Decentralisation and Supply Efficiency: The Case of Rural Water Supply in Central India

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Demand for decentralisation of provision of public services is gaining ground in developing countries. Also, the policy advice to decentralise given by international agencies to the developing countries is turning into pressure. However, the benefits of decentralisation are not as obvious as the standard theory of fiscal federalism predicts. This article examines the effect of decentralisation of provision of drinking water in central India. The efficiency of water utilities under the control of the state government and those under the local governments is compared in terms of expense and asset utilisation. It is found that the decentralised provision of water supply is less efficient. The possible reasons for this counter-intuitive result are analysed.

I. INTRODUCTION

Decentralisation of provision of public services is considered essential for improvement in the efficiency of the public sector. The standard argument provided by the theory of fiscal federalism is that within a region, there is varied preference. In area A, people prefer libraries, but in area B, the people may prefer more sports facilities. The same mix of libraries and sports facilities will satisfy neither. Decentralised provision makes it possible to give the residents of A and B the mix they want and, thereby, to increase welfare. This being so, the local governments are better placed to recognise the asymmetries in tastes and to provide appropriate responses. The second argument is based on supply efficiency. The local government being closer to the people is more likely to run public service projects in the interest of the stakeholders.

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A consensus is slowly emerging to the effect that decentralisation is desirable not only from the point of view of sustenance of democracy but also of efficiency. Responsibility for provision of public services should lie with the lowest level of government, unless due to strong reason of externality, chargeability and technicity the highest level has to step in. This is invariably the essence of policy advice given to developing countries by the international organisations.

Looking from the side of the demand efficiency, in developing countries the hypothesis on which this classical model rests is fragile. In the developing countries, the fine difference in preferences (for example, parks versus swimming pools) is not the issue. The main issue is the satisfaction of basic needs.

From the supply efficiency side, few scholars have challenged the validity of the decentralisation approach. Even those of who have raised doubts are of the view that while the provision of infrastructure could be centralised, maintenance should be decentralised because the local governments have comparative advantages in terms of information and incentive [*Prud'homme, 1995*].

The bias towards decentralisation in the federalism literature could be due to the fact that hardly any empirical studies relating to comparative efficiency are available. Analysis is based on individual case studies and subjective assessments subject to the halo effect. The halo effect comes when something, which is politically or socially desirable, is also assumed to be economically efficient by the evaluators in their subjective evaluations [*Isham et al., 1995*].

This article looks at the supply of safe drinking water in central India. Safe drinking water has been recognised as a basic need for a long time [e.g., *ILO, 1966*]. In India the state and the local governments are responsible for providing safe drinking water. International aid in the field of drinking water is a very small proportion of total investment and so policy in this sector has largely been autonomous.

II. THE SETTING

The area of study covers the rural areas of two large central Indian states, Madhya Pradesh and Chhattisgarh, which cover the whole of central India. These states together cover an area of 440,000 square kilometres and a population of 76 million. Per capita income (US$313; PPP$ 1626) is lower than the Indian average (US$460; PPP$ 2390). Eighty-six per cent of the population is below the international poverty line of two dollars a day and 44 per cent is below one dollar a day. According to the 2001 census, the literacy rate (64 per cent) is only slightly lower than that of India as a whole

(65 per cent). Health standards are as poor as in the rest of India. The infant mortality rate is 99 per thousand, even higher than that of India as a whole (61 per thousand). If we leave out some small outlier states and metropolitan cities with high levels of human development, the demographic and socio-economic profile of the area of study is the same as the rest of the India, and similar to the whole of South Asia.

As in the rest of the country, three-quarters of the population of the area is rural. In general, small villages and remote habitats are served by handpumps whereas larger villages, usually with a compact population of 2,000 are covered by piped water schemes. Of the 70,000 villages in the two states, only 1,708 villages have functioning piped water schemes. The study covers all of the 1,708 rural piped water schemes of the two states. While the handpumps of small villages are maintained by the local government agencies, the operation and maintenance of rural piped water supply schemes presents a mixed picture. In 459 villages, the water supply schemes are operated by the agencies of the local government. In the remaining 1,249 villages, these schemes are operated by the agencies of the state governments through centralised management in terms of staffing, inventory control and so on.

All state governments in India have decided to transfer the maintenance and operation of drinking water schemes to the local bodies. This decision, however, has yet not been fully implemented in most states. In general, NGOs have been in favour of decentralisation. The activist groups, however, hold the state governments responsible if there is an epidemic in an area even where the provision of water supply is under the control of the local authority. While the federal government has been urging the states to go ahead with decentralisation, the international aid agencies are even more insistent. The German aid agency KfW withdrew the second stage of their rural piped water supply project from the state of Madhya Pradesh because decentralisation was incomplete.

On the other hand, the State Human Rights Commission, which has jurisdiction over the geographical area under study, has recommended that the maintenance and operation of drinking water schemes should be with agencies of the state government. The commission is of the view that the availability of safe drinking water is not merely a basic need but is also a human right and that the state government is better placed to safeguard this human right as compared to a local authority [*MPHRC, 1999*].

III. DATA

Data for the study were obtained from the Public Health Engineering Departments of the State Governments of Madhya Pradesh and

Chhattisgarh. The Public Health Engineering Department is the nodal department for rural water supply. While the data are not published systematically or regularly, they are easily available. In the summer of 2000 a large number of schemes were visited.

Piped water supply schemes use either surface water or ground water sources for raw water. While use of surface water reduces pumping costs, surface water needs treatment whereas ground water extracted from deep wells does not need to be treated. A water source variable has been included in the analysis. The annual production is measured in million litres. The age of the utility is as on March 2000.

The financing variables are based on debt as it is widely recognised that external monitoring by the lenders can improve efficiency [e.g., *Diamond, 1984*]. Debt has two dimensions – quantity of debt and whether it is long term or short term. Quantity of debt can be measured as debt-to-asset ratio. Macaulay's 'Duration', roughly the weighted average of the repayment period, measures the maturity structure of debt, the higher the debt-to-asset ratio and higher the 'Duration', the greater is the incentive for the lender to monitor the managers. Loans to water utilities are available without collateral because the state government guarantees the repayment of loan in the case of default by the borrowers. In practice, the guarantee is normally not invoked.

IV. MEASURES OF EFFICIENCY

Our empirical approach uses two alternative measures of efficiency: (i) operating expense scaled by annual production; and (ii) asset utilisation, which is annual production of potable water divided by assets.

Operating expenses are defined as total expenses less cost of goods sold, interest expense and managerial compensation. In the present case, since no royalty is payable on extraction of raw water, the 'cost of goods sold' is zero. Inefficient inventory control and corrupt practices, reflect high operating expenses. This first measure indicates how effectively the utility controls its operating costs.

The second measure indicates how effectively the utility uses its assets. Low productivity of employees will lower asset utilisation. An efficiently run utility can be expected to have a low operating expense and a high asset utilisation.

V. PRELIMINARY RESULTS

About 73 per cent of the total 1,708 utilities are managed in a centralised manner, whereas in the rest the management is decentralised at the local level. The number of utilities in both categories is large and therefore

meaningful comparison between the relevant ratios can be made. The mean operating expense for decentralised utilities is 51.9 whereas that for centralised utilities is 46.9. This is depicted in Figure 1. This 5.0 difference is statistically significant at one per cent level. A back-of-the-envelope calculation shows that this difference implies that a median utility producing 1.3 million litres of water wastes Rs 65,000 (US$1,500) when under decentralised management.

Looking at the asset utilisation ratio, we find that for equal assets the production by decentralised utilities (4.35) is about ten per cent less than that of centralised utilities (4.76). This is depicted in Figure 2. The 0.41 difference is statistically significant at the five per cent level. This difference implies that the production of a median-sized centralised utility with assets of Rs 438,000 (US$10,000) is 180,000 litres higher than a similar decentralised utility.

FIGURE 1

EXPENSE RATIOS

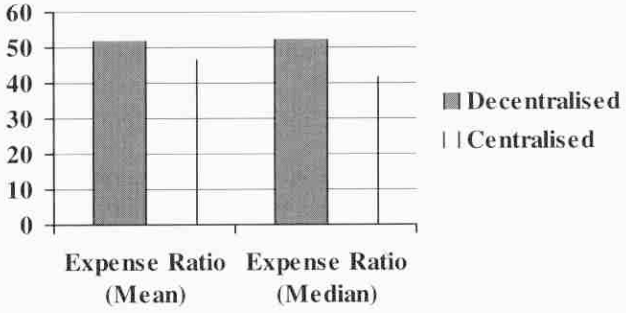
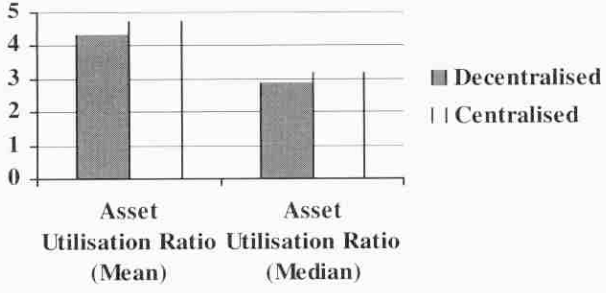


FIGURE 2

ASSET UTILISATION RATIOS



VI. REGRESSION ANALYSIS

If we regress the operating expense against annual production, we find a negative relationship that is statistically significant (t = 6.9) indicating the existence of scale economies. However, for regression of asset utilisation ratio against annual production alone we find the relationship less significant (t = 1.8). Similar results were obtained when these measures were regressed against the natural logarithm of annual production. We used the test proposed by Bera and Jarque [*1982*] and MacKinnon *et al.* [*1983*], often called MWD test, and find that as an explanatory variable, log of annual production would be more appropriate. For various regressions, we have used three control variables: the log of annual production as the size variable and the age of utility as on March 2000 as the age variable and availability of more than one source of ground water as the geological variable.

Results are reported in Tables 1 and 2.

VII. DETERMINANTS OF EFFICIENCY

Table 1 presents the results obtained from estimating multivariate regressions to explain the determinants of our two proxies for efficiency. Each proxy is regressed against the centralisation, geological, financing and control variables discussed in section III.

Column 1 identifies the variable while columns 2 to 6 display parameter estimates for five different model specifications. In columns 2 to 5 we analyse centralisation, water-source and financing variables independently. In the last column we test whether the independent results stand up when all variables are included in a single regression. To take into account economies of scale, we include the variable to control for size of the utility in each regression. Our measure of size is the logarithm of annual production.

A. Efficiency as Measured by the Operating Expense

In column 2 of Table 1, we find that the coefficient for centralisation is minus 5.4. This is very close to the 5.0 difference discussed in Section V. In column 3 of the table we analyse the effect of water-source variable. The sign of the coefficient would have shown that the operating costs get lowered if the utility use surface water but the variable is not significant. As for the financing variables, as apparent in columns 4 and 5 respectively, the coefficients of the debt-to-asset ratio and the duration variable are negative, as we would expect, but not significantly different from zero. In each of the four regressions, we find that the size variable, the natural logarithm of annual production is negative and statistically significant at one per cent level indicating economies of scale. In these regressions, we find that the

TABLE 1

REGRESSION RESULTS FOR EXPENSE RATIO

	(1)	(2)	(3)	(4)	(5)
Intercept	94.7***	87.4***	87.4***	88.7***	99.5***
	(17.4)	(16.6)	(1.6)	(16.9)	(17.3)
Centralisation	–5.4***				–5.9***
	(-4.1)				(-4.3)
Water source		1.1			1.0
		(0.7)			(0.6)
Financing variables					
Debt-to-asset ratio			–0.6		–0.7
			(0.6)		(-0.7)
Duration				–0.22	–0.29
				(-0.2)	(-0.3)
Control variables:					
Log of annual production	–2.9***	–2.6***	–2.8***	–2.6***	–2.9***
	(-8.8)	(-7.8)	(-8.3)	(-7.8)	(-7.9)
Utility age				–0.03	–0.02
				(-0.6)	(-0.4)
Regression summary statistics					
Adjusted R^2	0.246	0.240	0.239	0.244	0.259
F	16.04***	15.57***	15.46***	15.50***	14.57***

Note: The numbers in parentheses are absolute values of t-test statistics. *significance at the ten per cent level, **significance at the five per cent level, and ***significance at the one per cent level.

coefficients have the expected signs but not all are significant. Our final specification is in the last column of the table where we include centralisation, water-source, financing variables and control variables relating to the size and age of the utility. We find that the centralisation variable, which has a coefficient of minus 5.9, is significant at one per cent level. The geographical variable is negative and significant as in column 4. The two financing variables, duration is negative and significant whereas the debt-to-asset ratio is negative but not significant as in columns 4 and 5 respectively. Overall the results displayed in the last column generally confirm the findings when the analysis variables are examined independently in columns 2 to 5.

B. Efficiency as Measured by the Asset Utilisation

In column 2 of Table 2, we find that the coefficient for centralisation is 0.51 and is statistically significant at five per cent. In column 3 of the table we analyse the effect of the water-source variable. The sign of the coefficient is not significant. As for the financing variables, as apparent in columns 4 and 5 respectively, the coefficients of the debt-to-asset ratio and the duration are positive, as expected, but not significantly different from zero.

TABLE 2

REGRESSION RESULTS FOR ASSET UTILISATION

	(1)	(2)	(3)	(4)	(5)
Intercept	2.01*	2.51**	3.26***	2.49**	1.34
	(1.9)	(2.4)	(3.2)	(2.5)	(1.2)
Centralisation	0.51**				0.60*
	(2.0)				(1.9)
Water source		-0.49			0.40
		(-0.7)			(0.7)
Financing variables					
Debt-to-asset ratio			1.05		1.01
			(1.3)		(1.3)
Duration				0.03	0.01
				(1.2)	(0.4)
Control variables:					
Log of annual production	0.05	0.11*	0.02	0.07	0.28***
	(0.7)	(1.7)	(0.3)	(1.1)	(3.9)
Utility age				0.012	0.01
				(1.2)	(1.2)
Regression summary statistics					
Adjusted R^2	0.032	0.042	0.045	0.035	0.080
F	2.51	3.02	3.20	2.63	4.37

Note: The numbers in parentheses are absolute values of t-test statistics. *significance at the ten per cent level, **significance at the five per cent level, and ***significance at the one per cent level.

Our final specification is in the last column of the table, where we include centralisation, water-source and financing variables and also control variables relating to the size and age of the utility. We find that the centralisation variable, which has a coefficient of 0.6, is significant at the ten per cent level. The water-source and the two financing variables have the expected signs but are not significant. The size variable is positive and significant at one per cent level but the age variable is not significantly different from zero. Overall, the results displayed in the last column generally confirm the findings when the analysis variables are examined independently in columns 2 to 5, though not as closely as in the previous regression reported in Table 1.

VIII. GOODNESS OF FIT AND SIGNIFICANCE OF VARIABLES

The adjusted R^2 for each of the regressions for operating costs indicates that the models explain approximately one quarter of the variability in the operating expenses. Adjusted R^2 for the regressions for asset utilisation are not as high. Significance of most variables explaining operating costs is of a generally higher order than those explaining asset utilisation. Though the

results relating to operating expense are more clear-cut as compared to those of asset utilisation, the latter two are by and large acceptable.

From the control variables we can see that while the larger utilities are more efficient, the effect of the age of the utility as also that of the water source is insignificant. We did not find significance of financing variable even at ten per cent level. The explanation could lie in the lack of vigorous monitoring by the lenders. The loans are provided by the Life Insurance Corporation of India at a fixed rate as a social obligation to the health sector and the repayment is guaranteed by the state government. Apparently, the lenders have no incentive to monitor the performance of the borrower.

We are getting significant results for the variable of our main attention. A utility under centralised management has lower operating costs and higher asset utilisation. In the last column of Table 1, we find that the coefficient for centralisation is minus 5.9. This implies that, other things being equal, a median utility producing 1.3 million litres of water has higher operating costs to the tune of Rs 77,000 (US$16,500) on account of decentralisation. Similarly, the coefficient of 0.6 in Table 2 implies that for a median-sized utility with the assets of Rs 438,000 (US$10,000), 0.26 million litres of production loss could be on account of decentralised management.

IX. SUPPLY INEFFICIENCY OF DECENTRALISATION

Admittedly, the coefficients for the centralisation variable are small, but they are significant. More important, their signs go against the prevailing policy advice against centralisation.

In the water sector, the review articles [e.g., *Gadgil, 1998*] focus on technology and policy relating to tariffs and so on. It is usually taken for granted that decentralised service is more efficient. It is often assumed that the only reason why complete decentralisation has not taken place is that the vested interests of the regional level politicians and technocrats are too strong.

Economies of scale in terms of inventory control and supervision may not be the only reason for increased efficiency. Probably, the human factor is more important.

Technocrats both at the regional level and the local level are likely to operate quite far from the technical production area. And, it is likely that the local level technocracy would be farther away. State level engineering and administrative services offer better careers, greater diversity of tasks and comparatively less political intervention. State governments, with economies of scale, can invest in research and development, training and other measures for long-term growth. Often they are short of funds for research and human resource development, but the local governments have

virtually none. Even in developed countries, decentralisation may lead to deterioration of prestigious institutions like Ingéniers des Ponts et Chaussées of France without equivalent progress in local government bureaucracies [*Prud'homme, 1995*]. Also, in the developing counties, the technical skill of the local bureaucracies is at a primary level.

There is enough evidence to believe that there is widespread corruption in the provision of public services in developing countries. Decentralisation of the provision of public services can have the dubious beneficial effect in terms of decentralisation of corruption and consequent redistributive effects. But there is also evidence that corruption is more prevalent at the local level as compared to the regional and national levels. There are many reasons why this may be so. Local politicians are likely to be more subject to pressure demands from local interest groups. On the other hand the managers working for the regional governments move from place to place and have less unethical relationships with the local politicians. A major theoretical advantage of decentralisation is more discretion at the local level [*Oates, 1972*]; but this discretion could be a source of higher level of corruption.

At the same time there are fewer obstacles to corruption at the local level. The local level bureaucrats have less independence from the politicians than the state level bureaucrats do from the state level politicians. Monitoring and auditing are better developed at the state level. At the national and regional level, the media provide information on political markets, exposing corrupt and unethical politicians [*World Bank, 2002: 181*]. Since the media at the local level are underdeveloped, they are not in a position to play a constructive role.

Corruption is very difficult to measure. Most of the studies relating to 'corruption perception' analyse the effect of corruption on business. Moreover, these studies compare national governments and sub-national governments. Relevant comparison would be within the category of 'sub-national', that is, regional and local governments. Studies in Zaire and Tunisia point towards higher levels of corruption in local governments [*Prud'homme, 1992*]. Recently studies in Uganda and the Philippines [*Azfar et al., 2001*] point out the lack of accountability at the local level. Corruption is bound to increase the cost of provision and lower efficiency. For this reason, privatisation can only partially improve the situation. When the local government selects the private provider and supervises the service, the problem of corruption remains.

There is some evidence that participation by the beneficiaries in drinking water projects leads to better project outcomes [*Briscoe and de Ferranti, 1988; Isham et al., 1995*]. Decentralisation is not the same as participation. When social inequalities supplement economic inequalities, the process of decentralisation is political rather than participative and liable to be

captured by the local elite. The pressures of caste, tribe and local politics are too strong even for a well-meaning local government official. Location of public water stand posts and handpumps is an example. The state governments have issued clear guidelines as to how these should be located with a view to serve the disadvantaged sections of the population. Often, the local level functionaries are compelled to install the standposts and handpumps near influential households.

Political arguments in favour of decentralisation are strong. Notwithstanding many outliers (for example, communist Yugoslavia was far more decentralised than France) democratic countries have more decentralisation. On the economic side, it is true that richer countries are far more decentralised than poor ones; but the causality is not established.

It is often assumed that the people want decentralisation, while the regional level governments oppose it. This view is open to question. There has never been any referendum to determine what the people want. Paradoxically, the decisions relating to decentralisation are taken at the central level without consulting the people.

The only valid argument in favour of decentralisation, rarely advanced, is that of learning by doing. Under the guidance of the state governments and under pressure from the people and the NGOs, the local governments are likely to be more efficient, less corrupt and more responsible. This would take time even if a carefully formulated strategy is put in place. Another strategy could be to sidetrack centralisation–decentralisation dichotomy, empower the people to group together, form NGOs and engage in provision of public services that the local governments may fail to provide satisfactorily. In a multicultural multi-ethnic society, it is a difficult task. Even strong votaries of decentralisation have warned that we should not idealise village community and community ownership has lowered the capacity of public authorities in India and other developing countries [*Petrella, 2001: 15–16*]. In most developing countries no long-term viable strategy relating to decentralisation with empowerment is in place. There is only ham handed pressure from the metropolitan elite and the donor community for decentralisation.

VIII. CONCLUSION

Provision of public services in developing countries is a gigantic task. Due to externalities and social reasons, it has not been left to market forces even in developed countries. However, in the developed countries the provision of public services is decentralised to the maximum possible extent. The same model is sought to be imposed on developing countries through policy advice and pressure by international donors.

As a basic need, water supply in rural areas has moved up the agenda for development since the United Nations declared the 1980s as the International Decade for Drinking Water and Sanitation. The jury is still out as to the level of government which is best suited for achievement of goals set.

Studies relating to decentralisation in developing countries focus on relative accountability of national and subnational governments. Comparison between regional and local governments needs to be studied further. The assumption that a government which is 'closer to the people' will provide better services is intuitively appealing but does not pass the test of empirical analysis in the present context. There may be sound political reasons for decentralisation; however the economic efficiency is doubtful at least in the short and medium term.

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