

## **Fiscal Decentralization: Incentives, Redistribution and Reform in China**

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*ABSTRACT* China's great size and diversity give rise to serious principal-agent problems among tiers of government. The fiscal relationships between central and provincial governments over the period of economic reform are examined within an agency framework. Provincial governments have been responsible for most revenue collection and public spending, but they have done so within the consolidated state budget: central government takes, or gives, the difference between a province's revenue collection and expenditure. Five interrelated questions are posed. Does provincial expenditure depend on provincial revenue collection, i.e. to what extent are provinces fiscally self-sufficient? How does the pattern of provincial expenditure relate to provincial revenue and income level? Is fiscal redistribution equalizing, i.e. to what extent does central government redistribute revenue from rich to poor provinces? Does central government's marginal propensity to tax the provinces serve as a deterrent to their revenue collection? Do the arrangements create greater fiscal instability for central or provincial governments? The provincial governments retained an increasing proportion of their revenue collected over the reform period, and the extent of fiscal redistribution by the centre from the rich to the poor provinces correspondingly declined. An important reason for these trends is that revenue effort was sensitive to the various marginal tax rates—mostly high—imposed by central government on the provinces: the Laffer curve is alive and well and living in China. This helps to explain the fiscal reforms of the mid-1990s, the effects of which are not yet discernible.

### **1. Introduction**

China's vast size has two important implications. First, the wide diversity in natural resource endowments, population density and physical and human capital has given rise to great regional economic inequalities (see, for instance, Knight & Song, 1993). Second, with China's 30 provinces averaging 40 million people, each province is equivalent to a country in other parts of the world. This means that important issues of governmental decentralization have to be solved, involving serious principal-agent problems. The nature of the fiscal relationship between the central and provincial governments is crucial both for efficiency and for equity. It influences the strength of

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The research was conducted during Li Shi's visit to the Institute of Economics and Statistics. We are grateful to the Leverhulme Trust for financial support under grant F.519L.

incentives to raise government revenue and to promote economic growth, and it determines the extent of egalitarian fiscal redistribution among provinces.

The principal instrument of financial control over the economy is the state budget. Provincial, city and county governments, which have their own budgets, collect much of the public revenue and carry out much of the public expenditure. However, in form, the state budget is consolidated, with provincial, city and county budgets incorporated into the state budget, and in substance, there is strong central control over both local taxes and local expenditures falling within the state budget. The fiscal relationships between the central government and the provincial governments are *ad hoc* and subject to negotiation; in so far as formulae are used, different provinces are subject to different formulae. Central government has thus dominated in tax-making policy and in the determination of tax bases, tax rates and revenue-sharing formulae, whereas provincial governments have been responsible for most tax administration and revenue collection.

In principle, therefore, there is little provincial autonomy in revenue-raising or expenditure. In practice, however, provincial and sub-provincial governments have considerable fiscal discretion derived from their administration of the fiscal system. For instance, they can collect "extra-budgetary" revenue and can grant preferential tax treatment to enterprises. According to the incentives that they face, provincial governments effectively decide how much effort they put into revenue collection (World Bank, 1990, pp. 78, 82).

Local governments are permitted to retain funds derived from sources other than their "budgetary" revenue, i.e. the revenue that they collect in accordance with the state budget. They have full discretion in the spending of these "extra-budgetary" funds. Most extra-budgetary revenue takes the form of retained profits and depreciation funds of state-owned enterprises and their supervisory agencies, or of tax supplements, levies and fees imposed by government departments at various levels (Huang, 1996, p. 657); the majority of extra-budgetary revenue is used for investment (Agarwala, 1992, pp. 12, 18). The revenue of local governments comprises budgetary plus extra-budgetary revenue, i.e. all local sources of funds including profits from public sector enterprises and collectives owned by the local government. Expenditure similarly includes budgetary and extra-budgetary expenditure, i.e. all forms of spending, both current and capital expenditure. Provincial and local governments in China are not normally permitted to borrow (World Bank, 1990, p. 87). Even in the case of capital projects, they rely on revenue or grants, and only to a negligible extent on credit. The surplus of a provincial government (its collected revenue minus expenditure) thus represents a net transfer to (if positive) or from (if negative) central government. Throughout this paper, when we refer to revenue we shall, unless indicated otherwise, mean revenue collected, i.e. revenue prior to inter-governmental transfers. Revenue is thus not to be taken as the funds available for spending, which are better measured by expenditure.

Government revenue in China is largely based on indirect taxes and producer taxes. Over the period 1985–90, when state revenue totalled 22.5% of gross national product (GNP), indirect taxes (mainly turnover and value added taxes) represented 9.8% and the profits and taxes of enterprises represented 7.8% of GNP; personal income taxes were negligible (Wong *et al.*, 1995, p. 48). Until very recently, central government has directly collected only customs duties and revenue from the enterprises that it owns, and has generally allowed the provinces to collect the rest directly. Central government itself carries out expenditures in each province. Such spending is for particular purposes and activities bearing large externalities, such as defence, research and national investment projects. It is likely that there is limited substitutability between central and provincial government spending, although there is overlap at the higher levels

of education and health care and in some forms of investment (Ma, 1997, pp. 10–11). In any case, the extent of substitutability cannot be examined empirically as central government expenditure is not reported by province.

Centre–province fiscal relations have moved through three stages. In the pre-reform stage, the provincial governments merely collected revenue, handed it over to the central government and received funds from the central government in accordance with the state plan. They had no objective function of their own: there was only the plan. The principal and the agent were as one. In the late 1970s, when China began its transition from a planned to a market economy, central–provincial fiscal relations entered a second stage. In order to promote revenue collection in the new conditions, the central government introduced the revenue-contracting system (*caizheng baogan*) which is the subject of this paper. During the second stage the Chinese fiscal system was decentralized in revenue collection and in implementation of expenditure plans but centralized in revenue and expenditure policy. Nevertheless, local governments acquired a degree of decentralized power and autonomy with which to pursue their own objectives. The scope for conflict between different tiers of government gave rise to a principal–agent problem. Throughout the 1980s there was a series of reforms, each being intended to strengthen the incentive for provincial governments to collect more revenue for themselves and for the central government while maintaining an egalitarian fiscal redistribution among provinces. The key issue was to find a successful revenue-raising formula: one which would encourage provincial governments to collect revenue while at the same time ensuring that the central government could tax the provinces sufficiently.<sup>1</sup>

The basic structure of central–provincial fiscal relations in the reform era was framed in 1980. Separate arrangements were adopted for five groups of provinces. These arrangements are described in Table 1. In 1980 there were 10 provinces on which the central government implicitly imposed a zero marginal tax rate. Nine poor, mainly ethnic minority, provinces could retain all the revenue they collected and in addition receive a lump-sum subsidy from the central government, and one initially poor but rapidly developing province, Guangdong, was required to pay a lump-sum tax to the central government. In five provinces the total revenue collected was to be shared with central government in fixed proportions. The centre's share varied from 12 to 90% according to province (Oksenberg & Tong, 1991, p. 24), i.e. the marginal (and average) propensity to tax the provincial government from its collected revenue ranged from 12 to 90%. In the remaining provinces revenues were shared in more complicated ways, generally according to revenue source, and in three of these cases subsidies were also received. In total, 15 of the 29 provinces had a revenue surplus in 1980, i.e. made a net transfer to central government, and the remaining 14 had a revenue deficit. Although the system appeared in some cases to be rule-based, in practice there was considerable and frequent politicking, negotiating and bargaining between the centre and each province (World Bank, 1990, pp. 80, 90; Oksenberg & Tong, 1991, p. 2).

These arrangements were soon amended: some provinces were accorded fixed revenue shares, and the shares of the provinces were generally raised in 1982 and lowered in 1983 in accordance with central government revenue requirements. Subsequent reforms were made in 1985 and 1988, which had the effect of allowing the provinces to retain a higher share of the revenue they collected. For instance, in the surplus provinces the average provincial retention ratio (expenditure/revenue) rose from 43% in 1983 to 66% in 1987 and to 87% in 1990 (Table 6 later). The fiscal incentives facing the provinces appeared to improve over time. In 1980, no fewer than 19 provinces were on some form of revenue sharing or division, whereas in 1985 revenue

**Table 1.** Fiscal arrangements for the sharing of revenue between central and provincial governments in China, 1980–93

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990-93
Beijing	SOR	SOR	SOR	SOR	SOR	SOR	SOR	SOR	STR	STR	STR
Tianjin	SOR	SOR	SOR	SOR	SOR	SOR	SOR	SOR	SOR	SOR	SOR
Hebei	DR	DR	SOR	SOR	SOR	SOR	SOR	SOR	STR	STR	STR
Shanxi	DR	DR	DR	SOR	SOR	SOR	SOR	SOR	SOR	SOR	SOR
Inner Mongolia	GS	GS	GS	GS	GS	GS	GS	GS	GS	GS	GS
Liaoning	SOR	SOR	SOR	SOR	SOR	SOR	SOR	SOR	STR	STR	STR
Jilin	DRS	DRS	DRS	DRS	DRS	LS	LS	LS	LS	LS	LS
Heilongjiang	DRS	DRS	DRS	DRS	DRS	SOR	LT	LT	LT	LT	LT
Shanghai	SOR	SOR	SOR	SOR	SOR	SOR	SOR	SOR	LT	LT	LT
Jiangsu	SOR	SOR	SOR	SOR	SOR	SOR	SOR	SOR	STR	STR	STR
Zhejiang	DR	DR	SOR	SOR	SOR	SOR	SOR	SOR	STR	STR	STR
Anhui	DR	DR	SOR	SOR	SOR	SOR	SOR	SOR	SOR	SOR	SOR
Fujian	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS
Jiangxi	DRS	DRS	DRS	DRS	DRS	LS	LS	LS	LS	LS	LS
Shandong	DR	SOR	SOR	SOR	SOR	SOR	SOR	LT	LT	LT	LT
Henan	DR	DR	SOR	SOR	SOR	SOR	SOR	SOR	STR	STR	STR
Hubei	DR	DR	SOR	SOR	SOR	SOR	ROR	ROR	ROR	ROR	ROR
Hunan	DR	DR	SOR	SOR	SOR	SOR	SOR	SOR	GT	GT	GT
Guangdong	LT	LT	LT	LT	LT	LT	LT	LT	GT	GT	GT
Guangxi	GS	GS	GS	GS	GS	GS	GS	GS	GS	GS	GS
Sichuan	DR	DR	SOR	SOR	SOR	SOR	ROR	ROR	ROR	ROR	ROR
Guizhou	GS	GS	GS	GS	GS	GS	GS	GS	GS	GS	GS
Yunnan	GS	GS	GS	GS	GS	GS	GS	GS	GS	GS	GS
Tibet	GS	GS	GS	GS	GS	GS	GS	GS	GS	GS	GS
Shaanxi	DR	DR	SOR	SOR	SOR	LS	LS	LS	LS	LS	LS
Gansu	DR	DR	SOR	DRS	DRS	LS	LS	LS	LS	LS	LS
Qinghai	GS	GS	GS	GS	GS	GS	GS	GS	GS	GS	GS
Ningxia	GS	GS	GS	GS	GS	GS	GS	GS	GS	GS	GS
Xinjiang	GS	GS	GS	GS	GS	GS	GS	GS	GS	GS	GS

Sources: Oksenberg & Tong (1991), pp. 24–25; World Bank (1990), p. 89; Agarwala (1992), p. 68.

Notation	Definition	Revenue accruing to province	Marginal tax rate
SOR	Sharing overall revenue	$\alpha C$	$1 - \alpha$
DR	Dividing revenue	$\sum \alpha_i C_i$	$\sum (1 - \alpha_i) C_i / \sum C_i$
DRS	Dividing revenue and receiving growing subsidy	$\sum \alpha_i C_i + S_0 e^{rt}$	$\sum (1 - \alpha_i) C_i / \sum C_i$
GS	Receiving lump-sum but growing subsidy	$C + S_0 e^{rt}$	0
LS	Receiving lump-sum subsidy	$C + S$	0
LT	Paying lump-sum tax	$C - T$	0
ROR	Retaining overall revenue	$C$	0
GT	Paying lump-sum but growing tax	$C - T e^{rt}$	0
Str	Sharing target revenue but retaining residual revenue	$C - (1 - \alpha) C_0 e^{rt}$	0

Notes:  $C$  = revenue collected by province;  $C_i$  = revenue collected by province from source  $i$ ;  $i = 1, 2, 3$  = revenue from source  $i$  goes to central government, to provincial government, and is shared between them, respectively;  $S$  = lump-sum subsidy from central government;  $T$  = lump-sum tax to central government;  $R$  = annual growth rate;  $\alpha$  = fixed share of revenue collected by province:  $0 < \alpha < 1$ ;  $\alpha_i = \alpha_1, \alpha_2, \alpha_3$ ;  $\alpha_1 = 0, \alpha_2 = 1, 0 < \alpha_3 < 1$ .

**Table 2.** Budgetary revenue collected by central, provincial and total government as a percentage of GNP, 1978–96

Year	Central	Provincial	Total
1978	4.85	26.39	31.24
1979	5.72	22.67	28.39
1980	6.30	19.38	25.68
1981	6.40	17.79	24.19
1982	6.54	16.31	22.85
1983	8.23	14.72	22.95
1984	9.24	13.57	22.80
1985	8.56	13.74	22.30
1986	7.63	13.17	20.80
1987	6.16	12.24	18.40
1988	5.19	10.61	15.80
1989	4.86	10.89	15.75
1990	5.34	10.45	15.79
1991	4.33	10.21	14.54
1992	3.68	9.39	13.07
1993	2.77	9.81	12.58
1994	6.24	4.97	11.21
1995	5.69	5.21	10.90
1996	5.42	5.55	10.97

Sources: PRC, MOF (1997), pp. 461, 544; PRC, SSB (1997), p. 42.

division had ceased and 15 provinces shared their revenue. In the 1988 reforms most of these were switched to lump-sum taxation or the sharing of target revenues: only three provinces remained on a revenue-sharing formula. It is possible, however, that other provinces perceived an implicit marginal tax rate as a result of their negotiations with central government. The arrangements introduced in 1988 were retained, with only trivial modifications, until the end of 1993.

This account of the fiscal relationship between the central and provincial governments during the second stage highlights four problems. First, the non-uniform treatment of provinces appeared to be neither efficient nor equitable. Second, the uncertainty associated with changing rules and bargaining had disincentive effects on the revenue collection of provincial governments. Third, the high marginal tax rates faced by some provinces could be expected to deter revenue collection. Evidence consistent with such disincentive effects is provided in Table 2, which shows the revenue collected by central and local government and by government as a whole, expressed as a proportion of GNP. The revenue collected by central government fluctuated during the revenue-contracting period, rising and then falling but always under 10% of GNP, whereas that collected by provincial governments fell from over 20% to under 10%. Between 1980 and 1993 total budgetary revenue was halved from 26 to 13% of GNP.

A fourth effect of the various reforms was to reduce the share that central government received of the revenue collected by the provinces. Table 3 shows central government post-transfer revenue, comprising revenue directly collected and net transfers from the provinces. Post-transfer revenue fell as a proportion of GNP, from some 13% in 1980 to 4% in 1993. The net revenue transferred from the provinces collapsed

**Table 3.** Central government budgetary revenue as a percentage of GNP, by source, 1979–93

Year	Total post-transfer revenue	Revenue directly collected	Transfer from provinces		Net revenue from provinces	Net revenue as a percentage of revenue collected by provinces
			From surplus provinces	To deficit provinces		
1979	13.17	4.56	na	na	8.61	31.52
1980	13.02	4.52	na	na	8.50	35.80
1981	12.78	3.85	na	na	8.93	40.70
1982	11.88	5.13	na	na	6.75	33.20
1983	11.85	7.06	6.87	2.08	4.79	25.86
1984	11.58	8.66	5.42	2.50	2.92	16.89
1985	11.53	9.67	4.24	2.38	1.86	11.27
1986	9.01	10.70	2.93	3.63	-0.69	-0.04
1987	9.03	8.58	2.73	2.28	0.45	0.03
1988	7.17	7.73	1.59	2.16	-0.56	-0.04
1989	6.68	7.30	1.33	1.95	-0.62	-0.04
1990	7.15	8.27	1.10	2.22	-1.12	-0.08
1991	6.93	7.57	1.07	1.70	-0.64	-0.05
1992	4.39	3.68	0.64	0.90	-0.26	-2.71
1993	3.80	2.77	0.87	0.69	0.18	1.80

Sources: PRC, MOF (1992), pp. 59, 103, 138, 182, 339; PRC, MOF (1989), pp. 53, 89; PRC, MOF (1993), pp. 599–642; PRC, MOF (1994), pp. 599–642.

Note: na, not available.

from over 8% of GNP at the start of the 1980s to a slightly negative value at the start of the 1990s. This fall reflected a sharp reduction in central government taxation of the surplus provinces. Transfers to the deficit provinces remained fairly constant at about 2% of GNP throughout the 1980s, dipping in the 1990s. The central government net share of revenue collected by the provinces peaked at 41% in 1981 but had become effectively zero or negative by 1986.

With a far-reaching reform of tax administration introduced in 1994, China entered the third stage in the evolution of policy. The centre transferred certain sources of revenue from the provinces to its own domain. The central government now collects all shared as well as central government taxes, and local government collects only those designated as local government taxes (Wong, 1997, pp. 31–37). It is still too early to evaluate this new system: we concentrate on the second stage of inter-governmental fiscal relations.

The content and form of our analysis are governed by the limited available information set. Basic fiscal data are provided in the State Statistical Bureau's annual *Statistical Yearbook*, but detailed information on budgetary and extra-budgetary finances at the central and provincial levels is to be found only in the Ministry of Finance's *Finance Statistics*, published in 1989 and 1992.<sup>2</sup> We have to use the official definitions, although these are generally not ideal for the purpose (Wong *et al.*, 1995, pp. 23–25).

In this paper, we address five main questions. Section 2 provides a theoretical framework to help answer the questions. In Section 3 we ask: Does provincial expenditure depend on provincial revenue, i.e. to what extent are provinces fiscally self-

sufficient? Section 4 inquires into the pattern of provincial government expenditure and its relation to provincial revenue and income level. In Section 5 the question becomes: Is fiscal redistribution equalizing, i.e. to what extent does central government redistribute revenue from rich to poor provinces? The question in Section 6 is: Does the marginal propensity to tax the revenue of provinces serve as a deterrent to their revenue collection, i.e. do central-provincial fiscal relations help to explain the decline in government revenue as a proportion of GNP? Section 7 asks: Do the arrangements create greater fiscal instability for central or for provincial governments? Section 8 draws conclusions.

## 2. The Theoretical Framework

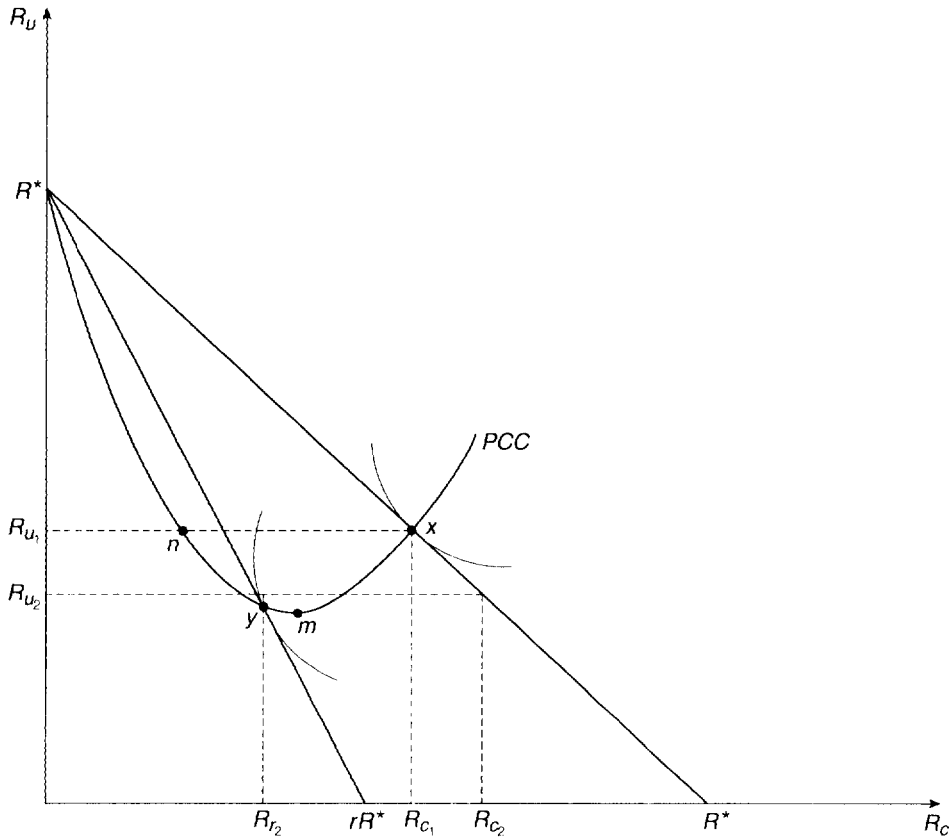
During the period under study the provincial governments served as tax collectors for central government. In that sense they were the agents of central government. Their tax collection role allowed them a degree of discretion in their tax effort. Central government wished to give the provinces the right incentives to fulfil its fiscal objectives, in particular to ensure that they did not shirk in their tax effort. In that sense central government was their principal.

A crucial variable in the design of the incentive structure is the rate at which the principal taxes the revenue collected by the agent. This can be explored theoretically using a simple model. Assume that a province has potential revenue ( $R^*$ ) comprising collected and uncollected revenue ( $R^* = R_c + R_u$ ). Assume that there is no collection cost. Define the province's retention rate as the ratio of retained to collected revenue: it therefore retains  $R_r = rR_c$ . The provincial government is assumed to place different valuations on retained and on uncollected revenues and no value on revenue transferred to central government ( $R_t = (1 - r)R_c$ ).

In Figure 1 the budget line  $R^*R^*$  shows potential revenue, to be allocated between  $R_c$  and  $R_u$ .<sup>3</sup> Assume initially that all revenue is retained. Given a well-behaved indifference map, the provincial government chooses the tangency point  $x$  on  $R^*R^*$ , i.e. it collects revenue  $R_{c1}$ , leaving  $R_{u1}$  uncollected. The outcome depends on how highly the provincial government values collected revenue in relation to uncollected revenue at the margin. Now introduce retention rate  $r$ , i.e. central government levies taxes on the province at the marginal (and average) rate  $(1 - r)$ . The budget line now facing the province is  $rR^*R^*$ . It chooses the new tangency point  $y$ . As drawn, this equilibrium involves less retained revenue and uncollected revenue ( $R_{r2}$ ,  $R_{u2}$ ) than the initial equilibrium ( $R_{c1}$ ,  $R_{u1}$ ). Both the income effect and the substitution effect are likely to reduce retained revenue. However, collected revenue is now greater than it was previously ( $R_{c2} > R_{c1}$ ). This result is not inevitable, however: sufficiently strong negative income and substitution effects could produce a new tangency point such that less revenue is collected.

The argument can be expressed in terms of the price consumption curve PCC in the figure. As the tax rate is raised, so more revenue is collected, until  $m$ , the minimum point on PCC, is reached. Any further tax increase reduces  $R_c$ . Any tax rate greater than that which produces a budget line passing through point  $n$  on PCC involves less revenue being collected than if no tax were levied. If  $R^*R^*$  passes to the left of point  $m$ , any rate of tax reduces revenue collection.

The implication of this simplified analysis is that central government taxation of provincial governments does not necessarily diminish their tax efforts. However, beyond some tax rate the amount of revenue collected by the provincial government



**Figure 1.** The revenue incentives for a province.

will inevitably fall. Central government has to discover and choose that tax rate which will maximize its objective function.

The analysis has been based on the assumption that a constant proportion of provincial revenue is taxed, i.e. the average and the marginal tax rates are equal. One way in which the central government can ease its problem is by adjusting marginal relative to average tax rates. Four cases are illustrated in Figure 2. In case 1, tax sharing in the proportions  $r$  and  $(1 - r)$  as before, the choice of retained and uncollected revenue for the province is at point  $b$  on PCC, with the central government tax equal to the length  $bf$  and collected revenue corresponding to the point  $f$ . The other three cases are all assumed to involve the same average tax rate, implying that the province is in equilibrium somewhere on the line  $rR^*R^*$ .

In case 2, the post-tax budget curve  $R^*Q$  shows the marginal rate of tax to be decreasing: the province is in equilibrium at  $c$ , the point of tangency with an indifference curve, and collected revenue is shown by point  $g$ . Case 3: if the tax imposed by the centre is lump-sum (equal to the length  $R^*v$ ), the marginal rate of tax is zero and the province's feasible set is given by  $R^*wv$ , where  $wv$  is parallel to  $R^*R^*$ . The province is in equilibrium at the point  $d$  on the income consumption curve ICC; collected revenue is shown by  $h$ . In this case collected revenue must increase as a result of the tax, provided that both retained and uncollected revenue are normal goods. Comparing



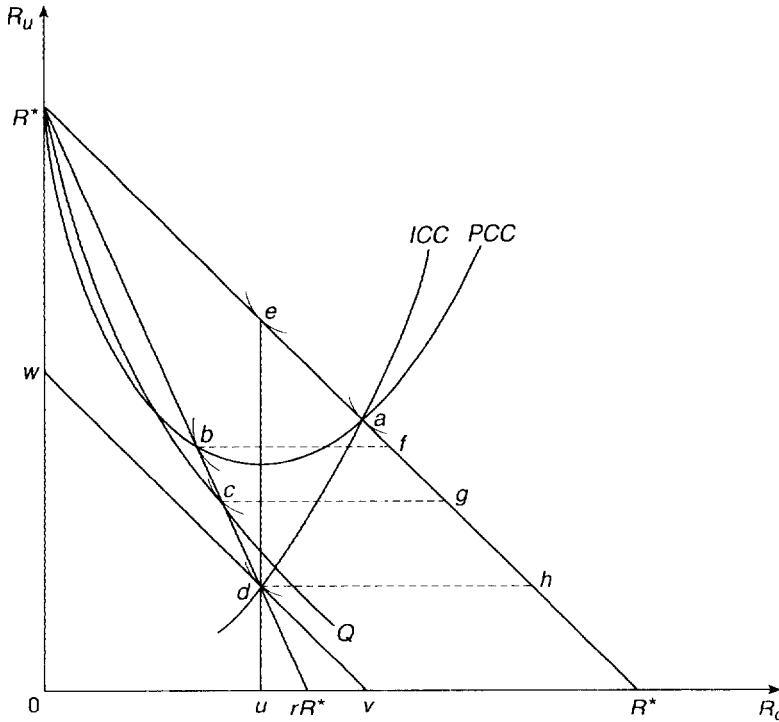


Figure 2. The revenue incentives for a province when marginal and average tax rates differ.

the three cases, it is clear that collected revenue increases as the marginal tax rate is reduced. Finally, assume that the centre permits the province to retain a lump-sum (equal to  $Ou$ ). The feasible set is shown by  $R^*eu$ . The unconstrained choice is  $e$ , at the kink: unless it values transfers to the centre, the province has no incentive to collect more revenue. Nevertheless, the centre may induce it to choose retention at point  $d$  and collection at point  $h$ . The inducement is the threat of making the province worse off than at  $d$  by renegotiating the tax in the future.

A divergence between marginal and average rates of tax introduces issues of revenue instability and risk aversion. For instance, a lump-sum tax with zero marginal tax rate involves greater stability for central government and greater instability for local government. If attitudes to risk influence decisions, the optimal incentive structure must take into account both the level and the variability of revenue.

The principal-agent problem in the Chinese fiscal system corresponds to the principal-agent problem in the relationship between landlord and tenant in agrarian societies. The tenant, having discretion over the amount of effort put into farming, can be viewed as the agent and the landlord as the principal. The problem for the principal in pursuing his objectives in the absence of perfect control and information is to induce the agent to provide the optimal degree of effort by means of contractual arrangements. Farming is risky and the risks have to be borne by someone. Owing to risk-aversion, risk-taking normally involves a cost: the cost is minimized if the risks are borne by the less risk-averse party. Being poorer, tenants are normally more risk-averse than landlords. A fixed wage arrangement removes risk-taking from the more risk-averse party, but it also reduces his incentive for effort. A fixed rent arrangement gives the agent the maximum incentive for effort but places all the risk on him. The landlord pays the cost

of this on account of the compensation for risk-taking that prospective tenants implicitly seek. Share-cropping may be the optimal arrangement in these circumstances. It permits the principal to share the risk while maintaining some incentive for effort on the part of the tenant (see, for instance, Stiglitz, 1974).

Consider the application of this theory to the fiscal relationships between central and provincial governments in China. Given that provincial governments collect the revenue, i.e. are the farmers,<sup>4</sup> there are three solutions corresponding to the landlord-tenant solutions. One is for the central government to remove the risk from local governments by allowing them to keep a fixed amount of revenue while itself taking the residual revenue. Beyond the amount retained by the province, the centre effectively imposes a marginal propensity to tax of unity: the province therefore has no incentive to make a tax effort. The second solution is for the centre to take a lump-sum, with the province holding any residual revenue. Provided that the provincial government expects to collect more than the lump-sum, it faces a zero marginal tax rate. The incentive for effort is thus present, the central government has revenue certainty, but it is the provincial government that bears all the risk. The third solution is revenue-sharing, either by source of revenue or by division of the total. Provincial government incentives for tax effort are present, albeit muted, and the risks associated with revenue fluctuations are shared by both parties.

A possible solution to the principal-agent problem is to reverse their roles, although that would require asymmetry with respect to the objectives of the agent. Thus, central government would become the predominant tax collector, and it would then allocate some of the revenue to the provinces. Provided that central government was as concerned about provincial government welfare as about its own, there would be no problem of eliciting optimum tax effort. It would not be necessary for central government to maintain a high marginal retention rate, i.e. for provincial governments to "impose" a low marginal tax rate. The problem of risk-bearing would remain: greater revenue stability for one party could be achieved only at the cost of greater revenue instability for the other. However, the problem would be simpler to solve. The risks could be shared between the principals and the agent according to their degrees of risk-aversion without the complication that the sharing formula would affect the degree of tax effort.

A third approach draws on regulation theory, also within a principal-agent framework (Laffont & Tirole, 1993, pp. 55-84). Its advantage over the indifference curve analysis used earlier is that it can incorporate informational imperfection and asymmetry. The regulator, in fixing a contract with the person being regulated, faces a trade-off between the objective of increasing the efficiency and decreasing the rent of the person being regulated. Like the regulator, the central government, being less well informed than the provincial government, faces problems of adverse selection (taxable capacity) and moral hazard (tax effort). The regulator's "cost plus" contract is equivalent to a marginal tax rate of unity by the central government: the provincial government has no incentive for tax effort. A "fixed price" contract is the same as a zero marginal tax rate: the provincial government can retain all the revenue collected at the margin. A "linear contract" is equivalent to a fixed marginal tax rate between zero and unity, i.e.  $R_i = a + bR_c$ , where  $0 < b < 1$  and  $R_i$  is again the transferred revenue and  $R_c$  the collected revenue.

Assume initially that both principal and agent are perfectly informed. In that case the principal does not face a conflict between effort inducement and tax extraction. Knowing the taxable capacity of the province, the central government can levy the optimal lump-sum tax and a zero marginal tax rate ( $R_i = a^*$ ). The value of  $a^*$  depends

on the centre's marginal valuation of the province's retained and transferred revenue given its expenditure responsibilities.<sup>5</sup> The trade-off arises when the principal is at an informational disadvantage—knowing only the total revenue collected by an agent, not the contributions made by its tax efficiency and tax effort. Faced with the same tax formula, tax-efficient provinces are able to mimic inefficient ones while making less tax effort, or to collect and retain more revenue with the same effort. It can thus be optimal for central government to offer a menu of incentive-compatible contracts such as  $R_i = a_i + b_i R_c$ . An inefficient province—needing to exert more tax effort to collect the same revenue or, equivalently, placing a higher marginal value on uncollected revenue—has an incentive to choose a low value of  $a_i$  and a high value of  $b_i$ , whereas an efficient province opts for the reverse. Thus, we expect less tax-efficient provincial governments to choose higher marginal tax rates.

A game-theoretic complication arises if, as in the Chinese case, the principal can change the contract at will. Provinces reveal their degree of tax-efficiency in their choices from the menu. The central government has the power and the incentive to adjust transfers accordingly, for instance raising its lump-sum tax on efficient provinces. A provincial government's expectation of such behaviour can in turn serve as a disincentive to its revenue collection. This is referred to by Ma (1997, pp. 48–64) as the "time-inconsistency problem".

The optimal tax system should also take account of egalitarian objectives. By taxing some provinces more heavily than others, and subsidizing yet others, the centre effects a fiscal redistribution among provinces. Central government is concerned with equalizing economic welfare per capita. Those provinces with low income per capita are also liable to have low taxable capacity per capita: in the absence of fiscal transfers, public expenditure would mimic private income. Central government's objective function places greater value on fiscal resources allocated to provinces with lower income per capita. It might, for instance, wish to equalize public spending per capita or even to achieve a higher level in poorer provinces. The greater its degree of inequality aversion, the greater the optimal dispersion of tax burden that the centre places on the provinces, according to their income per capita. However, such equity objectives involve a trade-off against efficiency objectives. For instance, the attempt to raise average tax rates on richer provinces is liable, at least eventually, to diminish their revenue collection.

A theoretical model that attempted to encompass all four approaches would constitute a paper in itself. However, the following insights are available from our discussion. Central government taxation of provincial government revenue does not necessarily result in reduced collection, even when the marginal and average tax rates are the same. The provincial government is more likely to increase its revenue collection, in response to central government taxation, the lower is the marginal relative to the average tax rate. When the centre is imperfectly informed, it faces a trade-off between provincial revenue collection and central revenue extraction. It can have an incentive to offer a menu of revenue contracts, such that provinces with lower revenue-raising capacity opt to be taxed at higher marginal rates. However, the central government has a more complex objective function than can be incorporated into our indifference curve analysis or into the framework of regulation theory. The dispersion of revenue over both time and space is also relevant. Government is concerned not only with the distribution of revenue between principal and agent, but also with revenue fluctuations and the corresponding incidence of the associated risks. Through the differential taxation of provinces it is concerned to effect fiscal transfers from rich to poor provinces. However, the pursuit of these objectives is liable to be constrained by considerations of efficiency.

### 3. Does Provincial Expenditure Depend on Provincial Revenue?

In this section, we examine how a provincial government's expenditure is related to the revenue that it collects. We do so for three years: 1983 (the earliest year for which full data were available), 1987 and 1990 (the latest year). Table 4 shows three equations: budgetary expenditure ( $BE$ ) as a function of budgetary revenue ( $BR$ ), extra-budgetary expenditure ( $EE$ ) as a function of extra-budgetary revenue ( $ER$ ), and total expenditure ( $E$ ) as a function of total revenue ( $R$ ), all expressed in yuan per capita. The three equations are of the form  $E = a + bR$ . Recall that the surplus of a province, i.e. its net transfer to the centre, is  $T = R - E$ . Thus, the net transfer to the centre increases with provincial revenue (and, in the case of a deficit province, the net transfer from the centre decreases) provided that  $b < 1$ . In principle, we should deduct from the net transfer any direct central government expenditure in a province in so far as it benefits the province. However, the generally low degree of substitutability between central and local government expenditure means that our inability, through lack of data, to make this adjustment is not serious.

The equations in Table 4 are generally well determined and have significant coefficients. Consider, first, the state budget. The coefficient of revenue within the state budget rose from 0.12 in 1983 to 0.30 in 1987 to 0.47 in 1990. Initially, on average only 12% of additional budgetary revenue collected by the province was spent by the province and 88% accrued to central government. Seven years later no less than 47% of additional budgetary revenue was retained and spent by the province. In the case of extra-budgetary funds the coefficient exceeded 0.87 in each year and reached 0.97 in 1990. Although it was significantly below 1.0 prior to 1990, the difference might have arisen simply because annual expenditure does not adjust fully to annual fluctuations in revenue. Basically, whatever extra-budgetary revenue is collected will be spent. The coefficient of total revenue is a weighted average of the  $BR$  and  $ER$  coefficients. The coefficient  $b$  on  $R$  rose from 0.31 in 1983 to 0.53 in 1987 to 0.72 in 1990. Increasingly, the expenditure of provincial governments was permitted to respond to their revenue, and a declining proportion of their revenue was transferred to the centre.

In 1987 the combined budgetary expenditure of the provincial governments was 97% of their combined budgetary revenue. Therefore, in so far as the budgetary revenue and expenditure of each province did not coincide, the associated surpluses and deficits largely represented inter-province fiscal redistribution. The situation was changing rapidly, however: in 1983 aggregate  $BE$  was 74% of aggregate  $BR$ , and in 1990 it was 107%. In 1983 there was, in addition to inter-province redistribution, a net transfer from the provinces to the centre, whereas in 1990 the net transfer went the other way.<sup>6</sup>

There are three main reasons why the provinces have retained an increasing proportion of the revenue they collect. One is the growing importance of extra-budgetary revenue in total revenue. In 1978 extra-budgetary revenue represented 19% of the total, and in 1983 it was 41%. Its importance grew to 45% in 1987 and to 46% in 1990 (Table 5).

Under the lump-sum contract system, the marginal rate of tax was unity if the target was not achieved and zero for revenue in excess of the target. An important question, therefore, was: Which marginal rate of tax did a province perceive itself to face? In its concern to provide revenue collection incentives, central government may have set low targets. In this way, Beijing may have produced a downward bias in the growth of revenue transfers to the centre from those provinces facing lump-sum target taxes.

The third reason concerns the increasing cross-section responsiveness of budgetary expenditure to budgetary revenue. This is to be explained in terms of the

**Table 4.** Budgetary, extra-budgetary and total expenditure per capita as a function of corresponding revenue per capita, by province, 1983, 1987, 1990: regression analysis

Equation:	Dependent variable									
	Budgetary expenditure (BE)			Extra-budgetary expenditure (EE)			Total expenditure (E)			
	1983	1987	1990	1983	1987	1990	1983	1987	1983	1990
Intercept	71.827**	115.186**	139.093**	5.352	2.875	5.802	103.499**	133.927**	134.633**	
Budgetary revenue 1983	0.122**									
Budgetary revenue 1987		0.299**								
Budgetary revenue 1990			0.470**							
Extra-budgetary revenue 1983				0.871**						
Extra-budgetary revenue 1987					0.898**					
Extra-budgetary revenue 1990						0.972**				
Total revenue 1983							0.396**			
Total revenue 1987								0.533**		
Total revenue 1990									0.722**	
Adjusted R <sup>2</sup>	0.230	0.528	0.643	0.967	0.995	0.988	0.620	0.863	0.925	
F-value	9.342	32.345	51.396	796.735	5720.219	2172.784	44.960	171.362	333.019	
Mean of dependent variable	87.828	171.483	243.069	80.305	144.196	196.361	171.269	321.803	438.718	
Mean of independent variable	130.862	188.552	221.379	86.012	157.432	196.078	221.550	352.717	421.399	
N	28	28	28	28	28	28	28	28	28	28

Sources: PRC, MOF (1992), pp. 336-337, 195-243; PRC, MOF (1989), pp. 111, 113, 170-171.

Note: \*\*Statistical significance at the 1% level.

**Table 5.** Provincial budgetary, extra-budgetary and total revenue as a percentage of GNP, 1978–92

Year	Revenue			Extra-budgetary revenue as percentage of total
	Budgetary	Extra-budgetary	Total	
1978	26.48	6.41	32.88	19.50
1979	22.66	7.52	30.17	24.93
1980	19.38	8.17	25.96	31.77
1981	17.79	8.34	26.13	31.92
1982	16.31	10.03	26.34	38.09
1983	14.72	10.20	24.93	40.93
1984	13.57	9.96	23.53	42.35
1985	13.74	9.94	23.69	41.99
1986	13.17	10.01	23.18	43.17
1987	12.24	10.04	22.28	45.07
1988	10.60	9.74	20.35	47.87
1989	10.89	9.38	20.27	46.27
1990	10.46	8.79	19.25	45.68
1991	10.21	8.60	18.80	45.72
1992	9.39	8.06	17.45	46.17

Source: PRC, MOF (1997), pp. 461–462, 467.

Notes: The data for extra-budgetary revenue before 1982 are not available. The figures before 1982 are estimated by using the ratio of provincial extra-budgetary revenue to national extra-budgetary revenue in 1982.

fiscal reforms. Table 6 distinguishes the 12 deficit provinces (excluding Tibet) and the 16 surplus provinces, but otherwise corresponds to Table 4. Consider first the deficit provinces. The coefficient  $b$ , showing the response of  $BE$  to  $BR$ , i.e. the marginal retention ratio, for this group rose from  $-0.39$  in 1983 to  $0.79$  in 1987 and to no less than  $1.18$  in 1990. Initially, the deficit provinces that collected least revenue per capita were more than compensated, enabling them to maintain the highest expenditure per capita. The sharp reversal of sign between the years spanning the 1985 fiscal reform reflects an exogenous paring of lump-sum subsidies, while permitting the deficit provinces to keep and spend all the revenue they collected. Until 1990, however, budgetary revenue was a poor predictor of budgetary expenditure for the deficit provinces. The coefficients imply that the marginal tax rate that central government applied to provincial revenue swung from exceeding 100% in 1983 to being negative in 1990. The average retention rate ( $BE/BR$ ) was well in excess of unity throughout, reflecting their budget deficits, but declined from 2.14 in 1983 to 1.58 in 1990.

In the subsample of surplus provinces the coefficient  $b$  on  $BR$  rose from 0.14 in 1983 to 0.32 in 1987 and to 0.51 in 1990, all three coefficients being significant at the 1% level. Moreover, revenue could explain an increasingly large proportion of the variance in expenditure. These marginal retention rates for the surplus provinces were less than their average retention rates: 0.43, 0.66 and 0.87, respectively. Whereas central government imposed substantial marginal tax rates—as much as 86% in 1983 and still 49% in 1990—average tax rates were lower than their marginal counterparts. Although central government policy was moving in the right direction, it is possible that marginal tax rates on the surplus provinces were high enough to serve as a deterrent to their revenue collection throughout the 1980s.

**Table 6.** Budgetary expenditure per capita as a function of budgetary revenue per capita, 1983, 1987 and 1990: the fiscal deficit provinces and the fiscal surplus provinces

	Dependent variable: budgetary expenditure per capita ( <i>BE</i> )		
	1983	1987	1990
<i>Deficit provinces</i>			
Intercept	112.709	101.307	60.657
Budgetary revenue per capita ( <i>BR</i> )	-0.385	0.787	1.178*
Adjusted $R^2$	-0.094	0.010	0.190
<i>F</i> -value	0.05	0.89	3.58
Mean of dependent variable	95.500	178.000	238.667
Mean of independent variable	44.667	97.500	151.167
Average retention ratio ( <i>BE/BR</i> )	2.138	1.826	1.579
<i>N</i>	12	12	12
<i>Surplus provinces</i>			
Intercept	59.940**	91.436**	102.757**
Budgetary revenue per capita ( <i>BR</i> )	0.136**	0.320**	0.507**
Adjusted $R^2$	0.386	0.710	0.791
<i>F</i> -value	10.41	37.72	57.69
Mean of dependent variable	87.563	177.313	245.125
Mean of independent variable	203.688	268.625	280.938
Average retention ratio ( <i>BE/BR</i> )	0.430	0.660	0.873
<i>N</i>	16	16	16

Sources: PRC, MOF (1992), pp. 195-243, 336-337; PRC, MOF (1989), pp. 111, 113, 170-171.

Notes: \*\*Statistical significance at the 1% and \*at the 5% level.

Table 5 helps to explain why these changes in the fiscal formulae took the form they did. It shows that the extra-budgetary revenue of the provinces rose rapidly as a proportion of GNP between 1978 and 1983 and thereafter remained roughly 10% of GNP. By contrast, their budgetary revenue fell sharply prior to 1983 and then continued to fall, from 15 to 10% of GNP, between 1983 and 1992. Central government therefore had to allow the provinces to retain an increasing part of their budgetary revenue over this period.

#### 4. The Pattern of Budgetary Expenditure

How is the pattern of provincial budgetary expenditure related to its level? And how is it related to the level of income per capita in the province? We explore these questions in Table 7, which shows four categories of budgetary expenditure as functions of total budgetary expenditure and of income per capita. All variables are expressed per capita and in logarithms. The equations are estimated for two years (1983 data are not available), but the differences between 1987 and 1990 are not substantive. The four expenditure categories correspond broadly to physical capital formation, human capital formation, social welfare and administration.

We express each expenditure category as a function of total expenditure and as a separate function of income. Since total expenditure depends on income (Section 5), the second function is a reduced form.<sup>7</sup> In the expenditure equations the intercept terms are positive for administration and negative and significant otherwise. All the

**Table 7.** Categories of budgetary expenditure per capita as a function of total budgetary expenditure per capita or of income per capita, by province, 1987 and 1990, in logarithms: regression analysis

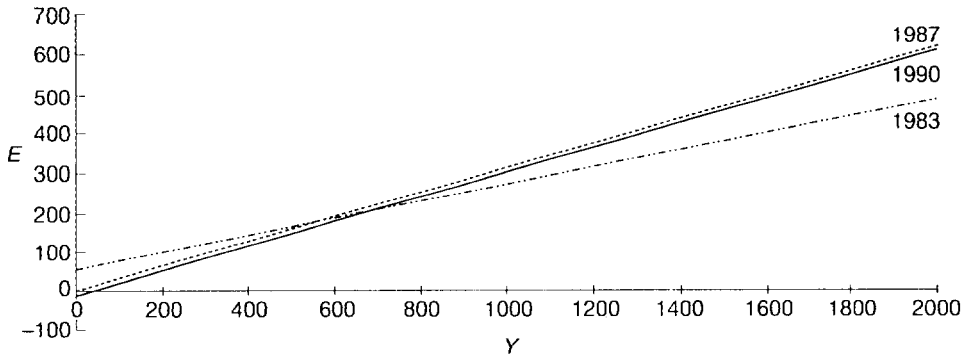
	Dependent variable			
	Ln investment	Ln education and science	Ln welfare and subsidies	Ln administration
<i>1987</i>				
Intercept	-2.705**	-0.524**	-1.260*	0.039
Ln expenditure per capita	1.267**	0.823**	0.927**	0.533**
Ln income per capita	0.733**	0.562*	0.784	0.101
Adjusted $R^2$	0.930	0.423	0.659	-0.018
$F$ -value	360.083	919.764	99.017	33.528
Mean of dependent variable	3.691	3.632	3.420	2.729
$N$	28	28	28	28
<i>1990</i>				
Intercept	-2.725**	-0.763**	-1.526**	0.948
Ln expenditure per capita	1.227**	0.887**	0.961**	0.365**
Ln income per capita	0.867**	0.727**	0.874**	-0.041
Adjusted $R^2$	0.911	0.972	0.782	-0.036
$F$ -value	276.629	945.711	98.018	8.403
Mean of dependent variable	3.864	4.000	3.638	2.908
$N$	28	28	28	28

Sources: PRC, MOF (1992), pp. 138-168; PRC, SSB (1988), p. 55; PRC, SSB (1992), p. 31.

Notes: \*\*Statistical significance at the 1% and \*at the 5% level.

Investment expenditure: expenditure for capital construction plus funds for developing productive capacity of existing enterprises plus expenditure on supporting agricultural production plus operating expenses for industry and transformation plus expenditure on technology promotion. Education and science expenditure: expenditure on education, culture and public health plus expenditure on science. Welfare and subsidies expenditure: expenditure on social relief and welfare plus expenditure on price subsidies. Administration expenditure: expenditure on government administration. A few small items of expenditure could not be classified.





**Figure 3.** Provincial expenditure per capita as a function of income per capita.

coefficients on expenditure are significantly positive but they are highest (above 1.2) for investment and lowest (below 0.6) for administration. The provinces with high budgetary expenditure per capita thus achieve relatively high public investment per capita. Expenditure on administration appears to be unrelated to income per capita. Other expenditure categories have negative intercept terms and positive coefficients on the income variable. The most income-elastic expenditure is welfare and subsidies, closely followed by investment. The coefficient implies that, at their (geometric) mean values (1267 yuan for income and 48 yuan for investment) in 1990, a rise in income per capita of 100 yuan raises public investment by 3.2 yuan. It would appear, therefore, that the richer provinces can benefit from a virtuous circle associated with higher public investment per capita.

### 5. Is Fiscal Redistribution Equalizing?

Is the redistribution of revenue among provinces egalitarian? To answer this question we relate the provincial government revenue, expenditure and transfer per capita by province ( $R$ ,  $E$  and  $S$ , respectively) to mean household income per capita by province ( $Y$ ) in the three years. The equations are linear, of the form  $R = a_1 + b_1 Y$ ,  $E = a_2 + b_2 Y$  and  $T = R - E = (a_1 - a_2) + (b_1 - b_2) Y$ .

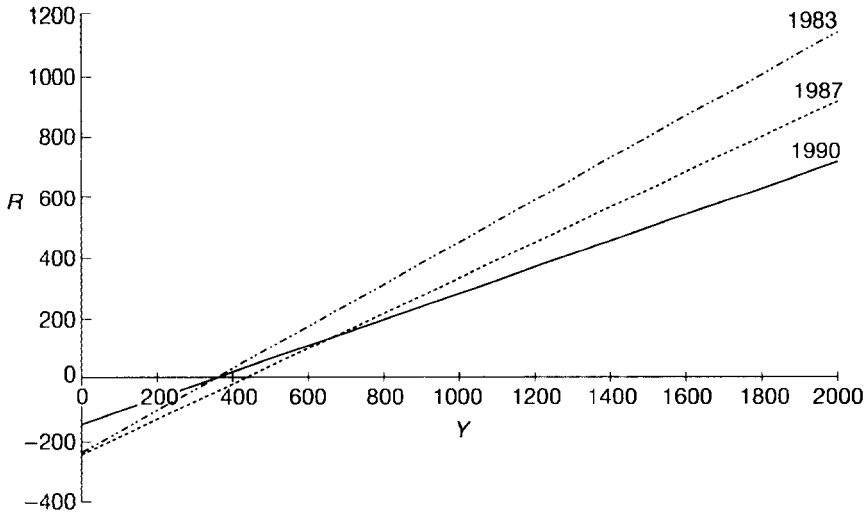
The upper section of Table 8 shows the expenditure equations. The coefficient of  $Y$  in the equations predicting  $BE$  is seen to rise consistently over time, and in the equations predicting  $EE$  it is higher for the last two years than for the first. This means that the response of  $E$  to  $Y$  rose from 0.22 in 1983 to 0.31 in 1987 and 1990, a result illustrated in Figure 3.<sup>8</sup> Richer provinces enjoy more public spending: an increase in income per capita of 100 yuan raises public expenditure per capita on average by over 30 yuan. The discrepancies in public spending between rich and poor provinces grew over the 1980s.

The equations predicting revenue, shown in the middle section of the table, tell a different story. The coefficient of  $Y$  in the  $BR$  equations falls consistently over time, whereas in the  $ER$  equations it remains at roughly 0.2. The response of  $R$  to  $Y$  thus falls over the 1980s, from no less than a remarkable 0.69 in 1983 to 0.58 in 1987 and to 0.43 in 1990 (see also the declining slope in Figure 4). The amount of revenue collected by a province was initially highly sensitive to its income, but became much less so over time. Thus, the income-elasticity of provincial revenue, in particular provincial budgetary revenue, fell over the period.

**Table 8.** Budgetary, extra-budgetary and total expenditure, revenue and surplus per capita as a function of income per capita, by province, 1983, 1987 and 1990: regression analysis

	Dependent variable								
	Budgetary			Extra-budgetary			Total		
	1983	1987	1990	1983	1987	1990	1987	1990	
<i>Expenditure</i>									
Intercept	48.188**	67.220**	65.444*	- 6.615	- 63.283**	- 81.673**	41.573	3.937	- 16.229
Income per capita (Y)	0.072**	0.107**	0.120**	0.146**	0.201**	0.189**	0.218**	0.308**	0.310**
Adjusted R <sup>2</sup>	0.317	0.554	0.667	0.834	0.922	0.910	0.655	0.818	0.850
F-value	13.550	34.464	55.169	136.863	318.080	273.900	52.181	122.540	153.909
Mean of dependent variable	90.964	177.607	242.357	80.305	144.196	196.361	171.269	321.803	438.718
Mean of independent variable	594.964	1031.464	1470.000	594.964	1031.464	1470.000	594.964	1031.464	1470.000
<i>Revenue</i>									
Intercept	- 170.038**	- 171.262**	- 127.244**	- 16.236	- 75.486**	- 86.007**	- 186.274**	- 246.748**	- 213.250**
Income per capita (Y)	0.514**	0.355**	0.240**	0.172**	0.226**	0.192**	0.686**	0.581**	0.432**
Adjusted R <sup>2</sup>	0.944	0.944	0.912	0.909	0.941	0.895	0.974	0.957	0.932
F-value	455.046	455.006	282.207	269.131	430.568	230.311	997.784	604.493	371.328
Mean of dependent variable	135.536	195.286	225.321	86.012	157.432	196.078	221.548	352.717	421.399
Mean of independent variable	594.964	1031.464	1470.000	594.964	1031.464	1470.000	594.964	1031.464	1470.000
<i>Transfer</i>									
Intercept	- 218.226**	- 238.482**	- 192.687**	- 9.621*	- 12.204**	- 4.334	- 227.847**	- 250.685**	- 197.021**
Income per capita (Y)	0.442**	0.248**	0.120**	0.026**	0.025**	0.003	0.468**	0.273**	0.122**
Adjusted R <sup>2</sup>	0.847	0.792	0.570	0.477	0.788	- 0.023	0.840	0.802	0.620
F-value	150.018	104.082	36.722	25.597	101.391	0.404	142.661	110.246	45.067
Mean of dependent variable	44.571	17.678	- 17.036	5.707	13.236	- 0.284	50.279	30.915	- 17.319
Mean of independent variable	594.964	1031.464	1470.000	594.964	1031.464	1470.000	594.964	1031.464	1470.000
N	28	28	28	28	28	28	28	28	28

Sources: PRC, MOF (1992), pp. 195-243, 336-337; PRC, MOF (1989), pp. 111, 113, 170-171; PRC, SSB (1988), p. 55; PRC, SSB (1991), p. 31.  
 Note: \*\*Statistical significance at the 1% and \* at the 5% level.



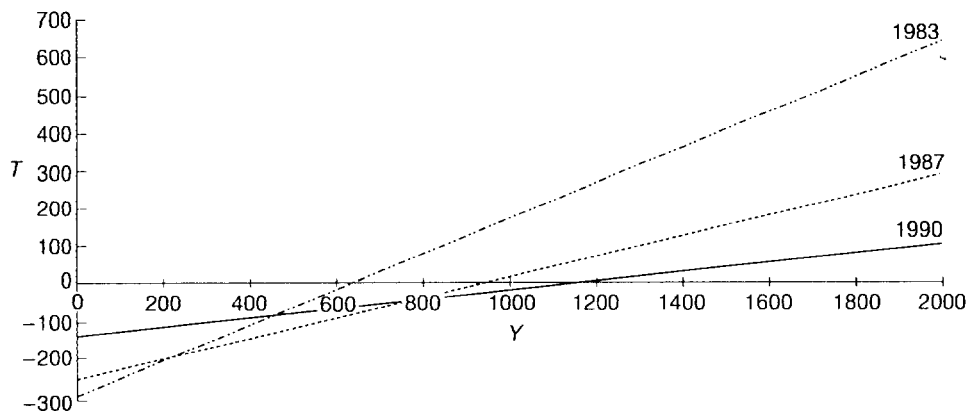
**Figure 4.** Provincial revenue per capita as a function of income per capita.

The third section of Table 8, which predicts the surplus of collected revenue over expenditure as a function of income, is implicit in the first two (since  $T = R - E$ ). As there is hardly any relationship between  $Y$  and  $ET$ , the sharp fall in the coefficient of  $Y$  in the equations predicting  $T$  mirrors that in the equations predicting  $BT$ . Figure 5 illustrates the transformation: the response of  $T$  to  $Y$  fell consistently, from 0.47 in 1983 to 0.27 in 1987 and to 0.12 in 1990. Remarkably, in the first of these years the marginal propensity of the central government to tax the household income per capita of a province was almost one-half. By the last year, on average the centre took only 12% of any increase in provincial income per capita. It is clear from the negative intercepts in Figure 5 that the richer provinces experienced higher average ratios of central government taxation per capita to income per capita than did the poorer provinces.

Another way of measuring the extent to which fiscal intervention by central government has an equalizing effect on the distribution of income among provinces is by examining the Gini coefficient of income pre- and post-intervention (Table 9). Pre-intervention income ( $Y_1$ ) is the factor income per capita and post-intervention income ( $Y_2$ ) is  $Y_1 - (R - E)$ , where  $R - E$  is the net taxation per capita by central government of revenue collected by the province. The table also shows the Gini coefficients of provincial revenue and expenditure per capita ( $R$  and  $E$ , respectively).

The pre-intervention inequality of income per capita among provinces, as measured by the Gini coefficient, fell consistently. It was 0.31 in 1983 and 0.27 in 1990. By contrast, the post-intervention Gini coefficient rose slightly, from 0.23 to 0.25. Thus, the equalizing effect of fiscal intervention by central government grew weaker over the period. Intervention reduced the Gini coefficient by 0.08 in 1983, by 0.04 in 1987 and by only 0.02 in 1990. This was the net outcome of two countervailing forces. On the one hand, the inequality of budgetary expenditure declined over the 7 years, from 0.32 to 0.28. This would tend to benefit poor provinces relative to the rich. On the other hand, the inequality of budgetary revenue per capita diminished much more rapidly, from 0.59 to 0.38. This would favour the rich provinces relative to the poor. The net effect was a sharp reduction in the redistributive role of central government.

It is important to know whether the richer provinces faced higher marginal rates of tax on the revenue they collected. Where the marginal retention rate ( $r$ ) is defined as



**Figure 5.** Provincial net transfer per capita to central government as a function of income per capita.

the proportion of additional revenue that a province can retain, the marginal tax rate is  $(1 - r)$ . We relate the marginal retention rate to the income per capita of provinces (Table 10). We do so for the 3 years in which marginal retention rates can be calculated for all provinces from our knowledge of the fiscal rules, 1985–87; this restrictive and *ad hoc* procedure is imposed by the information set.

The coefficient on income was negative and significant in each year. Thus, in 1985 a rise in income per capita of 100 yuan (mean income 826 yuan) would have lowered the retention rate by three percentage points. If a province with income per capita equal to that of the third poorest province were to raise its income to that of the third richest province, according to the 1985 equation its marginal retention rate would fall from 103 to 52%. Between 57 and 70% of the variance in retention rates could be explained by the income variable. There is indeed a powerful positive relationship between the

**Table 9.** Measures of income and fiscal intervention: province analysis, 1983, 1987 and 1990, mean values and Gini coefficients

	Mean values			Gini coefficients		
	1983	1987	1990	1983	1987	1990
Pre-intervention income ( $Y_1$ )	595	1008	1470	0.313	0.294	0.272
Post-intervention income ( $Y_2$ )	544	977	1488	0.235	0.251	0.251
Revenue ( $R$ )	222	353	421	0.507	0.445	0.378
Budgetary revenue ( $BR$ )	136	195	225	0.587	0.471	0.379
Extra-budgetary revenue ( $ER$ )	86	157	196	0.416	0.422	0.388
Expenditure ( $E$ )	171	322	439	0.349	0.340	0.315
Budgetary expenditure ( $BE$ )	91	178	242	0.322	0.291	0.276
Extra-budgetary expenditure ( $EE$ )	80	144	196	0.402	0.419	0.381
$N$	28	28	28	28	28	28

Sources: PRC, MOF (1992), pp. 195–243, 336–337; PRC, MOF (1989), pp. 111, 113, 170–171; PRC, SSB (1988), p. 55; PRC, SSB (1991), p. 31.

Note: All basic variables are expressed in per capita terms.

**Table 10.** The marginal rate of retention of budgetary revenue as a function of income per capita, by province, 1985–87: regression analysis

	Dependent variable: marginal retention rate ( $r$ )		
	1985	1986	1987
Intercept	104.544**	110.039**	112.821**
Income per capita ( $Y$ )	-0.028**	-0.029**	-0.027**
Adjusted $R^2$	0.566	0.653	0.700
$F$ -value	36.162	51.743	60.537
Mean of dependent variable	81.207	83.744	84.998
Mean of independent variable	826.464	902.107	1031.464
$N$	28	28	28

Sources: PRC, SSB (1988), p. 34; World Bank (1990), p. 89; PRC, MOF (1989), p. 170; PRC, MOF (1992), p. 348.

Note: \*\*Statistical significance at the 1% and \*at the 5% level.

income level of a province and central government taxation of its marginal revenue. Richer provinces have less incentive to collect additional budgetary revenue than do poorer provinces. It is notable that the positive relationship observed contradicts the prediction for incentive-compatible revenue contracts derived from regulation theory. In so far as income per capita is a measure of revenue raising capacity, poorer provinces should, in theory, face higher marginal propensities to tax.

**Table 11.** Annual growth rate of budgetary revenue per capita as a function of annual growth rate of income per capita and the marginal retention rate, by province, 1985–87: regression analysis

	Dependent variable: growth rate of budgetary revenue per capita			
	1985–87	1985	1986	1987
Intercept	6.891	8.800	7.364	13.071**
Annual growth rate of income per capita	0.362	0.532	0.782*	0.265
Retention rate				
1985–87	0.236**			
1985		0.324**		
1986			0.178**	
1987				0.249**
Adjusted $R^2$	0.277	0.269	0.282	0.611
$F$ -value	13.170	5.961	6.311	22.195
Mean of dependent variable (%)	17.523	24.913	15.719	12.026
Mean annual growth rate of income per capita (%)	13.098	13.911	10.441	14.941
Mean retention rate (%)	83.316	81.207	83.744	84.998
$N$	84	28	28	28

Sources: World Bank (1990), p. 89; PRC, SSB (1988), p. 55; PRC, MOF (1992), p. 348; PRC, MOF (1989), p. 170.

Notes: \*\*Statistical significance at the 1% and \*at the 5% level. The retention rate  $r = 100 BE/BR$ , subject to  $r \leq 1$ . The period 1985–87 contains pooled data, with  $3 \times 28$  observations.

## 6. Is the Marginal Propensity to Tax a Deterrent?

Does the marginal propensity of central government to tax the provinces serve as a deterrent to provincial revenue-raising? The following set of results suggests that this may be the case under the revenue contracting system, which operated from 1980 to 1993:

- (1) The budgetary revenue, and also the total revenue, collected by provincial governments fell sharply as a proportion of GNP over the period under study (Table 2).
- (2) Many provinces faced high marginal tax rates, especially in the early part of the period (Tables 1 and 6).
- (3) The richer provinces were generally subjected to higher marginal tax rates and therefore may have had a greater disincentive (Table 10).
- (4) Inter-province analysis showed that the responsiveness of provincial revenue collection to income per capita declined over the period (Table 8).

In Section 2 we showed theoretically that an increase in the tax imposed by central government need not cause provincial governments to reduce their tax collection. Even a high tax rate could increase revenue collected if the province valued its retained revenue sufficiently highly. However, two important features of the fiscal system in China make it more likely that central government deters budgetary revenue collection by the provinces. One is the possibility of substituting extra-budgetary revenue (all of which is retained) for budgetary revenue. The most important component of extra-budgetary revenue is the post-tax profits of enterprises owned and managed by local governments. A decrease in budgetary revenue collection can thus involve a corresponding increase in extra-budgetary revenue. It has been argued that fiscal incentives did indeed cause local governments to divert resources from budgetary to extra-budgetary channels (Hofman, 1993, p. 212; Wong, 1991, pp. 694, 708). Second, not all enterprise profits appear as provincial extra-budgetary revenue. Thus, diminished taxation of enterprises, for instance in the form of investment incentives, may have valued consequences such as higher enterprise investment, more rapid local economic development and higher provincial government revenue in the future. The deterrent hypothesis is worth testing.

Our concern is to examine the relationship between the growth of budgetary revenue per capita and  $r$ , the marginal retention rate, where  $(1 - r)$  is the marginal tax rate of the central government. We need to study the years 1985–87, when  $r$  can be readily measured. Before 1985 and after 1987 fiscal arrangements were too complicated to measure marginal as opposed to average values. During the period to be examined there were 16 surplus provinces and 13 deficit provinces. All of the surplus provinces except Guangdong shared their overall revenue with central government. For these 15 the marginal retention rate was equal to the ratio of budgetary expenditure to budgetary revenue. In the 13 deficit provinces and Guangdong the marginal tax rate was zero, i.e. the marginal retention rate was put at unity.

In Table 11 we show growth as a function of both tax effort and the growth of the tax base:  $\Delta \ln BR = a + br + \Delta \ln Y$ . The coefficient on growth in provincial income per capita over the year ( $\Delta \ln Y$ ) is positive but generally not significant. By contrast, the coefficient on a province's marginal retention rate ( $r$ ) is in each case not only positive but also large and highly significant. The pooled equation implies that, *ceteris paribus*, if the retention rate were raised by 10 percentage points, budgetary revenue collection would grow 2.4% more rapidly over the year. An increase in the retention rate by one standard deviation raises the annual growth of budgetary revenue on average by 7.7

**Table 12.** Annual growth rates and fluctuations in budgetary revenue and expenditure of central and provincial governments, 1979–91 and 1983–91

	Average annual percentage growth rate		Average annual percentage standard error		N
	BR	BE	BR	BE	
<i>1979–91</i>					
Central government	19.9	7.6	22.7	9.4	1
Provincial governments	8.5	13.7	10.7	14.8	28
<i>1983–91</i>					
Central government	14.4	11.4	15.4	3.5	1
Provincial governments	14.8	15.6	6.5	9.2	28
of which: lump-sum arrangements	18.6	16.0	6.9	8.6	16
sharing arrangements	9.8	15.3	6.0	10.0	12

Sources: PRC, MOF (1992), pp. 59, 103, 138, 182; PRC, MOF (1989), pp. 53, 89.

percentage points in 1985, 4.2 percentage points in 1986, 5.8 percentage points in 1987 and 5.5 percentage points in the period as a whole. If the province with the third lowest retention rate (Jiangsu) were raised to the third highest position (100% retention) the annual percentage increment in the growth of budgetary revenue would be: 13.0 in 1985, 7.1 in 1986, 10.0 in 1987 and 9.4 overall. These results constitute persuasive evidence that the marginal tax rate levied by the central government on the budgetary revenue collected by provincial governments has a powerful effect on their incentive and efforts to collect additional budgetary revenue.

This result is all the more impressive because we do not expect the amount of revenue collected by a provincial government to depend solely on the incentives that the provincial government itself faces. Its revenue should depend also on the set of incentives that it gives to subordinate local governments. The principal-agent problem between central and provincial governments arises again between provincial and sub-provincial governments. Part of the reported provincial government revenue is collected by and derived from local governments. The amount of revenue that they collect, and thus the amount that accrues to the provincial government, depends on the fiscal incentives that they in turn face. To regard provincial government as an independent agent, and to ignore its role as a principal itself trying to influence agents, is to simplify the analysis. However, an analysis of intra-province fiscal relationships would require a separate paper. We rest content that the marginal tax rates faced by provincial governments are indeed found to be important.

It is not only actual but also implicit marginal tax rates that serve as a deterrent. These can be perceived even in a system of lump-sum taxes and zero marginal tax rates: "... every effort by the central government to raise the revenue-GNP ratio and the ratio of central/local shares in the budget has been met by strategic responses by local governments, who anticipate that increased collections will invite imposition of a greater remittance quota in the next round" (Wong *et al.*, 1995, p. 127).

## 7. Which Governments Bear the Risks?

There are two measures of fiscal instability: fluctuations in revenue collected and fluctuations in expenditure. The former is an indication of the potential instability of

**Table 13.** The incidence of risk-bearing transferred from central to provincial governments, 1983–91: regression analysis

	Dependent variable: percentage standard error of <i>BE</i> minus percentage standard error of <i>BR</i> ( <i>RT</i> )		
Intercept	1.619	3.961***	3.526**
Income per capita of province in 1987	0.001		0.0003
Lump-sum provinces		-2.306*	-2.101
Adjusted $R^2$	0.003	0.072	0.038
<i>F</i> -value	1.088	3.083	1.530
Mean of dependent variable	2.643	2.643	2.643
<i>N</i>	28	28	28

Sources: PRC, MOF (1992), pp. 59, 103, 138, 182; PRC, SSB (1988), p. 55.

Notes: \*\*\*Statistical significance at the 1%, \*\*at the 5% and \*at the 10% level. The dummy variable represents the 16 provinces on lump-sum contracts (the omitted 12 having revenue-sharing arrangements).

expenditure in the absence of inter-governmental transfers,<sup>9</sup> whereas the latter is an indication of the actual instability of post-transfer funds available for spending. We argued in Section 2 that the institutional arrangements for inter-governmental transfers can shift instability from one tier of government to another. In a market economy in which risk has a marketable cost, the burden of risk-bearing is transferred to the less risk-averse party.

Do fiscal transfers have the effect of shifting the burden of risk-bearing from one government to another? We explore this question in two ways: shifts between provincial and central governments, and shifts among provincial governments. We estimate a regression equation of the form  $\ln X = a + bt$ , where  $X$  is revenue or expenditure over the period 1979–91 or 1983–91 and  $t$  is time in years. The coefficient  $b$  is the estimated proportionate average growth rate of  $X$ . The standard error of the estimate, i.e. the proportionate standard error of  $X$ , is our measure of the extent of fluctuations around the exponential time trend.

We see from Table 12 that, over the period 1979–91, central government had a faster growth rate of collected budgetary revenue but a slower growth rate of budgetary expenditure than did the provinces as a group. Similarly, whereas the percentage standard error of *BR* was greater for central government, that of *BE* was lower. The fluctuations in *BR* exceeded those in *BE* by 13.3 percentage points for central government, and fell short by 4.1 percentage points for the group of provincial governments. Thus, fiscal transfers had the effect of stabilizing the public expenditure of the centre and destabilizing that of the provinces.

The same information could be calculated for each province for the period 1983–91. All provinces fell short of central government in the percentage standard error of *BR* but exceeded central government in the percentage standard error of *BE*. In 21 of the 28 provinces, *BE* was more unstable than *BR*. The destabilizing effect of inter-governmental transfers was widespread among provinces.

Table 12 also divides the provinces into two groups: those with lump-sum transfer arrangements and those with revenue-sharing or revenue-dividing arrangements. The criterion is whether a province faced a lump-sum tax or subsidy in most of the 9 years 1983–91. The lump-sum provinces did much better in their growth of collected revenue. Moreover, their instability of *BE* exceeded that of *BR* by only 1.7 percentage points, compared with 4.0 percentage points for the other provinces. Can



more be said about the incidence of risk-bearing among provinces? We define  $RT$ , our measure of the extent of risk transferred, as the percentage standard error of budgetary expenditure minus the percentage standard error of budgetary revenue.  $RT$  is the dependent variable in Table 13. It bears little relationship to income per capita: the coefficient is positive but not significantly different from zero. However, it does depend on the type of revenue contract: the dummy variable representing provinces on lump-sum contracts has a significantly negative coefficient. Thus, more risk-bearing is transferred to the sharing provinces than to the lump-sum provinces. The intuition behind this result is that the lump-sum provinces generally receive subsidies. Their funds available for expenditure (collected revenue plus lump-sum subsidies) are less variable than is their collected revenue alone.

The inter-governmental fiscal arrangements have involved a transfer of risk-bearing from the centre to the provinces. Was this transfer efficient? There are reasons to believe that provincial and central governments have different attitudes to risk. On the one hand, because not all revenue fluctuations of the provinces are covariate, central government is capable of pooling risks: it should be less risk-averse on this account. On the other hand, central government has macroeconomic objectives and responsibilities not held by provincial governments, and these may provide an additional reason for central government to value revenue stability. In the absence of a market which could be predicted to locate risk-bearing with the less risk-averse party, the transfer of risk is better recognized than judged.

## 8. Conclusions

The theoretical and empirical analysis has suggested the following answers to the five main questions posed in this paper:

- (1) In the early 1980s less than a third of additional provincial revenue was retained and spent by the provinces, whereas by 1990 the proportion had risen to more than two-thirds. The increase was due to the growing importance of extra-budgetary revenue and the tardy growth of budgetary revenue, itself related to the high marginal tax rates imposed on the surplus provinces, which were generally also the richer provinces.
- (2) Richer provinces enjoyed more public spending, especially in the later part of the period under study. In 1990 the marginal propensity for provincial governments to spend as provincial household income rose was about one-third. The pattern of budgetary expenditure is related both to total budgetary expenditure and to income. Investment is the most sensitive form of expenditure: it would appear that the richer provinces can benefit from a virtuous circle associated with higher public investment per capita.
- (3) The amount of revenue collected by provincial governments was initially remarkably sensitive to their income levels but had become less so by 1990. The marginal propensity to contribute a surplus, i.e. to transfer funds to central government, decreased from one-half to one-eighth over the 7-year period. The inequality of pre-intervention income per capita among provinces fell over the period, whereas post-intervention inequality rose. Inter-government transfers reduced the Gini coefficient substantially in 1983, but negligibly in 1990. Thus, the equalizing role of fiscal transfers among provinces became weaker over time.
- (4) The marginal tax rate levied by the central government on the budgetary revenue collected by provincial governments has a powerful negative effect on their incen-

tives and efforts to collect additional budgetary revenue. The Laffer curve would appear to be alive and well and living in China.

- (5) The effect of intra-government transfers has been to shift the burden of risk-bearing from the central government to the provincial governments and, among provincial governments, towards the revenue-sharing provinces.

Our evidence suggests that central government was faced with a trade-off. On the one hand, it wished to tax the provinces so as to redistribute revenue among them and to achieve its own spending objectives. On the other hand, it wished to limit its taxation of the provinces so as not to discourage them from collecting revenue. The Chinese government improved the trade-off in various ways. First, it moved from the revenue-sharing or revenue-dividing arrangements for non-poor provinces in 1980 to lump-sum taxation arrangements for almost all provinces in 1990. Second, it moved from negotiated lump-sum taxation towards formula-based lump-sum taxation, dependent on target growth rates of provincial revenue, for a number of provinces. By this means it attempted to avoid the disincentive effects of perceived implicit marginal tax rates. Finally, in its most radical reform, introduced in 1994, it ended the revenue contracting system by transferring most sources of revenue from the provinces to its own domain. The new system required a transfer of funds from the centre to the provinces, based on a formula yet to be developed; in the initial years it was based on previous expenditures (Arora & Norregaard, 1997, p. 22).

There is a large literature on optimal tax assignment and the principles of fiscal transfers among tiers of government, in which considerations of informational advantage, externalities, inequality, horizontal competition and the political process are prominent (surveyed by Oates, 1994, and Heady, 1997, pp. 61–82). We consider the merits of the latest fiscal reform merely by comparison with the revenue-contracting system and only from two perspectives: efficiency and equity. The pursuit of revenue by local governments under the revenue-contracting system may have accelerated economic development, for instance in the form of local public entrepreneurship and rural industrialization (Wong, 1991, p. 694); and, by generating more competition, it may have fostered efficiency and hastened the transition to a market economy (Zhang, 1993, pp. 61–65). However, the revenue-contracting system has also been criticised for misallocating resources, for instance by encouraging local protectionism and poor investment decisions (Wong, 1991, pp. 694, 708). The 1994 solution to the principal-agent problem of the revenue-contracting period was essentially to transpose the principal and the agent. If the new agent shares the objective function of the principals, i.e. central government is as concerned to raise revenue for the provinces as they are, the principal-agent problem will indeed be diminished. It could reappear in a different form, however, in so far as the incentive of local governments to make revenue-raising investments is diminished and the pace of economic development suffers as a result.

The redistributive effects of centre-province fiscal relations were powerful in the early 1980s. We have seen that these dwindled and became weak by the early 1990s. The criteria for distributing central government grants among the provinces under the new fiscal arrangements have yet to be developed. That is a crucial and urgent task, deserving debate. On the one hand, it is important that the criteria take account of the needs of poor provinces and embody anti-poverty objectives to a greater extent than in the recent past. On the other hand, the choice of criteria must take cognisance of their potential disincentive effects on the recipients. In any event the danger of informational distortion by provinces will be present.

A problem that has dogged fiscal reform in China and is likely to continue to do so

is the interplay between fiscal and other areas of economic reform, such as price, enterprise and bankruptcy reform (Oksenberg & Tong, 1991, pp. 30–31). Reforms such as these have had important implications for centre–province fiscal relationships, and have necessitated constant bargaining about and frequent adjustments of those relationships. Fiscal arrangements have been jolted off-course or dragged along by the unintended or unforeseen consequences of other reforms. The Chinese reform process itself makes it difficult to arrive at a lasting, non-bargaining centre–province fiscal system.

## Notes

1. Oksenberg & Tong (1991) provide a detailed account and explanation of the evolution in and revolutions of centre–province fiscal arrangements over the period 1971–84, and Wong *et al.* (1995, pp. 81–99, 241–252) cover the 1980–93 period well.
2. The Ministry of Finance's annual *Finance Yearbook of China* has recently become available, which would permit analysis of the post-1993 system.
3. If there is a collection cost, the budget line  $R^*R^*$  becomes a curve: the  $(R_u, R_c)$  locus lies within the budget line as drawn, except at the intersection with the vertical axis, and is bowed outwards.
4. The original meaning of farmer was "one who undertakes the collection of taxes, paying a fixed sum for the proceeds".
5. In the regulation of enterprises the optimum is assumed to be the maximum rent extraction possible while keeping the enterprise in production.
6. These figures differ slightly from those implicit in Table 3 because Tibet is excluded from the regression analysis presented in the table.
7. When both independent variables are included, the coefficients on income are greatly altered: the income effect occurs mainly through the expenditure effect.
8. Figures 3–5 are derived from the equations reported in Table 8 but are shown in constant (1987) prices—an adjustment that alters the intercepts but not the slopes of the 1983 and 1990 lines.
9. Although collected revenue depends on the set of fiscal incentives and does not therefore represent what would be collected in the absence of inter-governmental transfers, the fiscal rules are more likely to affect the level of revenue than its fluctuation, i.e. if the rules do not vary, tax effort need not vary from year to year.

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