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The growth impact of intersectoral and intergovernmental allocation of public expenditure: With applications to China and India

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Abstract

The negative association between fiscal decentralization and provincial economic growth has been found to be consistently significant and robust in China. For India, however, we have found that fiscal decentralization is positively, and even statistically significantly, associated with state economic growth. The state allocation of public spending in various sectors is broadly consistent with "growth maximizing," whereas increases in the central allocation of its budget among development projects, nondevelopment projects, and social and community services by cutting the center's spending on all other functions can promote regional growth. © 2001 Elsevier Science Inc. All rights reserved.

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1. Introduction

Currently, there have been three approaches to studying the growth impact of public expenditures on economic growth: (1) Aschauer (1989) and Barro (1990), among many others, have studied the impact of aggregate government spending on growth and productivity. In

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those studies, government spending is divided either into aggregate consumption and aggregate investment or into aggregate spending in different sectors. The growth impact of various spending by different levels of government has not been carefully examined. (2) Devarajan, Swaroop, and Zou (1996) have taken the first step toward a systematic examination of the relationship between the composition of public expenditure and economic growth. While they have focused on the growth effects of various central government's expenditures, they have largely ignored the corresponding role of state and local government spending in the growth process. (3) Finally, Davoodi and Zou (1998), Xie, Zou, and Davoodi (1999), and Zhang and Zou (1998) have explored the growth effect of aggregate public spending by different levels of government along the line of fiscal-federalism arguments, but they have not looked into the composition of various public spending by different levels of government.

This paper unifies and extends the three above-mentioned approaches by dealing with the growth impact of the allocation of public expenditures among multiple sectors with multiple levels of government. Positively, we need this broad framework to make actual decisions on the allocations of public spending among different sectors (such as health, education, transportation, and social welfare) and among different levels of government (such as local, state, and federal). This complete theoretical and empirical evaluation is important for two reasons.

First, out of the 75 developing and transitional economies with populations greater than 5 million, all but 12 claim to have embarked on some type of transfer of power to local governments (Dillinger, 1994). Fiscal decentralization, the devolution of fiscal power of national government to subnational governments, is seen as part of a package to reform the inefficient public sector, to increase competition among subnational governments in efficient delivery of public services, and to escape from low economic growth (Bahl & Linn, 1992; Bird & Wallich, 1993; Oates, 1993, 1999). In the decentralization process, the knowledge of the productivity of aggregate public spending or the productivity of central government expenditures is not sufficient, because we need to know the relative productivity and relative efficiency of different public expenditures by different levels of government in order to achieve optimal expenditure assignments among different levels of government. This is the core of public expenditure reviews routinely undertaken both by international agencies (the United Nations, the IMF, and the World Bank) and all governments in the world.

Second, both central governments and local governments in many countries have been facing hardening budget constraints or have been running budget deficits. Budget cutting involves not only the cut in the aggregate government spending, it also demands a clear picture on the budget sizes of central and local governments. Shall we cut the central government budget more than the local budget? Which component of public expenditures should be cut for both the center and localities? These hard choices and realities depend on the relative contributions of different public spending by different levels of governments to economic growth.

To these ends, we first provide a general, theoretical framework to integrate the allocation of public expenditures among various public sectors and among different levels of governments in Section 2 of this paper. We focus on one important dimension: economic growth. Our emphasis on the growth dimension is due to three reasons. First, economic growth is often cited as one objective of fiscal decentralization and efficient public expenditures.

Second, a stated objective of many governments is to adopt policies that lead to a sustained increase in per capita income. Third, per capita growth is easier to measure and interpret.

In Sections 3 and 4, as two examples of practical implementation of the general analytical framework, we investigate the effects on provincial (state) economic growth of fiscal decentralization and various public expenditures by both the central governments and provincial (state) governments in China and India, respectively. We summarize our main findings in Section 5.

2. Analytical framework

We develop a theoretical model that links multiple sectors of public spending by multiple levels of government to economic growth in this section. To be as general as possible, the model assumes that there are three levels of government: federal, state, and local. In the model, fiscal decentralization is defined as spending by each level of government as a fraction of total government spending. For example, fiscal decentralization increases if spending by state and local governments rises relative to spending by the federal government. Furthermore, for each level of government, there are various public expenditures. The model then allows us to analyze the efficiency gains of fiscal decentralization and to evaluate the growth impact of various public spending by the three levels of government.

Following Barro (1990), we begin with an endogenous growth model consisting of a production function with multiple inputs: private capital and multiple public spending by the three levels of government. Let k be private capital stock, g the total government spending, f the vector of federal government spending, s the vector of state government spending, and l the vector of local government spending (see Eqs. (1) and (2)):

$$f = (f_1, \ldots, f_i, \ldots, f_I) \tag{1}$$

$$s = (s_1, \ldots, s_j, \ldots, s_J)$$

$$l = (l_1, \ldots, l_h, \ldots, l_H)$$

and

$$\sum_{i=1}^{I} f_i + \sum_{j=1}^{J} S_j + \sum_{h=1}^{H} l_h = g \tag{2}$$

The production function is a nested Cobb–Douglas[1] (Eq. (3))

$$y = k^{\alpha}\left[\prod_{i=1}^{I} f_i^{\beta_i}\right]^{\beta}\left[\prod_{j=1}^{J} s_j^{\gamma_j}\right]^{\gamma}\left[\prod_{h=1}^{H} l_h^{\omega_h}\right]^{\omega} \tag{3}$$

[1] The use of more general functional forms such as the CES would not alter our analysis qualitatively (see Devarajan et al., 1996; Xie et al., 1999).

where y is per capita output, $1>\alpha>0$, $1>\beta>0$, $1>\gamma>0$, $1>\omega>0$, $\alpha+\beta+\gamma+\omega=1$, $\beta_i>0$ for $i=1,\ldots,I$, $\sum_i \beta_i \leq 1$, $\gamma_j>0$ for $j=1,\ldots,J$, $\sum_j \gamma_j \leq 1$, $\omega_h>0$ for $h=1,\ldots,H$, and $\sum_h \omega_h \leq 1$.

The introduction of public spending by different levels of government creates a link between differential effects of various expenditures by the three levels of government and growth. The division of consolidated or total government spending g among different levels of government takes the following form (Eqs. (4)–(6)):

$$\sum_{i=1}^{I} f_i = \theta_f g \tag{4}$$

$$\sum_{j=1}^{J} s_j = \theta_s g \tag{5}$$

$$\sum_{h=1}^{H} l_h = \theta_h g \tag{6}$$

and $\theta_f+\theta_s+\theta_l=1$ and $0<\theta_i<1$ for $i=f$, s, and l. Thus, θ_f is the share of federal government in total spending, θ_s is the share of state governments, and θ_l the share of local governments. It is further assumed that the federal government spends a share of δ_i ($i=1,\ldots,I$) on its ith item f_i, state governments spend a share of δ_j ($j=1,\ldots,J$) on their jth item s_j, and local governments spend a share of δ_h ($h=1,\ldots,H$) on their hth item s_h. Therefore, Eq. (7) holds true.

$$f_i = \delta_i \theta_f g \text{ for } i = 1,\ldots,I \text{ and } \sum \delta_i = 1 \tag{7}$$

$$s_j = \delta_j \theta_s g \text{ for } j = 1,\ldots,J \text{ and } \sum \delta_s = 1$$

$$l_h = \delta_h \theta_l g \text{ for } h = 1,\ldots,H \text{ and } \sum \delta_h = 1$$

The consolidated government spending g is financed by a flat income tax at rate τ (Eq. (8)):

$$g = \tau y \tag{8}$$

The representative agent's preference is given by

$$U = \int_0^{\infty} u(c,\ f,\ s,\ l)\mathrm{e}^{-pt}\mathrm{d}t \tag{9}$$

where c is per capita private consumption, ρ is the positive time discount rate, and $u(c,f,s,l)$ is an increasing, concave, and differentiable utility function.

The dynamic budget constraint of the representative agent is:

$$\frac{dk}{dt} = (1-\tau)y - c = (1-\tau)k^{\alpha}\left[\prod_{i=1}^{I} f_i^{\beta_i}\right]^{\beta}\left[\prod_{j=1}^{J} S_j^{\gamma_j}\right]^{\gamma}\left[\prod_{h=1}^{H} l_h^{\omega_h}\right]^{\omega} - c \tag{10}$$

For analytical simplicity, let

$$u(c,f,s,l) = \ln c + \sigma_f \ln \prod_{i=1}^{I} f_i^{\beta_i} + \sigma_s \ln \prod_{j=1}^{J} S_j^{\gamma_j} + \sigma_l \ln \prod_{h=1}^{H} l_h^{\omega_h} \tag{11}$$

where σ_f, σ_s, and σ_l are positive (Eq. (11)). While the productivity of the expenditures by the federal, state, and local governments are measured by β, γ, and ω, respectively, their impacts on the representative agent's utility are measured by θ_f, θ_s, and σ_l, respectively. All government expenditures enter the production function and the utility function in the Cobb–Douglas form. That is to say, production and consumption services from public expenditures are generated through a specific production technology. Again, the Cobb–Douglas form is adapted here for analytical tractability.

We further assume a constant tax rate τ along the balanced growth path. Hence, the ratio (g/y) is constant. With simple, but tedious calculation (Eq. (12)),

$$\frac{y}{k} = \frac{g}{\tau k} = \tau\frac{1-\alpha}{\alpha}\left[\prod_{i=1}^{I}\delta_i^{\beta_i}\right]^{\frac{\beta}{\alpha}}\left[\prod_{j=1}^{J}\delta_j^{\gamma_j}\right]^{\frac{\gamma}{\alpha}}\left[\prod_{h=1}^{H}\delta_h^{\omega_h}\right]^{\frac{\omega}{\alpha}} \theta_f^{\frac{\beta}{\alpha}\sum_{i=1}^{I}\beta_i}\,\theta_s^{\frac{\gamma}{\alpha}\sum_{j=1}^{J}\gamma_j}\,\theta_l^{\frac{\omega}{\alpha}\sum_{h=1}^{H}\omega_h} \tag{12}$$

Given the total government spending g, the constant tax rate τ, and the shares of spending by different levels of government (θ_i's, $i=f,s,l$) among the aggregate government spending, and the shares of allocations of public expenditures among various sectors by each level of government (δ_i, $i=1,\ldots,I$, δ_j, $j=1,\ldots,J$, and δ_h, $h=1,\ldots,H$), representative agent's choices are determined by maximizing Eq. (9) with respect to c and k subject to Eq. (10) and initial conditions. Along the balanced growth, the solution for the per capita growth rate of the economy is given by:

$$\frac{dy/dt}{y} = \alpha(1-\tau)\frac{y}{k} - \rho$$

or

$$\frac{dy/dt}{y} = \alpha(1-\tau)\tau^{\frac{1-\alpha}{\alpha}}\left[\prod_{i=1}^{I}\delta_i^{\beta_i}\right]^{\frac{\beta}{\alpha}}\left[\prod_{j=1}^{J}\delta_j^{\gamma_j}\right]^{\frac{\gamma}{\alpha}}\left[\prod_{h=1}^{H}\delta_h^{\omega_h}\right]^{\frac{\omega}{\alpha}} \theta_f^{\frac{\beta}{\alpha}\sum_{i=1}^{I}\beta_i}\,\theta_s^{\frac{\gamma}{\alpha}\sum_{j=1}^{J}\gamma_j}\,\theta_l^{\frac{\omega}{\alpha}\sum_{h=1}^{H}\omega_h} - \rho \tag{13}$$

For the case that, $\sum\beta_i = 1$, $\sum\gamma_j = 1$, and $\sum\omega_h = 1$, the expression can be further simplified to:

$$\frac{dy/dt}{y} = \alpha(1-\tau)\tau^{\frac{1-\alpha}{\alpha}}\left[\prod_{i=1}^{I}\delta_i^{\beta_i}\right]^{\frac{\beta}{\alpha}}\left[\prod_{j=1}^{J}\delta_j^{\gamma_j}\right]^{\frac{\gamma}{\alpha}}\left[\prod_{h=1}^{H}\delta_h^{\omega_h}\right]^{\frac{\omega}{\alpha}} \theta_f^{\frac{\beta}{\alpha}}\theta_s^{\frac{\gamma}{\alpha}}\theta_l^{\frac{\omega}{\alpha}} - \rho \tag{14}$$

Both Eqs. (13) and (14) show that the long-run growth rate of per capita output is a function of the tax rate, shares of spending by different levels of government, and the shares of spending allocation on various public expenditures undertaken by the three levels of government, respectively. This understanding is the theoretical foundation for our empirical investigation on the relationship between growth and intersectoral and intergovernmental allocations of public expenditures. Please note that, for a given share of total government spending in GDP, a reallocation of public spending among different levels of government and among different sectors can lead to higher economic growth if the existing allocation is different from the growth-maximizing allocation of public expenditures. To show this point, we maximize the growth rate in the simple case of Eq. (14) (Eq. (15)):

$$\text{Max}\left\{\alpha(1-\tau)\tau^{\frac{1-\alpha}{\alpha}}\left[\prod_{i=1}^{I}\delta_i^{\beta_i}\right]^{\frac{\beta}{\alpha}}\left[\prod_{j=1}^{J}\delta_j^{\gamma_j}\right]^{\frac{\gamma}{\alpha}}\left[\prod_{h=1}^{H}\delta_h^{\omega_h}\right]^{\frac{\omega}{\alpha}}\theta_f^{\frac{\beta}{\alpha}}\theta_s^{\frac{\gamma}{\alpha}}\theta_l^{\frac{\omega}{\alpha}}-\rho\right\} \tag{15}$$

by choosing δ_i (i=1,..., I), δ_j (j=1,..., J), δ_h (h=1,..., H), θ_f, θ_s, and θ_l subject to the constraint $\theta_f+\theta_s+\theta_l=1$, $\sum\delta_i=1$, $\sum\delta_j=1$, and $\sum\delta_h=1$. The solution to this problem involves the following formulae for the growth-maximizing case:

$$\theta_f^* = \frac{\beta}{\beta+\gamma+\omega} \tag{16}$$

$$\theta_s^* = \frac{\gamma}{\beta+\gamma+\omega} \tag{17}$$

$$\theta_l^* = \frac{\omega}{\beta+\gamma+\omega} \tag{18}$$

$$\delta_i^* = \frac{\beta_i}{\sum\beta_i} = \beta_i \text{ for } i = 1,\ldots,I \tag{19}$$

$$\delta_j^* = \frac{\gamma_j}{\sum\gamma_j} = \gamma_j \text{ for } j = 1,\ldots,J \tag{20}$$

$$\delta_h^* = \frac{\omega_h}{\sum\omega_h} = \omega_h \text{ for} h = 1,\ldots,H \tag{21}$$

Therefore, as long as the actual θ_f, θ_s, θ_l, δ_i (i=1,..., I), δ_j (j=1,..., J), and $\delta_h(h=1,\ldots,H)$ differ from the growth-maximizing ones θ_f^*, θ_s^*, θ_l^*, δ_i^* (i=1,..., I), δ_j^* (j=1,..., J), and δ_h^* (h=1,..., H) as in Eqs. (16)–(21), the growth rate can always be increased without any change in the tax rate and the total budget size in the GDP.

We also have simple explanations for the growth-maximizing shares for different levels of government spending θ_f^*,θ_s^*,θ_l^*, and the multisector allocation of public spending by the three levels of government δ_i^* (i=1,..., I), δ_j^* (j=1.,..., J), and δ_h^* (h=1,..., H) as in Eqs. (16)–(21). We can regard β, γ, and ω as the measures for the total productivity of federal, state, and local government spending, respectively, and $(\beta+\gamma+\omega)$ as the aggregate productivity of all

government spending. The growth-maximizing shares for public spending allocation among three levels of government are just the ratios of individual productivity over the total productivity. Similarly, we can take the vectors $\{\beta_i\}_{i=1}^{I}$, $\{\gamma_j\}_{j=1}^{J}$, and $\{\omega_h\}_{h=1}^{H}$ to be the vectors of sectoral productivity (in generating productive services) for the multisector expenditures by the federal, state, and local governments, respectively. For each level of government, these productivity measures sum to unity. The growth-maximizing rule for each sector allocation at each level of government is again the ratio of its productivity over the total productivity, which is 1. Of course, these explanations depend on our specific assumptions on the production technology. For a general production technology, it is difficult to have the nice separability in the rules for allocating public spending among different levels of government from the rules for spending among multiple sectors by each level of government.

Regarding fiscal decentralization and the allocation of budget among different levels of government, an important point can be derived from this theoretical exercise: It does not hold true that the more decentralized a country's fiscal system becomes, the faster its economy grows. As far as economic growth is concerned, there exists only an optimal degree of fiscal decentralization, which is determined by the relative productivity of different levels of government spending in our specific example.

In our specific example, it is very easy to show that the growth-maximizing allocation rules for public expenditures are the same as the welfare-maximizing rules for public spending as a result of logarithmic utility function. This is an extension of the result obtained by Xie et al. (1999).

From our theoretical analysis in Eq. (14), the growth rate is determined directly by the tax rate, the allocation of public spending among different levels of governments, the allocation of spending among different sectors by each level of government, and other exogenous variables. For a linear approximation, we have the following regression equation:

$$\frac{\mathrm{d}y/\mathrm{d}t}{y} = \mu_0 + \mu_\tau \tau + \mu_s \theta_s + \mu_l \theta_l + \sum_{i=1}^{I-1} \mu_i \delta_i + \sum_{j=1}^{J-1} \mu_j \delta_j + \sum_{h=1}^{H-1} \mu_h \delta_h + \mu_z Z \tag{22}$$

where Z is a vector of other exogenous variables in growth literature that we will control in our estimations and μ's are the coefficients to be estimated. It shall be noted that we have dropped θ_f, δ_I, δ_J, δ_H in Eq. (22) because of the various add-up conditions for these share variables.

3. Application to China

3.1. Trend in fiscal allocations between central and local governments: 1978–1992

Since the late 1970s, China has gone through several rounds of fiscal reforms in an effort to decentralize its fiscal system and fiscal management (Wong, Heady, & Woo, 1993; World Bank, 1990, 1992, 1995, 1996; Zhou & Yang, 1992). Can we say that the fiscal system is

now more decentralized? The following examination suggests that the question should be answered very carefully.

3.1.1. Overall fiscal status

In China, official government spending appears in three ways: budgetary spending, extrabudgetary spending, and consolidated spending, which is the sum of budgetary and extrabudgetary spending.

Budgetary spending accounted for 18.3% of GDP in 1992 compared to 30.8% in 1978.[2] Although rises were insignificant from 1978 to 1979, 1985 to 1986, and 1988 to 1989, the budgetary spending-to-GDP ratio declined continuously since the beginning of the reform in 1978. As for the share of extrabudgetary spending relative to GDP, changes were rather limited, and it rose from 14.2% in 1982 to 15.2% in 1992.[3] Consolidated budgetary spending as a share of GDP shows an inverted-U shape. It first increased during 1982–1986 from 36.4% in 1982 to 40.4% in 1986 (except for a small decline in 1985), and then declined during 1986–1992, up to 33.5% in 1992. This shows that overall government fiscal spending as a share of GDP, and especially budgetary expenditures, fell during the reform period.

3.1.2. Relative fiscal status between the central and local governments

In the literature on fiscal federalism, fiscal decentralization is measured by the relative sizes of local spending and revenue collection and central spending and revenue collection. In China, however, the relative size of local revenue collection is not a good indicator of decentralization. For many years in our sample period, most tax revenues were levied by the center, even though they were mainly collected by local governments. Locally collected revenues generally were not spent locally, so they did not reflect local tax autonomy. We take this into account in this study by focusing on the relative size of government spending between the central and local governments.

In 1978, spending by local governments, including the spending financed by transfers from the central government, was 16.4% of GDP. This accounts for 53.1% of total budgetary spending by both the central and local governments in the same year. These shares became 10.3% and 57.4%, respectively, in 1992, indicating slight progress in budgetary decentralization. The share of local budgetary spending out of total budgetary spending first declined to 46.0% in 1981, before climbing to 63.7% in 1989 and subsequently declining again, almost to its original level. Overall, the share of local budgetary spending increased over most of the decade.

By contrast, local extrabudgetary spending demonstrated a trend of fiscal centralization over the entire postreform period. Local governments spent 9.8% of GDP as extrabudgetary expenditures in 1978, and 8.4% in 1992; the share of local extrabudgetary spending in total extrabudgetary spending declined from 69.1% in 1982 to 56.4% in 1992. If we combined budgetary and extrabudgetary spending, the local share of consolidated spending fluctuated up and down from 57.5% in 1982 to 62.5% in 1989 and back to 56.9% in 1992.

[2] The data used in our calculation are described in Appendix A.

[3] The central and provincial aggregate data on extrabudgetary spending became available in 1982.

3.1.3. Fiscal decentralization from the provincial perspective

First, there is significant variation between provinces in terms of fiscal status.[4] From 1980 to 1992, the ratio of budgetary spending to provincial income ranged from 9.0% in Jiangsu (a coastal province) to 40.5% in Ningxia (an inland autonomous region), indicating a general tendency for provincial governments to participate less in developed areas and more in underdeveloped areas. Further complications are observed when considering the three metropolitan cities, Beijing, Tianjin, and Shanghai, which represent high ranks in per capita income and above average ratios of budgetary spending to provincial income.

Second, great variations in fiscal decentralization can be found between provinces. During the period 1978–1992, the average ratio of provincial budgetary spending to central budgetary spending ranged from 0.01 in Ningxia to 0.09 in Guangdong (known as a leading province in economic reforms). Because Chinese provinces vary in terms of geographic area and population size, we adjust the fiscal-decentralization measure in per capita terms. Accordingly, the ratio of per capita provincial budgetary spending to per capita central budgetary spending was as low as 0.78 in Henan (an inland province) and as high as 4.31 in Beijing (the nation's capital).[5] For extrabudgetary spending during 1986–1992, the average province-to-center ratio in Ningxia was only 5% of that in Liaoning, a China's heavy industrial center. Since extrabudgetary spending has been financed mostly by the revenues and profits of state-owned enterprises during our sample period, we adjust the measure of decentralization for the income size. The ratios of provincial extrabudgetary spending to central extrabudgetary spending, each expressed relative to income, varied from 0.71 in Guizhou (a mountainous minority province) to 2.84 in Beijing. In terms of the ratio of per capita provincial consolidated spending to per capita central consolidated spending, the degree of fiscal decentralization varied from 0.82 in Henan to 6.67 in Shanghai, China's largest metropolitan city.

Third, fiscal decentralization within a province also varies over time. Guangdong, a coastal province favored by the central government policies and among the first to undertake economic reforms in 1978, experienced the greatest fiscal decentralization. In terms of the ratio of per capita provincial budgetary spending to per capita central budgetary spending, Guangdong had an annual average increase of 6.6% during 1978–1992. At the other extreme, Ningxia, one of the eight minority provincial areas, experienced hardly any increase in its per capita budgetary spending relative to the central government. In fact, this ratio decreased by 1.6% annually during this period. Between Guangdong and Ningxia are mostly inland provinces. In terms of the ratio of provincial per capita budgetary spending relative to the central government, the annual growth rate was 3.0% in Sichuan, the most populous province in China, and 1.8% in Henan, a political and economic center of ancient China.

[4] Of the total 30 provincial areas in China, two provincial areas, Tibet and Hainan, are excluded due to their special status. For a complete list of the 28 provincial areas used in this study, see Appendix A.

[5] The central per capita spending is the central spending divided by the total population of China.

3.2. Expenditure allocation

3.2.1. Functionwise allocation of central budgetary expenditures

In the Chinese budgeting system, budgetary expenditures are classified into 27 categories according to the use of budgetary funds. To better served our empirical analysis in Section 3.3, we now rearrange the Chinese budgetary expenditure into six groups: administration, development, human capital, national defense, urban maintenance, and other expenditures.

For the central government, among the five categories of expenditures listed, development expenditure took a share of 43.47% on the average during the period of 1978–1994. Expenses on administration and human capital took the same percentage of the total budgetary spending at 15.15% each. Another 10.61% was spent on national defense. The rest expenses accounted for 15.61%.

This pattern of functionwise distribution has not been the same during the period of 1978–1994. Development and defense spent 53.30% and 15.11% each in their total budgetary spending, and the numbers dropped to 29.56% and 8.94%, respectively. On the other hand, the expenses on administration and human capital increased respectively from 7.72% and 10.14% in 1978 to 20.70% and 20.75% in 1994. After 16 years of fiscal reforms, the central budget has become more concentrated on noneconomic activities. More than half of the central budgetary expenditures are spent on administration, on agency expenses of culture, education, public health care, and science, and on defense. The total development spending accounts less than one-third of the total spending.

3.2.2. Provincial expenditure allocation: 1987–1993

For all the 29 provinces during the period of 1987–1993, urban maintenance and development (including urban youth employment) had the highest rate of nominal growth of budgetary spending, 31.0%. The next item was administrative expenses, increased by 22.4%. The growth pattern of consolidated provincial budgetary spending behaved consistently with the one at the national level, as mentioned earlier.

Starting with administration expenditure, we find that Chinese provinces spent less, on the average, on administration in 1993 than in 1987, the first year in which the data are available. The share of administration expenses was 28.88% in 1987, and it became 24.23% in 1993. In the meantime, the central government spent 7.69% of its total budgetary expenditure on administration in 1987 and 9.05% in 1993.

Provincial spending on administration varied among the 29 provinces. In 1987, the highest spending percentage, 36.41%, was produced by Anhui, and the lowest, 20.46%, by Ningxia. The max − min difference became larger in 1993, as 33.28% by Jilin and 12.69% by Shanghai. The intertemporal changes in the budgetary spending on "administration" are also found to be different across province. Although all but two provinces reduced their spending on administration, only three provinces saw their decreases by more than 10%: Jiangsu, Liaoning, and Anhui.

For development spending, provinces in China experienced a minor decrease on the average during the period 1987–1993, whereas the central government also reduced its spending on development from 59.46% in 1987 to 41.51% in 1993. Among the 29 provinces,

20 provinces reduced their spending on development, while the remaining nine others increased development spending, most of them are fast-growing economic areas.

Both the center and most of the 29 provinces raised their spending on human capital. However, the increases are all moderate. The central government spent 4.2% on human capital in 1978 and 5.17% in 1993. The biggest increase was produced by Anhui, from 22.65% in 1987 to 29.12% in 1993.

Due to the incomplete data availability on provincial spending on urban maintenance and development, we only report its across-province distribution in 1993, the latest year in which data are completely available. The least proportion of spending, 1.46%, was provided by Qinghai, and the highest, 8.37%, by Tianjin. Generally speaking, provincial spending on urban maintenance and development took only a small proportion of their total budgetary expenditures, with an average 4.42% in the 1987–1993 period.

3.3. Empirical estimations with provincial-level data

3.3.1. Variables

Our empirical estimations are based on the annual data over the period from 1987 to 1993 for 29 provinces. The dependent variable is provincial GDP growth rate in real terms. The explanatory variables fall into four categories: (1) production inputs; (2) fiscal decentralization; (3) variables that measure the compositions of the budgetary expenditures of the central and provincial governments; and (4) standard control variables such as the investment rate, labor growth, tax rates, foreign trade, and the inflation rate.

We use the following data in our estimations:

Y = real growth rate of provincial GDP, measured in the annual percentage change;
LB = growth rate of the provincial labor force, measured by the annual percentage change in the total number of social labor force;
I = provincial investment rate, measured by the ratio of investment (accumulation in fixed asset and circulating funds) to provincial GDP;
FT = degree of openness of provincial economy, measured by the share of total volume of foreign trade (exports and imports) in provincial GDP;
TAX = tax rate;
R = inflation rate, measured by the overall social retail price index in each province;
FDC = degree of total fiscal decentralization, measured by the ratio of consolidated provincial budgetary spending to central budgetary spending;
CADM = the share of central budgetary spending on administration in total central budgetary spending;
CDEV = the share of central budgetary spending on development in total central budgetary spending;
CDFN = the share of central budgetary spending on defense in total central budgetary spending;
CHUM = the share of central budgetary spending on human capital in total central budgetary spending;

PADM = the share of provincial budgetary spending on administration in total provincial budgetary spending in each province;
PDEV = the share of provincial budgetary spending on development in total provincial budgetary spending in each province;
PURB = the share of provincial budgetary spending on urban maintenance in total provincial budgetary spending in each province; and
PHUM = the share of provincial budgetary spending on human capital in total provincial budgetary spending in each province.

3.3.2. Regression results

In our regression analysis, the measure of fiscal decentralization, FDC, is defined as the ratio of the consolidated provincial budgetary spending to central budgetary spending. Since Chinese provinces have different sizes in terms of population size, area, and GDP, we can make the ratios more comparable across provinces using an adjusted measure: the ratio of per capita state spending in each province to per capita central spending. But the results are qualitatively the same.[6]

The regression results are reported in Table 1. The first column shows the estimates when only the measure of fiscal decentralization and the shares of public spending at the central and provincial levels and a constant term are included. The estimate has shown a negative association between fiscal decentralization and real output growth. The coefficient is -1.79 and it is significant at the conventional 5% level. The estimated coefficient for central administration is positive and significant; the estimated coefficient for central development spending is positive but insignificant; the estimated coefficient for central defense spending is negative and significant; and the coefficient for central human capital spending is positive but insignificant. On the other hand, the estimated coefficient for provincial share of administration spending is negative and significant; the coefficient for provincial development spending is negative but insignificant; the coefficient for provincial urban maintenance and development spending is positive but insignificant; and finally, the coefficient for provincial human capital spending is positive but insignificant.

The second column shows the estimates of the model when provincial fixed effects (i.e. provincial dummy variables) are included. By including fixed effects, effects of volatility on growth that occurs because of differences in the average growth rates across provinces can be removed. The estimate of fiscal decentralization, FDC, is still negative and significant. The associations between output growth and the share variables found in the first column remain unchanged. So does their significance status.

The third through fifth columns report estimation results when other variables are introduced. The results show that the negative association between fiscal decentralization and output growth remains significant and quite robust with the inclusion of other control variables. The estimated coefficients for various shares of central and provincial spending are also consistent with the ones for our baseline regression in columns 1 and 2.

[6] See Zhang and Zou (1998) for more regression results on the basis of various measures of fiscal decentralziation.

Table 1
Effect of intersectoral and intergovernmental alllocation of budgetary expenditure in China (dependent variable: real growth of provincial GDP)

Independent variables	1	2	3	4	5	6
CONSTANT	3.12					
	(4.02)					
Tax (tax rate)	− 10.06	− 10.63	− 10.79	− 10.87	− 14.70	− 15.00
	(− 3.31)	(− 3.80)	(− 3.84)	(− 4.06)	(− 2.51)	(− 3.52)
LB (labor)	0.30	0.29	0.25	0.27	0.29	0.36
	(.90)	(.70)	(.58)	(.64)	(.68)	(1.33)
FDC	− 1.79	− 2.00	− 1.96	− 1.99	− 2.50	− 2.42
(fiscal decentralization)	(− 2.72)	(− 3.29)	(− 3.23)	(− 3.43)	(− 2.77)	(− 3.59)
CADM	6.93	7.48	7.87	7.55	9.22	9.61
	(4.09)	(4.63)	(4.59)	(4.56)	(3.28)	(4.75)
CDEV	1.07	1.12	1.15	1.12	1.68	1.71
	(2.83)	(3.21)	(3.30)	(3.61)	(2.31)	(3.22)
CDFN	− 6.23	− 6.13	− 6.52	− 6.37	− 7.79	− 8.63
	(− 6.14)	(− 6.49)	(− 6.17)	(− 6.01)	(− 3.53)	(− 5.38)
CHUM	0.47	0.03	0.15	− 0.04	− 0.38	0.34
	(.61)	(.04)	(.21)	(− .06)	(− .44)	(.56)
PADM	− 0.44	− 0.39	− 0.40	− 0.33	− 0.33	− 0.29
	(− 4.18)	(− 2.17)	(− 2.20)	(− 1.83)	(− 1.81)	(− 2.15)
PDEV	− 0.14	− 0.18	− 0.20	− 0.25	− 0.25	− 0.21
	(− 1.45)	(− 1.37)	(− 1.52)	(− 1.95)	(− 2.01)	(− 2.14)
PHUM	0.51	0.18	0.29	0.34	0.30	0.44
	(3.91)	(1.04)	(1.58)	(1.90)	(1.65)	(3.00)
PURB	0.07	0.33	0.29	0.15	0.15	
	(.36)	(.93)	(.81)	(.40)	(.41)	
I (investment)			− 0.04	0.04	0.05	0.04
			(− .54)	(.46)	(.58)	(.72)
FT (foreign trade)				0.09	0.07	0.02
				(1.12)	(.75)	(.29)
R (inflation rate)					− 0.12	− 0.17
					(− .74)	(− 1.48)
R^2	0.63	0.77	0.78	0.79	0.79	0.75
Adjusted R^2	0.60	0.68	0.69	0.69	0.69	0.69
S.E. of regression	0.04	0.03	0.03	0.03	0.03	0.03
Obs.	136	136	135	125	125	192
Number of provinces	29	29	29	29	29	29
Provincial fixed-effects	not included	included	included	included	included	included

t Statistics are in parentheses. Source: See the data in Appendix A.

Considering the limited data on provincial urban maintenance and development spending, we run our estimations in the sixth column by dropping the variable PURB. In this case, the negative correlations between provincial spending on administration and on development and output growth become significant, and the positive correlation between provincial expendi-

tures on human capital and output growth also become significant. The impacts of other variables on output growth are found consistent with those in the previous estimations.

4. Application to India

4.1. Fiscal decentralization, public spending, and growth in India: 1970–1994

The constitution of the Republic of India can be described as quasifederal in character because it provides for a federal structure with a strong unitary feature. The states have a substantial degree of autonomy within the area of responsibility granted to them by the constitution. At the same time, local government affairs are entirely within the states' sphere, and local governments do not have constitutional status (see Agarwala, 1992; Chelliah, 1990; Rao, 1997, Rao & Sen, 1996; Singh, 1997 for details).

For expenditure assignments between the center and states, the constitution provides three lists: the Union list, the States list, and the concurrent list. All matters relating to defense, currency, banking, foreign affairs, and interstate relations are in the exclusive domain of the central government. The states are responsible for maintenance of law and order and the courts, the social sector, agriculture, infrastructure, trade within the state, and overall development of the state economy. The concurrent list of responsibility includes important civil matter such as law, marriage, succession, administration of justice, trusts and civil procedure, economic and social planning, social security, education, trade unions, and electricity. By international comparison, especially among developing countries, India is quite decentralized by the conventional measure of fiscal decentralization: the share of subnational (state) government spending out of the total (state and central) government spending. According to IMF's Government Finance Statistics (GFS), from 1974 to 1993, this ratio was between 60% and 64% and remained stable.

On the revenue side, the constitutional assignment of tax powers has been based on two principles. The first is the avoidance of assigning any one tax to the center and the states at the same time. The second is that the most important taxes, which have economywide implications or which can be collected most efficiently and economically by the central government, should be assigned to the center. In the end, the center has the power to levy individual and corporate income tax, all excise taxes, and custom duties. Therefore, the central government has the most productive sources of revenue with wide bases. According to the IMF's GFS, the share of state revenue collection out of total government tax revenue ranged from 31% to 36% from 1974 to 1993. Therefore, the revenue measure of fiscal decentralization is relatively low compared to the corresponding spending measure.

For fiscal decentralization, we will consider both spending measure and revenue measure of decentralization for India. The revenue measure for India is more appropriate than for China because central revenues have been collected by the center instead by the states. In our empirical analysis, we will also make the ratios more comparable across states using two adjusted measures: (1) the ratio of per capita state spending in each state to per capita central spending and (2) the ratio of per capita state revenue collection in each state to per capita

central revenue collection. We will see later that these adjustments can significantly change the regression results, which is not true in the case of China.

For the composition of central government expenditures according to the IMF's GFS, defense spending relative to other services was the highest, about 15–26% of the total budget. Spending on health, education, and transportation were relatively low, ranging from 1% to 3%. Spending was moderate on general public services (6–9%), agriculture (5–10%), housing (3–7%), mining (2–8%), and other economic services (5–9%). Spending on mining decreased steadily from 9% to 2% from 1977 to 1993, while spending on housing rose substantially from 3% to 7% during the same period. At the same time, its spending share on general public services remained stable.

Another perspective on central spending is provided by India Economic Statistics (various years). It divides spending into three major categories: development spending, nondevelopment spending, and social and community services. From 1970 to 1990, on the average, the central government spent 31% of its budget on development, 47.5% on nondevelopment services, and 6.4% on social and community services.[7]

For the composition of state spending by function according to the IMF's GFS, major budget allocation went to education (22–25%), agriculture (14–25%), and general public services (14–18%). Spending for health, housing, social security, energy, and transportation was moderate. ranging between 4% and 7% of total state spending. We also note that total state spending on various functions was highly stable in terms of the allocation ratios.

In order to have a better understanding of public spending at the individual state level, we have collected spending data for 16 major Indian states in four categories: administration, economic services, education, and health. These data show large variations in public spending across states and over time. For example, on the average, Kerala spent about 7% of its total budget on administration, while Bihar and Punjab spent about 11% on administration. In the state of Assam, the spending share on administration varied from a minimum of 1.4% to a maximum of 14.5% in Assam between 1970 and 1994. Many other states also experienced large changes in spending for administration.

Spending for economic services was the largest single item of state spending across Indian states. On the average, their spending share ranged from 27% in West Bengal to 46% in Haryana. Over time, the spending share for economic services was also much more stable than the share for administration.

Education spending varied across states and over time. For example, spending share for education varied from 2% to 22.7% in Himachal Pradesh. On the average, however, it accounted for 16–28% of state budget from 1970 to 1994.

As with administration, state spending shares on health varied significantly from highs of 6.7% in Haryana to 13% in Himachal Pradesh to lows of 0.2% in Madhya Pradesh, 0.4% in Maharashtra, 0.5% in Orissa, and 0.6% in Punjab.

Across the 16 major Indian states from 1970 to 1994, all states experienced large variations in their per capita income growth rates with episodes of significant, negative growth in per

[7] See Zhang and Zou (1998) for more details.

capita income. During the 24 years in our sample, Gujarat, Tamil Nadu, and Maharashtra performed relatively well, with an average growth rate greater than 3%. At the same period, Rajasthan, West Bengal, and Bihar performed poorly, with an average annual growth rate of around 1%.

4.2. Data and variables

Our regression analysis is based on the panel data from 1970 to 1994 for 16 major Indian states. The dependent variable is real per capita income growth rate in each state. We take a 5-year forward-moving average of per capita real income growth in our regression analysis in order to eliminate short-term fluctuations.[8]

The regression equation is defined as follows:

$$Y^i_{t+1,t+5} = \beta_0 \mathrm{FDC}^i_t + \beta_1 \mathrm{CDEV}_t + \beta_2 \mathrm{CNONDEV}_t + \beta_3 \mathrm{CSOCCOM}_t + \beta_4 \mathrm{SADM}^i_t + \beta_5 \mathrm{SEDU}^i_t + \beta_6 \mathrm{SHLTH}^i_t + \beta_7 \mathrm{SECON}^i_t + \Theta Z^i_t$$

where the variables are:

$Y_{(t+1,t+5)}{}^i$: Five-year forward-moving average of per capita real income growth in state i.

FDC^i_t: Measures of fiscal decentralization across states at time t. Four alternatives will be utilized in this paper:

1. $\mathrm{FDCEXP}_t{}^i$=(total state public spending in state i)/(total central spending);
2. $\mathrm{FDCEXPPC}_t{}^i$=(per capita state spending in state i)/(per capital central spending);
3. $\mathrm{FDCTAX}_t{}^i$=(total state own revenue in state i)/(total central revenue); and
4. $\mathrm{FDCTAXPC}_t{}^i$=(per capita state revenue in state i)/(per capital central revenue).

CDEV_t: Ratio of central development spending to total central spending at time t.

$\mathrm{CNONDEV}_t$: Ratio of central nondevelopment spending to total central spending at time t.

$\mathrm{CSOCCOM}_t$: Ratio of central social and community service spending to total central spending at time t.

SADM^i_t: Ratio of state administration spending to total state spending in state i at time t.

SEDU^i_t: Ratio of state education spending to total state spending in state i at time t.

SHLTH^i_t: Ratio of state health spending to total state spending in state i at time t.

SECON^i_t: Ratio of state economic development spending to total state spending in state i at time t.

Z^i_t: A vector of other control variables in standard growth regression analysis such as the area of each state (AREA), initial (year 1970) per capita real income in each state (GDP70), secondary school enrollment (SCHOOLING) in each state, the ratio of state own tax revenue to state aggregate income (SOTAX) in each state, and the central tax rate (CTAX) defined as the ratio of total central tax revenue over national GDP in India.

[8] Growth rates of Indian states have much higher year-to-year variations the ones of Chinese provinces. For methodological details on the lagged structure of growth rates, see Devarajan et al. (1996).

4.3. Regression results

We divide our regression analysis into four parts depending on the choice of the four measures of fiscal decentralization listed in the subsection above. The results are presented in Tables 2–5. These four tables generate very consistent results for most variables, so we summarize the main results next.

Table 2
Effect of intersectoral and intergovernmental allocation of public expenditure in India (dependent variable: real per capita net state product growth rate)

Independent variables	1	2	3	4	5
CONSTANT	−0.719	−0.72	−0.731	−0.734	−1.192
	(−3.662)	(−3.648)	(−3.699)	(−3.724)	(−5.869)
FDCEXP	−0.042	−0.083	−0.199	−0.15	−0.519
	(−0.055)	(−0.082)	(−0.195)	(−0.147)	(−0.535)
CDEV	1.162	1.164	1.177	1.163	2.245
	(3.087)	(3.071)	(3.104)	(3.075)	(5.626)
CNONDEV	0.476	0.477	0.478	0.458	0.813
	(3.041)	(3.033)	(3.041)	(2.911)	(5.032)
CSOCCOM	2.583	2.579	2.563	2.586	9.513
	(3.514)	(3.489)	(3.466)	(3.508)	(7.55)
SADM	0.052	0.053	0.043	0.018	0.051
	(0.450)	(0.453)	(0.369)	(0.15)	(0.414)
SEDU	−0.068	−0.067	−0.058	−0.051	−0.093
	(−1.393)	(−1.285)	(−1.075)	(−0.945)	(−1.763)
SHLTH	0.028	0.028	0.027	−0.006	−0.073
	(0.408)	(0.401)	(0.385)	(−0.09)	(−1.094)
SECON	−0.008	−0.008	−0.012	−0.015	−0.004
	(−0.321)	(−0.326)	(−0.476)	(−0.576)	(−0.164)
AREA		0	0	0	0
		(0.061)	(0.435)	(0.593)	(0.147)
GDP70			0	0	0
			(1.012)	(0.95)	(−0.54)
SCHOOLING				0.108	0.0133
				(1.643)	(2.19)
CTAX					−6.392
					(−6.685)
SOTAX					0.253
					(2.622)
Number of observations	272	272	272	272	272
R^2	0.11	0.112	0.115	0.124	0.259
Adjusted R^2	0.084	0.081	0.081	0.0870	222
S.E. of regression	0.027	0.027	0.027	0.027	0.025
Durbin–Wats	1.403	1.405	1.39	1.375	1.53

t Statistics are in parentheses. Data source: See data in Appendix A.

Table 3
Effect of intersectoral and intergovernmental allocation of public expenditure in India (dependent variable: real per capita net state product growth rate)

Independent variables	1	2	3	4	5
CONSTANT	−0.709	−0.691	−0.699	−0.707	−1.193
	(−3.621)	(−3.507)	(−3.524)	(−3.567)	(−5.872)
FDCTAX	0.087	0.111	0.099	0.085	0.018
	(1.382)	(1.561)	(1.263)	(1.083)	(−0.22)
CDEV	1.132	1.101	1.11	1.108	2.237
	(3.015)	(2.91)	(2.927)	(2.925)	(5.601)
CNONDEV	0.467	0.458	0.46	0.444	0.815
	(2.988)	(2.917)	(2.925)	(2.821)	(5.048)
CSOCCOM	2.594	2.613	2.607	2.621	9.561
	(3.548)	(3.568)	(3.553)	(3.581)	(7.605)
SADM	0.045	0.04	0.036	0.014	0.03
	(0.395)	(0.346)	(0.312)	(0.119)	(0.242)
SEDU	−0.071	−0.085	−0.079	−0.069	−0.097
	(−1.45)	(−1.616)	(−1.451)	(−1.269)	(−1.831)
SHLTH	0.043	0.043	0.042	0.009	−0.065
	(0.632)	(0.64)	(0.614)	(−0.125)	(−0.979)
SECON	−0.012	−0.01	−0.011	−0.014	−0.002
	(−0.471)	(−0.407)	(−0.455)	(−0.554)	(−0.067)
AREA		0	0	0	0
		(−0.727)	(−0.4)	(−0.107)	(0.321)
GDP70			0	0	0
			(0.406)	(0.428)	(−0.558)
SCHOOLING				0.099	0.132
				(1.516)	(2166)
CTAX					−6.379
					(−6.66)
SOTAX					0.229
					(2.166)
Number of observations	272	272	272	272	272
R^2	0.118	0.12	0.12	0.128	0.258
Adjusted R^2	0.091	0.089	0.086	0.091	0.221
S.E. of regression	0.027	0.027	0.027	0.027	0.025
Durbin–Wats	1.396	1.386	1.385	1.361	1.527

t Statistics are in parentheses. Data source: See data in Appendix A.

First, except for one measure of fiscal decentralization, FDCEXP, the other three measures have positive and even significant estimated coefficients. Therefore, fiscal decentralization, especially decentralization in tax revenue collection, is in general positively associated with Indian regional economic growth on the basis our preliminary statistical analysis. It is interesting to note that when the explanatory variable is the ratio of state spending to central spending in each state, FDCEXP, the estimated coefficients under different specifications of the regression equations have very insignificant, negative signs (Table 2). When the ratio is

Table 4
Effect of intersectoral and intergovernmental allocation of public expenditure in India (dependent variable: real per capita net state product growth rate)

Independent variables	1	2	3	4	5
CONSTANT	−0.724	−0.741	−0.742	−0.739	−1.206
	(−3.697)	(−3.753)	(−3.754)	(−3.742)	(−5.916)
FDCEXPPC	0.068	0.101	0.081	0.038	0.053
	(1.012)	(1.239)	(0.882)	(0.404)	(0.594)
CDEV	1.169	1.197	1.195	1.171	2.265
	(3.11)	(3.166)	(3.157)	(3.096)	(5.649)
CNONDEV	0.462	0.463	0.466	0.453	0.812
	(2.949)	(2.948)	(2.96)	(2.881)	(5.033)
CSOCCOM	2.673	2.699	2.672	2.641	9.647
	(3.624)	(3.652)	(3.601)	(3.56)	(7.627)
SADM	0.048	0.049	0.044	0.019	0.039
	(0.414)	(0.432)	(0.378)	(0.163)	(0.323)
SEDU	−0.058	−0.038	−0.04	−0.043	−0.082
	(−1.146)	(−0.675)	(−0.694)	(−0.758)	(−1.448)
SHLTH	−0.003	−0.014	−0.005	−0.018	−0.087
	(−0.034)	(−0.186)	(−0.067)	(−0.234)	(−1.181)
SECON	−0.013	−0.018	−0.017	−0.017	−0.005
	(0.497)	(−0.67)	(−0.671)	(−0.646)	(−0.224)
AREA		0	0	0	0
		(0.717)	(0.764)	(0.76)	(0.047)
GDP70			0	0	0
			(0.489)	(0.648)	(−0.719)
SCHOOLING				0.099	0.122
				(1.448)	(1.929)
CTAX					−6.41
					(−6.703)
SOTAX					0.236
					(2.527)
Number of Observations	272	272	272	272	272
R^2	0.115	0.117	0.117	0.124	0.259
Adjusted R^2	0.088	0.086	0.0836	0.087	0.221
S.E. of regression	0.027	0.027	0.027	0.027	0.025
Durbin–Wats	1.395	1.407	1.402	1.377	1.531

t Statistics are in parentheses. Data source: See data in Appendix A.

adjusted by population size, FDEXPPC, the estimated coefficients are all positive and with much higher *t* statistics ranging from 0.4 to 1.24, weak evidence for the positive impact of fiscal decentralization on state economic growth in India (Table 4). When the measure of fiscal decentralization is the ratio of state own revenue collection to central revenue collection, FDCTAX, four estimated coefficients out the five in Table 3 are positive with *t* statistics between 1.08 and 1.56. When the decentralization measure is the ratio of per capita state tax revenues to per capita central tax revenue, FDTAXPC (Table 5), these

Table 5
Effect of intersectoral and intergovernmental allocation of public expenditure in India (dependent variable: real per capita net state product growth rate)

Independent variables	1	2	3	4	5
CONSTANT	−0.697	−0.707	−0.654	−0.658	−1.19
	(−3.581)	(−3.617)	(−3.323)	(−3.352)	(−5.876)
FDCTAXPC	0.01	0.011	0.026	0.026	0.021
	(2.139)	(2.241)	(2.708)	(2.683)	(1.315)
CDEV	1.11	1.126	1.044	1.033	2.225
	(2.974)	(3.005)	(2.778	(2.757)	(5.591)
CNONDEV	0.453	0.457	0.428	0.408	0.821
	(2.912)	(2.929)	(2.741)	(2.619)	(5.098)
CSOCCOM	2.622	2.612	2.675	2.693	9.414
	(3.604)	(3.585)	(3.683)	(3.719)	(7.484)
SADM	0.066	0.07	0.136	0.111	0.022
	(0.575)	(0.614)	(1.135)	(0.919)	0.148)
SEDU	−0.083	−0.073	−0.11	−0.103	−0.098
	(−1.684)	(−1.429)	(−2.01)	(−1.866)	(−1.877)
SHLTH	0.041	0.045	0.066	0.033	−0.047
	(0.614)	(0.674)	(0.975)	(0.47)	(−0.701)
SECON	−0.02	−0.024	−0.032	−0.035	−0.012
	(−0.795)	(−0.911)	(−1.226)	(−1.318)	(−0.483)
AREA		0	0	0	0
		(0.674)	(0.109)	(0.355)	(−0.106)
GDP70			0	0	0
			(−1.812)	(−1.82)	(−1.407)
SCHOOLING				0.104	−0.132
				(1.617)	(2.192)
CTAX					−6.079
					(−6.186)
SOTAX					0.07
					(0.44)
Number of Observations	272	272	272	272	272
R^2	0.127	0.128	0.139	0.147	0.263
Adjusted R^2	0.1	0.098	0.106	0.111	0.226
S.E. of regression	0.027	0.027	0.027	0.026	0.025
Durbin–Wats	1.395	1.404	1.437	1.397	1.553

t Statistics are in parentheses. Data source: See data in Appendix A.

positive estimates are statistically even more significant with the *t* statistics between 1.3 and 2.7.

Second, all shares of central government spending on development (CDEV), nondevelopment (CNONDEV), and social and community services (CSOCCOM) are positively and statistically significantly associated with state economic growth (Tables 2–5). Thus, increases in the central allocation of its budget among these three functions by cutting the center's spending on all other functions can promote regional growth.

Third, all shares of state spending on administration (SADM), education (SEDU), health (SHLTH), and economic development (SECON) have rather mixed signs with no statistical significance (Tables 2–5). These results suggest that state public spending shares are broadly consistent with growth-maximizing allocation of public spending.

Fourth, the central tax (CTAX) is negatively associated with state economic growth, suggesting that the central tax rate is on the wrong side of the "Laffer curve" in the sense of the Barro (1990) model. At the same time, the state tax has a positive, significant effect on economic growth and is on the left side of the "Laffer curve." These results indicate the possibility that central tax collection is too high relative to state collection, and a further decentralization in revenue collection promotes regional economic growth. Since both the central tax and state tax revenues finance productive public spending, the effect of a moderately distortionary tax may be outweighed by the substantial productive effect of tax revenues. Our preliminary results support this theoretical prediction for the state tax, not for the central tax.

5. Summary

The negative association between fiscal decentralization and provincial economic growth has been found to be consistently significant and robust in China. Perhaps this is understandable given the current stage of economic development in China, where the central government is constantly constrained by the limited resources for public investment in national priorities such as highways, railways, power stations, telecommunications, and energy. Such key infrastructure projects may have a far more significant impact on growth across provinces than their counterparts in each province. This is supported by the empirical results shown in Table 1, in which the association between central government development spending and economic growth is positive and significant. At the same time, provincial government development spending is negatively associated with growth.

For India, however, we have found that, in many cases of our regressions, fiscal decentralization is positively, and even statistically significantly, associated with state economic growth. The state allocation of public spending in various sectors is broadly consistent with "growth maximizing," whereas increases in the central allocation of its budget among development projects, nondevelopment projects, and social and community services by cutting the center's spending on all other functions can promote regional growth.

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Appendix A

A.1. Data appendix for China

Our empirical estimations are based on annual data for 28 provinces. Data sources are all official publications in China. Although over 100 volumes of statistical publications are involved, major data sources include *China Statistical Yearbook* and provincial statistical yearbooks for various years. Variables used for estimations are listed below with their data sources. Names of provincial areas included in our estimations are also listed.

Y = the real growth rate of provincial income, measured at constant price level. Source: For 1980–1985: *China National Income Statistics* 1949–1985 (*Guomin Shouru Tongji Ziliao Huibian* 1949–1985); for 1985–1992: *China Statistical Yearbook* (*Zhongguo Tongji Nianjian*) various issues.

L = the growth rate of the provincial labor force. Source: For 1980–1985, various volumes of provincial statistical yearbooks; for 1986–1992: *China Statistical Yearbook* (*Zhongguo Tongji Nianjian*), various issues.

I = the provincial investment rate, measured by the rate of accumulation in fixed assets and circulating funds. Source: For 1980–1985: *China National Income Statistics* 1949–1985 (*Guomin Shouru Tongji Ziliao Huibian* 1949–1985); for 1985–1992: *China Statistical Yearbook* (*Zhongguo Tongji Nianjian*), various issues.

F = the degree of openness of provincial economy, measured by the share of total volume of foreign trade (exports and imports) in provincial income. Source: *Almanac of China's Foreign Economic Relations and Trade* (*Zhongguo Duiwai Jingji Maoyi Nianjian*), various issues in 1984–1994/1995.

TAX = the tax rate. Source: Various volumes of provincial statistical yearbooks.

R = the inflation rate, measured by the overall social retail price index in each province. Source: *China Statistical Yearbook* (*Zhongguo Tongji Nianjian*), various issues.

FDC = decentralization measured by the ratio of provincial spending to central spending. Source: For provincial population: various volumes of provincial statistical yearbooks; for the central government, national population is used, *China Statistical Yearbook* (*Zhongguo Tongji Nianjian*), various issues.

Data sources for the following variables are derived by the authors from various provincial statistical yearbooks, and Ministry of Finance, *Finance Yearbook of China* (*Zhongguo Caizhang Tongji Nianjian*) 1993 and 1994; Ministry of Finance, *China Government Finance Statistics* (*Zhongguo Caizheng Tongji*) 1950–1985, 1950–1988, and 1950–1991.

CADM = the share of central budgetary spending on administration out of total central budgetary spending.

CDEV = the share of central budgetary spending on development out of total central budgetary spending, including expenses on capital construction, enterprise upgrading, technical R&D, and support for the agricultural sector.

CDFN = the share of central budgetary spending on defense out of total central budgetary spending.

CHUM = the share of central budgetary spending on human capital out of total central budgetary spending, including expenses on culture, education, public health care, and science.

PADM = the share of provincial budgetary spending on administration out of total provincial budgetary spending in each province.

PDEV = the share of provincial budgetary spending on development out of total provincial budgetary spending in each province.

PURB = the share of provincial budgetary spending on urban maintenance out of total provincial budgetary spending in each province.

PHUM = the share of provincial budgetary spending on human capital out of total provincial budgetary spending in each province.

A.1.1. List of provincial areas

Beijing, Tianjin, Hebei, Shanxi, Neimenggu (Inner Mongolia), Liaoning, Jilin, Heilongjiang, Shanghai, Jiangsu, Zhejiang, Anhui, Fujian, Jiangxi, Shandong, Henan, Hubei, Hunan, Guangdong, Guangxi, Sichuan, Guizhou, Yunnan, Shaanxi, Gansu, Qinghai, Ningxia, and Xinjiang.

A.2. Data appendix for India

Our empirical analysis is based on the aggregate data from *Government Finance Statistics*, International Monetary Fund, and on the annual data for 16 states during the period of 1972/1973–1992/1993. Major data sources include *Public Finance: India's Central and State Government* (1996) and *Profiles of States* (1997) by Economic Intelligence Service, India and various publications by Ministry of Finance of the Government of India. Variables used for estimations are listed below with their data sources. Names of states included in our estimations are also listed.

(1) Data for the following variables for all the 16 states, except for Andhra Pradesh, Madhya Pradesh, and Orissa, are taken from various publications by Ministry of Finance of the Government of India:

(2) Data for the variables mentioned above for Andhra Pradesh, Madhya Pradesh, and Orissa are taken from *Public Finance: India's Central and State Government* (1996) by Economic Intelligence Service, India.

(3) Data for the following two variables are taken from *Profiles of States* (1997 issue) by Economic Intelligence Service, India.

A.2.1. List of states included in the estimations

Andhra Pradesh, Assam, Bihar, Gujarat, Haryana, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, and West Bengal.

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