analysis relies on a data set that covers the entire period of economic reforms (1980-2001), which allows a

better assessment of trends and changes during transition as well as the impact of the 1994 tax reform.

The rest of the paper is organized as follows. The next section describes how risk sharing was shaped by the fiscal system in China during the reform period. Section 3 presents a model for estimating the extent of intranational risk sharing provided by the fiscal system. Section 4 describes the data used. Section 5 reports and discusses the empirical results and Section 6 concludes the paper.

2. Risk Sharing and the Fiscal System in China

The decentralization of economic decision-making, a major feature of the transition period in China, has led to a redefinition of fiscal relations between the central government and the provinces. Before the introduction of reforms, all revenues collected in the provinces were submitted to the central government, and all expenditures of provincial governments were financed by transfers from the center. Beginning in 1980, provincial governments were given a limited authority to keep the revenue from certain taxes and to share income from other taxes with the central government. This system left an increasing proportion of fiscal resources in the hands of the provincial governments, but it was accompanied by a gradual erosion of revenues for the central government. The resulting limitation on the ability of the center to use fiscal policies for macroeconomic stabilization prompted a comprehensive tax reform in 1994 which established new rules for revenue sharing and gave the central government again more control over tax collection. Therefore, the reform of fiscal relations between the center and the provinces in China is usually divided in a period of increasing fiscal decentralization (1980-1994) and a period of relatively centralized fiscal control (since 1994). The details of fiscal reform in China are well documented (Ahmad et al., 1995; Wong et al., 1995; Ma, 1997; Brean, 1998; Bahl, 1999). The purpose of this section is to examine the fiscal contracts between the central and the provincial governments with respect to their relevance for interregional risk sharing.

During the initial period of reforms in the 1980s the trend was toward increasing local autonomy in fiscal management. Similarly to the household responsibility system in agriculture, a contract system reshaped the fiscal relations between the central and the provincial governments. Beginning in 1980, all tax revenues were divided into three categories. Provincial governments were allowed to retain revenues from designated local taxes, but had to turn revenues from other tax sources over to the central government. A third group of taxes was shared between the center and the provinces according to a fiscal contract. A peculiarity of the fiscal system in China before 1994 was that the central government was responsible for the tax policy, but had no nationwide tax collection administration. All taxes with exception of custom

duties were collected at the provincial and county levels and were then transferred to the center. This gave provinces a *de facto* control over effective tax rates.

Local taxes are not important for the present analysis which focuses on risk sharing among provinces and not among counties within a province. Taxes designated as fixed revenue of the central government included mainly excise taxes and income tax for enterprises under direct central supervision. Personal income tax and social security contributions collected by the federal government have been shown to absorb a fraction of shocks to state income in the United States (Asdrubali et al., 1996; Sørensen and Yosha, 1999). But in China these two categories cannot provide interregional risk sharing, because the personal income tax is assigned as a local tax, and social security is administered by individual enterprises and local governments. Revenues from sales taxes (product tax, value-added tax, consumption tax), from the income tax for foreign-owned and joint-venture enterprises as well as from the salt tax and the natural resources tax were shared between the center and the provinces according to a fiscal contract (Prime, 1992). Revenue-sharing contracts were not uniform across provinces and were revised several times between 1980-1993. In general, fiscal contracts called for revenue sharing either through a proportional tax or a lump-sum tax with some variations (Wong et al., 1995; Bahl, 1999; Knight and Li, 1999). Some provinces were required to turn over a fixed proportion of their shared revenues to the central government. For others the proportional tax increased every year by a fixed rate. A third category of provinces had to pay a lump-sum tax, whereby in some cases the amount of the lump-sum tax increased by a contracted annual rate. Finally, some provinces were allowed to keep all their revenues, others received in addition a lump-sum subsidy, whereas the poorest interior provinces were given lump-sum subsidies that grew at a contracted annual rate.

Taxes and transfers in the revenue-sharing system can provide interregional risk sharing, but its extent depends crucially on the design of the fiscal contracts. In general, provinces have different risk characteristics and thus need different degrees of insurance against income shocks. The bigger the variance of provincial income relative to national income, the larger the possible effects of adverse income shocks and the higher the risk borne by the province. Naturally, high-risk provinces would need more insurance. In theory, the great variety of revenue-sharing agreements in China is well suited to reflect the different levels of risk across provinces, particularly in the absence of nationwide personal income taxes and social security that would automatically transmit the variations in provincial income. The practical problem in China was that many fiscal contracts in the first decade of economic reforms were initiated by the central government in the form of experiments, and the frequent revisions gave provinces a big incentive to lobby for a more favorable arrangement which was not necessarily the most efficient in terms of risk sharing. In general, revenues shared through lump-sum taxes provide less income insurance for provinces, because the

fixed amount paid to the central government does not reflect the risk measured by the relative fluctuations of provincial to national income. In contrast, fiscal contracts based on proportional taxes ensure a higher degree of risk sharing, since in this case, for instance, a decrease in provincial income would automatically lead to less taxes being turned over to the central government. In practice, however, the presumed advantage of proportional taxes with respect to insurance might be smaller, since the tax categories included in the revenue sharing reflect the fluctuations in revenues from sales taxes. Thus, the extent of risk sharing depends on how responsive sales taxes are to variations in provincial income.

Knight and Li (1999) examined the properties of lump-sum and proportional tax contracts in the context of interregional fiscal equalization in China. They used the fluctuations in revenue prior to any sharing as an indicator for the instability of expenditure in absence of fiscal contracts. The fluctuations in actual expenditure were applied as a measure for the instability of expenditure after revenue sharing. The results indicate that over the period 1979-1991 the variations in provincial expenditure with revenue sharing were larger than those without it, suggesting that the revenue sharing system in China leads to fiscal destabilization of provincial expenditure. Moreover, they defined the difference between the variation in expenditure with and without revenue sharing as the amount of risk transferred from the central to the provincial governments via fiscal channels. The results indicate that lump-sum tax contracts were associated with higher fiscal stability of provincial expenditure and thus less risk being borne by the province, as compared to proportional tax contracts. This can be explained by the fact that the majority of provinces with lump-sum contracts were allowed to keep all tax revenue and received in addition a fixed subsidy which contributed more to the stability of their expenditure than proportional taxes.

Knight and Li (1999) view risk as stemming from the fluctuations in provincial expenditure relative to revenue. This implies that the objective of revenue-sharing mechanisms and fiscal transfers is to provide equalization of fiscal capacity across provinces, which would result in an even distribution of public goods. Thus, their model differs from the definition of risk sharing as the extent to which taxes and transfers cushion the effects of economic shocks on provincial income. Their analysis allows a comparison between the fluctuations of provincial expenditure with and without revenue sharing, but it does not provide an estimate of the insurance effect of the fiscal system. Moreover, their data set is limited to the period 1979-1991, thus leaving out the impact of the 1994 tax reform.

As its revenues declined dramatically at the end of the 1980s, the central government used *ad hoc* revisions of the revenue-sharing contracts to limit the process of increasing fiscal decentralization. These steps culminated in the comprehensive tax reform of 1994 which fundamentally revised the fiscal relations between the central and provincial governments. One of the major changes was the reorganization

of the tax administration. The provinces were now limited to collecting only local taxes. The central and shared taxes were collected from then on by national 'tax bureaus' which operated in every province. Instead of having provincial governments keep their part of the shared taxes and submit the rest to the central government, the new reform resulted in all central and shared taxes being channelled to the center and the provincial fraction of shared taxes being remitted later (Bahl, 1999). This measure was intended to prevent provinces from shifting shared tax revenues in extra-budgetary funds which were out of the reach for the central government.

A second important change introduced by the new tax regulation was the gradual dismantling of the fiscal contracts. The value-added tax was expanded to include the product tax and became the major tax category shared between the center and the provinces. The revenue sharing was now based on a simple rule assigning 75% to the central government and 25% to the provinces, thus eliminating the possibility of *ad hoc* revisions and the incentive for lobbying from the regions. The main goal of the new fiscal system was to increase the share of the central government in total government revenue in the long run. Following the 1994 reform previous fiscal contracts were to be phased out only gradually, and provinces were guaranteed that their revenues would not fall below the 1993 level in nominal terms for a transition period which was still in effect in 2001. For this purpose, the central government established a system of compensation payments whereby tax revenues were transferred back to the provinces as needed.

There is a lack of empirical studies on the impact of the 1994 tax reform on redistribution and risk sharing. Bahl (1999) suggested that the new fiscal system might be less equalizing in terms of fiscal capacity, since the income elasticity of provincial expenditure in 1995 was higher than in 1990. However, this could also stem from temporary adjustments in the immediate aftermath of the reform. The extent of risk sharing was certainly affected by the gradual replacement of fiscal contracts with a uniform revenue-sharing formula based on proportional taxes and transfers. However, this effect might have been mitigated by the decision of the central government to guarantee the 1993 level of provincial revenues and subsidies.

In addition to shared tax revenue, provinces receive two major types of grants from the central government. Unconditional grants are given as a lump-sum subsidy to poor, mostly interior, provinces where local and shared revenues are inadequate to meet expenditures. The amount of the grant is determined by the provincial budget deficit in a base year and according to a fiscal contract is fixed in nominal terms for a period of five years (Ahmad et al., 1995). Special purpose grants are earmarked for specific tasks, including among others price subsidies, capital construction projects, administrative expenses, natural disaster relief, and subsidies for health and education in poor, minority and border provinces. Price subsidies vary from year to year depending on the price policy of the central government and made about 60% of all

special purpose grants in 1993 (Bahl, 1999), but their importance will decline as more and more prices are freed. The central government has no equalization grants *per se*, and per capita specific purpose grants seem to be distributed in significantly larger amounts to higher-income provinces (Bahl, 1999).

3. Measuring Interregional Risk Sharing

In the empirical literature, several econometric models have been developed to measure the extent of interregional risk sharing provided by the tax-transfer system. Despite some differences, all models have three common elements. First, they test for the joint behavior of regional per capita income and regional per capita disposable income. The difference between these two variables is that the former represents the amount prior to the collection and disbursement of taxes and transfers by the central government, while the latter includes the net transfers of the center. Some studies regress the disposable personal income of a region on the personal income (Bayoumi and Masson, 1995; Obstfeld and Peri, 1998), others regress instead the regional gross product net of taxes and transfers by the center on the regional gross product (Decressin, 2002), all expressed in per capita terms. Furthermore, the definition of net transfers varies across studies. Some adopt a narrow definition which includes only personal income taxes, Social Security and unemployment contributions as well as welfare payments and unemployment benefits (Bayoumi and Masson, 1995). Under a broader definition, corporate income taxes, indirect taxes as well as grants and subsidies to regional governments are counted in addition to personal taxes and payments (Asdrubali et al., 1996; Sørensen and Yosha, 1999; Decressin, 2002). The latter approach is based on the idea that net transfers by the center to the regional government and the local firms also contribute to the smoothing of regional per capita income, for instance by providing public goods. Mélitz and Zumer (2002) argue that in order to prevent over- or underestimation of the extent of risk sharing, the choice between using personal income and gross product must be consistent with the choice between the narrow and the broad definition of net transfers. In particular, if the focus is on the welfare of residents, it is appropriate to use personal income and narrowly defined net transfers. If the focus is instead on the economic activity of a region, the more adequate variables are regional gross product and broadly defined net transfers.

Since interregional risk sharing through taxes and transfers provides insurance against *idiosyncratic* shocks to regional income, a second feature common to all econometric models is to control for aggregate fluctuations, mainly that of aggregate income. This is achieved either by dividing all regional per capita income variables by their respective national aggregate per capita values (Bayoumi and Masson, 1995; Obstfeld and Peri, 1998) or by introducing time fixed effects (von Hagen, 1992;

Asdrubali et al., 1996; Sørensen and Yosha, 1999).

Lastly, all empirical studies make the distinction between redistribution and risk sharing provided by the tax-transfer system. The purpose of redistribution is to offset long-run regional income differentials, thus its extent is estimated by using regional income variables averaged over long time periods. In contrast, risk sharing aims at smoothing cyclical shocks to regional income. To capture the high-frequency fluctuations of regional income, the regional income variables included in the regression analysis are expressed in first differences.

To estimate the extent of risk sharing provided by taxes and transfers in China, it is necessary to use an econometric model that both incorporates all three aforementioned core elements and takes into account the peculiarity of the Chinese fiscal system. A representative example is the regression equation used by Asdrubali et al. (1996) and Sørensen and Yosha (1999):

$$\Delta \log y_{it} - \Delta \log(y_{it} + \phi_{it}) = \alpha_t + \beta \Delta \log y_{it} + \varepsilon_{it} \quad (1)$$

where the subscript t denotes the time period, α_t time fixed effects, y_i the per capita regional income of region i and ϕ_i the per capita net transfers to region i . The extent of interregional risk sharing is shown by the coefficient β which measures the fraction of shocks to regional income smoothed through the net transfers of the central government. For $\beta = 1$, the fiscal system provides full interregional risk sharing because every shock to regional income is fully cushioned by the net transfers of the central government. If $\beta = 0.1$, net transfers smooth 10% of the shocks to regional income, but the other 90% are still reflected in the regional disposable income.

In the case of China, it does not make sense to focus on the smoothing of regional personal income via interregional fiscal transfers. This is because personal taxes, social security contributions and welfare payments are not handled by the central government and are not part of the fiscal flows between the center and the provinces. Therefore, a more adequate measure of regional income is the provincial gross domestic product (GDP) which encompasses the economic activity of persons, firms and the provincial government. Consistently, it is necessary to adopt a broad measure of net transfers to include all fiscal flows between the center and the provinces. An additional advantage is the fact that Chinese data usually report one number for all transfers from the center to a province which is relatively broadly defined and includes subsidies to the local government as well as specific purpose grants for infrastructure projects, the development of agriculture and industry, price subsidies, education, health, culture, etc.

For the purpose of estimating the extent of risk sharing provided by taxes and transfers separately, Eq. (1) can be broken down into:

$$\Delta \log y_{it} - \Delta \log(y_{it} + \gamma_{it}) = \alpha_{1t} + \beta_1 \Delta \log y_{it} + \varepsilon_{1it} \quad (2)$$

and

$$\Delta \log y_{it} - \Delta \log(y_{it} - \tau_{it}) = \alpha_{2t} + \beta_2 \Delta \log y_{it} + \varepsilon_{2it} \quad (3)$$

where y_{it} stands now for per capita real GDP of province i , γ_{it} for per capita transfers of the center to province i and τ_{it} for per capita taxes collected by the center from province i . The fraction of shocks to provincial GDP smoothed via transfers and taxes is given by β_1 and β_2 , respectively.

Furthermore, Eqs. (2) and (3) can be transformed into:

$$\Delta \log y_{it} - \Delta \log(y_{it} + \gamma_{it}) = \alpha_{1t} + \beta_{11} D \Delta \log y_{it} + \beta_{12} (1 - D) \Delta \log y_{it} + \varepsilon_{1it} \quad (4)$$

and

$$\Delta \log y_{it} - \Delta \log(y_{it} - \tau_{it}) = \alpha_{2t} + \beta_{21} D \Delta \log y_{it} + \beta_{22} (1 - D) \Delta \log y_{it} + \varepsilon_{2it} \quad (5)$$

where D is a dummy variable with $D=1$ for provinces with lump-sum fiscal contracts and $D=0$ for provinces with proportional fiscal contracts.

The extent of interregional risk sharing provided by the fiscal system in China is estimated from running regression Eqs. (2) and (3) based on panel data from 29 Chinese provinces over the period 1980-2001. In addition, Eqs. (4) and (5) are used to estimate how risk sharing is affected by institutional reforms. In particular, fiscal contracts (lump-sum vs. proportional) are compared with respect to their risk sharing properties. Furthermore, the estimation is performed for the entire reform period (1980-2001) as well as for two subperiods (1980-1993 and 1994-2001) to examine the impact of the 1994 tax reform.

4. The Data

The panel data set is based on province-level data from 29 Chinese provinces over the period 1980-2001. Two provinces have been excluded (Hainan and Chongqing) due to the fact that both have received the status of a province in the course of the reform period, and data on taxes and transfers from the time when they were still part of other provinces is not available. Data on provincial gross domestic product (GDP) and population are provided in the *Statistical Yearbook of China* (various years). The real GDP of provinces is expressed in 1978 prices.

Before the 1994 tax reform, transfers of the central government to provinces included lump-sum subsidies (unconditional grants) and special purpose grants. From 1994 on, the amount intended to ensure the nominal level of the 1993 provincial revenues was included in the transfers of the central government. The direct spending of the central government on some public goods, such as national defense or infrastructure can also be viewed as a transfer to provinces, however it is excluded from the analysis because this type of spending cannot be broken down by province. Data on fiscal transfers to each province is provided by the Ministry of Finance in the *Finance Yearbook of China* which is published annually since 1992. For the period 1980-1991, data was gathered from a variety of provincial sources, such as statistical yearbooks, financial yearbooks, and local chronicles.

The fiscal flows from the provinces to the central government consist of taxes designated solely as revenue of the central government, the center's fraction of shared tax revenue as well as some special payments such as taxes on liquor and cigarettes. Data for the period 1980-1991 was collected from statistical yearbooks, tax yearbooks, and local chronicles published by provincial government agencies. From 1992 to 2001, the data come from the *Tax Yearbook of China*.

Unfortunately, for most of the reform period the amounts of taxes and transfers reported in the published statistics are not broken down in different sources, so that the extent of risk sharing provided by each element of transfers or taxes cannot be estimated separately. To calculate the per capita amounts, taxes and transfers for each year were divided by the population size of the province in that year. The fiscal status of a province depending on the contract type (lump-sum or proportional) was determined according to the classification by Knight and Li (1999).

5. Results

The key objective of the paper was to provide estimates of the amount of risk sharing via fiscal flows across provinces in China. The results presented in Table 1 suggest that over the entire reform period 3.4% of shocks to provincial GDP were smoothed through the fiscal system. Estimates from other transition economies are not available, but a comparison with the income smoothing effects of fiscal federalism in the United States reveals that the insurance effects in China constitute only a fourth of the U.S. value. However, although data limitations in the case of China do not allow the break down of transfers and taxes into different components, a detailed analysis of the estimates for the United States shows a different composition. In the U.S., 9.9% of state income shocks are smoothed through federal direct transfers to individuals which include mainly Social Security and Medicare payments. Furthermore, unemployment benefits absorb additional 2.2% of income shocks (Sørensen and

Yosha, 1999). Thus, the general welfare system in the U.S. contributes most to the total federal income insurance (12% of income shocks). It is, however, well-known that China has no nationwide social security system. Most of the welfare payments are financed by the provincial government and thus provide risk sharing within a province, but not among provinces. This is certainly one of the main reasons for the lower estimates in the case of China.

The results in Table 1 indicate further that taxes dis-smooth provincial GDP by 1.5% . This finding is supported by other studies (Sørensen and Yosha, 1999; Decressin, 2002). Possible reasons include time lags in the tax collection and the slower reaction of certain tax categories to GDP fluctuations. Moreover, in the first period of reform the dis-smoothing effect was relatively mild, however after 1994 taxes amplified the impact of shocks to provincial GDP by 2.5% . In the attempt to increase its revenue, the central government increased the amount of taxes and even provinces that were previously allowed to retain all their revenues had to pay taxes to the center. This might explain the larger dis-smoothing effect in the second reform period. The consequence for the overall amount of interregional risk sharing was that during the period of fiscal decentralization net transfers absorbed a higher fraction of shocks to GDP as compared to the period of relative fiscal recentralization.

A second objective of this paper was to compare the risk sharing properties of different fiscal arrangement between the center and the provinces. Results for the provinces with lump-sum and proportional fiscal contracts are presented in Table 2. Lump-sum contracts absorb a smaller amount of shocks than proportional arrangements. Knight and Li (1999) indicated that lump-sum contracts contribute more to the stabilization of provincial government's revenue, mainly because most provinces in that category receive lump-sum subsidy rather than paying lump-sum taxes. In fact, the results in Table 2 support these findings suggesting that transfers to provinces with lump-sum contracts provided more interregional risk sharing. However, it is evident that lump-sum taxes cushion a smaller amount of shocks to GDP as compared to proportional taxes. The intuition behind this result is that proportional taxes reflect the fluctuations of provincial GDP and thus provide more insurance against cycles in regional economic activity. Theoretically, this can be achieved as well by frequent adjustments of lump-sum taxes depending on cyclical fluctuations. Although in the case of China fiscal contracts between the center and the provinces were renegotiated frequently, this was not done on an yearly basis and the main goal of the bargaining process was never risk sharing.

6. Conclusion

The present paper has estimated the fraction of idiosyncratic shocks to provincial income absorbed by the fiscal system in China. The results show that this fraction is very small when compared to countries with an established system of fiscal federalism, however this may be explained by the lack of a nationwide social security system.

The tax reform of 1994 which slowed down fiscal decentralization and gave more fiscal authority to the central government resulted in a smaller amount of risk sharing across provinces. The broader implication of this result concerns interregional integration. High levels of smoothing of idiosyncratic shocks to provincial GDP contribute to higher correlation of GDP fluctuations across provinces, and thus to higher levels of economic integration. The decreasing amount of risk sharing over the reform period might be an important factor for the process of increasing divergence and disintegration across China's provinces.

If more detailed data on China becomes available, further research should estimate the insurance effects of different subcategories of taxes and transfers. Furthermore, estimates of interregional risk sharing in other transition economies, notably Russia, would allow for more meaningful comparisons with China and would yield more interesting results for different paths of transition towards a market economy.

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Table 1: Amount of interregional risk sharing through fiscal flows in China

Period	1980-2001	1980-1993	1994-2001
<i>Fiscal flows:</i>			
Transfers	0.049 (0.009)	0.047 (0.01)	0.053 (0.018)
Taxes	-0.015 (0.3)	-0.008 (0.712)	-0.025 (0.525)
Total	0.034	0.039	0.028

Note: Each column presents the estimates of the coefficients β_1 and β_2 from panel regressions (2) and (3). Standard errors are in parenthesis.

Table 2: Amount of interregional risk sharing through fiscal flows for provinces with lump-sum and proportional fiscal contracts

Period	1980-2001	1980-1993	1994-2001
<i>Lump-sum contracts:</i>			
Transfers	0.051 (0.011)	0.05 (0.012)	0.054 (0.022)
Taxes	-0.019 (0.5)	-0.011 (0.625)	-0.027 (0.548)
Total	0.032	0.039	0.027
<i>Proportional contracts:</i>			
Transfers	0.048 (0.01)	0.046 (0.011)	0.049 (0.019)
Taxes	-0.014 (0.61)	-0.002 (0.792)	-0.018 (0.49)
Total	0.034	0.044	0.031

Note: Each column presents the estimates of the coefficients β_{11} , β_{12} , β_{21} and β_{22} from panel regressions (4) and (5) where $D=1$ for provinces with lump-sum contracts and $D=0$ for provinces with proportional contracts. Standard errors are in parenthesis.