

Chapter 5

Methodological Issues of Tax Effort of Gram Panchayats: Some Explorations

5.1 Introduction

Apart from tax capacity factors the tax performance of the state or local governments depends on its revenue efficiency manifested in administrative and legislative efforts to expand the tax base, rationalize the tax structure and reduce avenues of tax avoidance and evasion (Jha et al. 1999). It is in this context that tax effort of lower level governments assumes critical importance for garnering resources for development. Measuring tax effort is a difficult task. Methodologies to estimate tax effort by relating some measures of tax potential to tax capacity have been developed by scholars in this field and have been applied largely in cross country comparisons and to a limited extent at sub-national level. At the local level estimating tax effort would be a challenging task, because concepts like local government income are often not defined. Therefore, methods used in the country context may not be appropriate in the case of local governments.

As introduced earlier, own source revenue is central to the autonomy of Gram Panchayats in Kerala and any discussion of own source revenue cannot avoid issues of tax effort. Estimation of tax effort at the local level is a relatively less researched subject owing to the methodological intricacies involved. This chapter makes an attempt to explore some methodological issues in the measures of tax effort of Gram Panchayats in Kerala.

This chapter is organised in to five sections. The second section discusses the concept and the methodological issues involved in the estimation of tax effort. The third section raises the issue of system of taxation in the estimation of tax effort. Fourth section deals with the property tax model. The fifth and sixth sections discuss the regression result. The seventh section concludes.

5.2 Issues in Measuring Tax Effort

Tax economists and tax practitioners usually rely on the ratio of tax collection as a share of gross domestic product (GDP) to assess the level of collection effort of a country and establish worldwide patterns and trends for tax collection efforts. Such a straightforward comparison implicitly assumes total income to be the only relevant indicator of inter-country differences in taxable capacity (Lotz and Morss 1967, Bahl 1972, Prest 1978, Minh Le et al. 2008). In comparisons of a country's tax performance with its peers, existing tax collection structures are also assessed using the share of each type of tax in GDP or in the total tax collection (Bahl 1972). The measurement and interpretation of such indices are relatively simple and straightforward. However, the comparison of effectiveness in revenue mobilization across countries in different income groups using the tax-GDP ratio could provide a completely distorted picture due to different economic structures, institutional arrangements, and demographic trends (Prest 1979). In essence, this ratio does not reflect the tax capacity of a country and hence it is impossible to assess whether or not a country is out of line in comparison with its peers in its effort to raise domestic tax revenues (Minh Le et al. 2008).

A number of tax economists have attempted to deal with this problem by applying an empirical approach to estimate the determinants of tax collection and identify the impact of such variables on each country's taxable capacity. Taxable capacity is the predicted tax- GDP ratio estimated from a regression, taking into account the specific characteristics of the countries (Lotz and Morss 1967). Tax effort is defined as the ratio of the actual tax to that which would be predicted on the basis of taxable capacity equation. Since, by assumption, all capacity factors are allowed for in the equation, the observed difference presumably measures the effort which a country makes to exploit this capacity (Bird 1978). A tax effort of above 1 (high tax effort) implies that the country utilizes well its tax base to increase revenues and a country with the tax effort below 1 (low tax effort) is likely to have relatively substantial scope or potential to raise revenues.

Lotz and Morss (1967) were the first to use the difference between actual and predicted tax ratios for the purpose of making inter-country tax effort comparisons. One can measure tax effort using actual tax revenues in relation to some norm, or the difference between tax revenues and the predicted value coming from a regression explaining tax capacity. The later empirical literature has mainly adopted this approach to estimate tax effort [e.g. Bahl (1971); Chelliah, Baas and Kelly (1975); Bird and Wallich (1992)] and to test the relationship between intergovernmental transfers and local tax effort [Baretti, Huber and Lichtblau(2000); Von Hagen and Hepp (2000); Jha, Mohanty, Chatterjee and Chitkara (1999); Sagbas (2001)].

The regression method developed by Lotz and Morss is called aggregate regression method. It assumes that the tax ratio (T/Y) is an appropriate reflection of taxable capacity if it is adjusted for variations in factors that are assumed to reflect inter-country differences in the size of the tax base and the ability to collect taxes. Bahl (1972) argues that the aggregate regression approach does not allow a desirable examination of the kinds of explicit relationships between particular taxes and particular economic structure variables that would seem useful for purposes of making inter-country comparisons of taxable capacity and tax effort. He developed an approach where taxable capacity is defined as the total tax amount that would be collected if each country applied an identical set of effective rates to the selected tax bases, that is, as the yield of a representative tax system.

In aggregate regression method and representative tax system, conceptually, the definition of taxable capacity and tax effort is the same. However, there are methodological differences between the two approaches. In the former, the statistical objective is to explain the inter-country variations in tax performance in terms of general characteristics of the population, or of the economy, that are thought to be determinants of overall taxable capacity. No attempt is made in the aggregate regression approach to define particular tax bases explicitly. In the latter, the

statistical objective is to explain the same variations by relating collections of each type of tax to the best available measure of the true tax base. Hence, while the aggregate regression approach considers such measures as stage of development as determinant of taxable capacity, the representative tax system approach considers only the specific tax bases as indicators of capacity.

The aggregate regression and representative tax system approaches are subject to criticism that the tax base proxies and/or explanatory variables chosen are assumed to reflect only taxable capacity differentials and not tax effort factors. More importantly, the measurement of the taxable capacity is based on, a priori set of explanatory variables that determine the potential capacity of a country to tax, but it does not reflect either the demand for higher public expenditures or the political willingness to tax (Bird 1978; Toye 1978). In addition, as the taxable capacity is estimated from a regression specification, inherently the tax effort index reflects the tax collection performance of a country in comparison with the average effort exercised by an average country in the selected sample.

However, the average performance may not be directly relevant to the actual performance of a particular country. As Bird (1970) rightly pointed out "one must design a tax system for the economic, political, and administrative conditions which one finds in a particular country and not for some average abstract hybrid of all countries" (p.49).

The tax effort approach is simply not a very useful way of analyzing evidence pertinent to the assessment of fiscal performance in any country, since in the interest of simplistic comparisons most of the relevant information is left completely out of account (Bird 1978). Further for a given region in a given time period tax revenue is affected by a myriad of potential variables outside the control of local governments (like idiosyncratic shocks to some specific tax bases) (Besfamille and Sanguinetti, 2004). In practice tax effort made by local governments encompasses a broad set of

actions.

Tax effort cannot substitute for a comprehensive study of taxation in direct relation with the need for and composition of public expenditures of a particular country. Due to multiple potential issues related to the methodology used to estimate and interpret tax effort indexes, Chelliah et al. (1975) emphasize that “the tax effort indexes are not intended to be applied in a mechanistic fashion but rather to be considered useful additional information in judging the scope for more taxes” (P.195).

In the Indian context, the studies of tax efforts at the national and sub-national levels relied mostly on aggregate regression and representative tax system approaches (Reddy 1975; Oommen 1987; Rao 1993; Sen 1997; Rakhe 2003). Turning to Kerala, there are two major studies (Oommen 2004, Shaheena, 2005) which had analysed the tax effort across the Gram Panchayats in Kerala. They have used aggregate regression method to estimate the tax effort. This method is subject to some well known criticisms as elaborated above. Hence, the first step in the methodological exploration is a movement away from aggregate regression to Representative Taxation System approach, which is a move towards disaggregation.

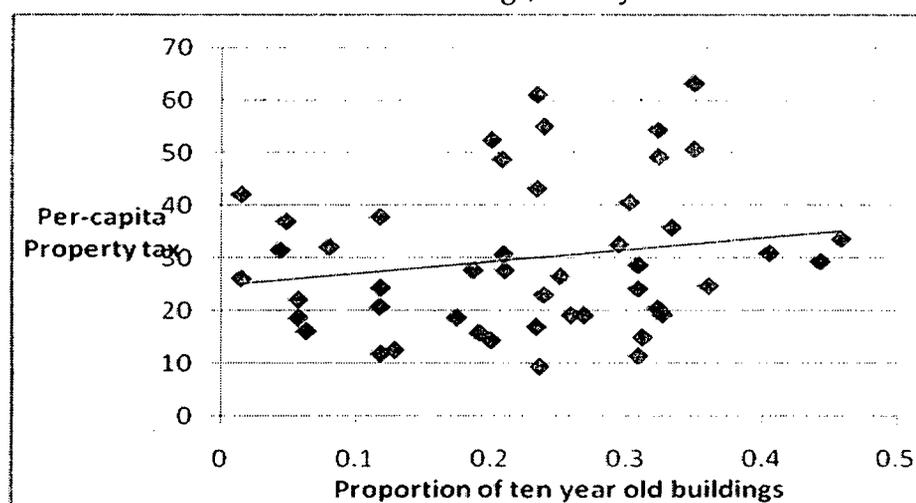
As explained above the own source revenue has three major constituents: Property tax, profession tax, and other tax. Among the three, the last one is a composite of many items, the composition of which varies very widely across the Gram Panchayats and hence cannot be subjected to modeling or estimation required for assessing efficiency. That leaves only property and profession taxes for systematic and universal treatment. The database of the tax base of profession tax is weak. Whatever data that were available was used in Chapter 4 to confirm the relationship between tax base and tax collection. The scope for any further exploration of the data is too limited. Thus, we are left with property tax for detailed analysis which is taken up in the subsequent sections of this chapter. But an initial ground needs to be cleared: that of the influence of the system of taxation on mobilising own revenue, which is taken up in the next section.

5.3 System of Taxation

System of taxation is an important factor that influences the tax effort of local governments in Kerala as is shown below. Property tax is the major component of tax revenue of Gram Panchayats and it is collected from all the buildings. Since the amount of property tax is arrived at on the basis of the rental value of the property at the time of its completion, the total property tax collected annually by the Gram Panchayats would vary according to the age structure of the buildings. A Gram Panchayat having comparatively larger proportion of newly constructed buildings will be collecting more property tax compared to another Gram Panchayat which has a larger proportion of old buildings. The regression approach using total number of buildings as explanatory variable will be showing the tax effort of the former Panchayat to be greater than that of the latter even when the efforts have been comparable. Such an anomaly arises because the design or system of taxation that influences the tax amount has not found a place in the approach.

The degree of influence of the system of taxation on the tax amount is sought to be illustrated here by taking the case of Kottayam. We have taken the data from the census 1991 and 2001 and calculated the additional number of buildings constructed after 1991 for all the Gram Panchayats in the district. When the proportion of new buildings and the per-capita property tax is put on a scatter it shows a mild positive relationship (Figure 5.1). It is evident from the figure that age structure has an influence on the property tax mobilized by the Gram Panchayats. This goes to confirm our surmise regarding the influence of tax system in mobilizing property tax, which in turn points to the need for incorporating elements of tax system in any approach to measure tax effort. One of the ways this could be done is by weighing the number of buildings by age and constructing an index rather than using the total number of buildings as an explanatory variable.

Figure 5.1: Relationship between Per-capita Property Tax and Proportion of Ten Year Old Buildings, Kottayam



Source: Panchayat Level Statistics 2006, Panchayat Directorate

Although the per capita property tax mobilized increases with the proportion of new buildings in a Gram Panchayat, Gram Panchayats with the same proportion of new buildings show wide variation in the amount of property tax collected. Taking two clusters of Gram Panchayats having new buildings within the range of 29 % to 34 % and 18 % to 26 %, we looked at the variations in property tax. In the first category there are 14 Gram Panchayats showing large variation in the property tax and in the second category, there are 16 Gram Panchayats which are also showing equally large variation. Having controlled for the system of taxation (by fixing the proportion of new buildings), the large variation in property tax could be an indicator of variation in tax effort if other systematic factors cannot explain it.

Two Gram Panchayats with same proportion of new buildings but different proportions of buildings housing formal institutions will yield different amounts of property tax. The Gram Panchayat with higher proportion of formal institutions is expected to yield more property tax than the other Gram Panchayats. In general, Gram Panchayats mobilising larger amount of profession tax should also be mobilising larger amount of property tax. The 16 Gram Panchayats of Kottayam with comparable proportions of new buildings report varying levels of profession tax. The Gram Panchayats collecting larger profession tax obviously have a higher proportion of buildings housing formal institutions. Thus we would expect a positive

relationship between profession tax and property tax among these 16 Gram Panchayats. There are 12 Gram Panchayats collecting relatively high profession tax with low property tax (Table 5.1). Rest of the Gram Panchayats collect higher property tax and lower profession tax. The variation in property tax, having controlled for the age composition of buildings and the proportion of buildings housing formal institutions, could be pointing to variations in tax effort.

Table 5.1: Profession Tax and Property Tax of Gram Panchayats with equal Proportion of New Buildings, Kottayam

Panchayat	Per-capita Profession Tax (Rs)	Per-capita Property Tax (Rs)	Proportion of ten year old buildings
Erattupetta	66.166	9.252	0.236
Chirakkadavu	28.520	14.211	0.200
Vakathanam	23.067	15.660	0.191
Bharananganam	61.205	16.810	0.234
Kumarakom	37.529	18.999	0.269
Kooroppada	27.827	19.065	0.259
Marangattupilly	35.693	22.894	0.239
Pampady	42.927	26.460	0.251
Kozhuvanal	24.057	27.563	0.210
Mutholi	31.598	27.574	0.187
Thrikkodithanam	13.783	30.692	0.209
Ramapuram	32.284	43.148	0.234
Puthuppally	49.854	48.691	0.208
Elikulam	19.481	52.406	0.200
Maravanthuruthu	9.362	54.978	0.239
T.V. Puram	16.118	60.984	0.234

Source: Panchayat Level Statistics 2006, Panchayat Directorate

5.4: Property Tax Model

In the present study we have adopted Representative Tax System Approach with some modifications to explore tax effort. Generally, in representative tax approach an identical tax rate for selected tax bases are applied. But here each tax revenue was regressed on its representative tax bases for the selected districts without applying identical tax rate as in Kerala, Gram Panchayats impose almost uniform tax rates. We have taken the property tax which is the single major component of tax revenue of the Gram Panchayats in Kerala.

As property tax is collected from all the buildings on the basis of their rental value, it can be expressed as a function of total number of buildings and the tax rate. The number of buildings consists of residential buildings and non-residential buildings.

The expression for property tax can be written as follows:

$$\text{Property Tax} = (\text{Number of Residential Buildings} + \text{Number of Non-Residential Buildings}) \times \text{Tax Rate}$$

Property tax from the residential buildings is not only a function of number and tax rate but also has an element of the size of the building in it.

$$\text{Property Tax from Residential Buildings} = \text{Number of Residential Buildings} \times \text{Size of Residential Building} \times \text{Tax Rate}$$

The data on the size of the buildings is not available. So, we assume that the family size would reflect on the size of the residential buildings and the expression for the property tax may then be written as,

$$\text{Property Tax} = \text{Number of Residential Buildings} \times \text{Family Size} \times \text{Tax Rate}$$

Dividing both sides of the expression by total population gives,

$$\begin{aligned} \text{Per-capita Property Tax (PC PROP)} &= [(\text{Number of Residential Buildings} \times \\ &(\text{Population} / \text{Number of Households}) \times \text{Tax Rate}) / \text{Population} \\ &= (\text{Number of Residential Buildings} / \text{Number of Households}) \times \text{Tax Rate} \end{aligned}$$

The first expression on the right hand side is represented by RB HH henceforth.

$$\text{PC PROP} = [\text{RB HH} + (\text{Number of Non-Residential Buildings} / \text{Population})] \times \text{Tax Rate}$$

As the tax rate does not vary much across the Gram Panchayats, we take it as unity and drop it and write the expression for per-capita property tax as follows,

$$\text{PC PROP} = \text{RB HH} + (\text{Number of Non-Residential Buildings} / \text{Population})$$

The buildings in a Gram Panchayat are put to three types of uses: residential, for housing formal institutions and for commercial purposes. In the above expression, what would be the expected relation between property tax and RB HH? For a given population as the number of residential buildings increase the size of buildings would come down as the family size would be falling. Increasing RB would have a positive effect on property tax but decreasing size would be pulling it down. The net effect would be a combination of the two and would depend on the balance between the two effects.

Turning to the issue of non-residential buildings, a reasonably good proxy for the number of buildings housing formal institutions could be the profession tax collected. Gram Panchayats having a higher profession tax means that, they have

higher number of professionals and higher number of buildings being used as offices. For any given population as the number of buildings housing formal institutions goes up the property tax should be going up. Thus, the expected relationship between profession tax and property tax is positive. However, one of the major limitations of this proxy is the following. As profession tax is related to the salary amount, the same extent of building space housing the same number of professionals would be yielding different amounts of profession tax depending up on the salary earned.

For the number of commercial buildings, rent from buildings can be used as a proxy. However, rent could be a poor proxy because the property tax assessed does not change by location of the building whereas the rent would be higher for the building that is located closer to the town than farther away. If rent were a good proxy then the relationship between property tax and rent from buildings would have been positive. As we do not know how good a proxy it is difficult to predict the relationship.

Having clarified the data availability and the proxy variables, the expression for per-capita property tax can now be translated into a regression equation as follows:

$$\ln PC PROP = a + \beta_1 \ln RB HH + \beta_2 \ln PC PROF + \beta_3 \ln PC RENT$$

PC PROP = Per-capita Property Tax

RB HH = Residential Buildings per Households

PC PROF = Per-capita Profession Tax

PC RENT = Per-capita Rent on Buildings

5.5: Regression Results

The least square regression method is currently the widely used approach in the estimation of tax effort because of tradition and ease of computation. However, the real data set frequently contains outliers which may be gross errors or exceptional observations. In this situation, the least squares method becomes unreliable. Two things often happen: the estimates themselves become totally incorrect and the outliers are hidden, which means that you do not notice them at all. To remedy this problem, robust statistical techniques have been developed, which gives a

trustworthy answer when the data are contaminated and allows us to easily identify the outliers at the same time. A first step towards a more robust regression estimator came from Edgeworth (1887), who argued that outliers have a very large effect on least squares because the residuals are being squared. Hence, in the present analysis we have adopted robust regression techniques.

The information on the relevant variables for the regression is not available for all the districts; because of that our analysis is confined to eight districts. Before running the regression, we tested the correlation among explanatory variables. The results show that there is no significant correlation among the explanatory variables in most of the cases (Table 5.2). However, there are a few exceptions. In Wayanad, Malappuram and Pathanamthitta the correlations between per-capita profession tax and per-capita rent are significant indicating that more commercialized Gram Panchayats have a concentration of formal institutions. There is no such easy explanation for the observed correlation between residential buildings per household and per-capita rent in Wayanad and Kottayam.

Table 5.2: Correlation between Explanatory Variables

District	Correlation Between RB HH and PC PROF	Correlation Between PC PROF and PC RENT	Correlation Between RB HH and PC RENT
Kasaragod	-0.01	-0.02	-0.05
Kannur	0	0.08	-0.05
Wayanad	-0.1	0.75***	-0.19**
Malappuram	-0.06	0.22**	-0.16
Palakkad	-0.02	-0.02	0
Ernakulam	-0.01	-0.02	-0.05
Kottayam	-0.07	0.19	0.18
Pathanamthitta	0.13	0.44***	-0.06

Source: Panchayat Level Statistics, 2006

** Significant at 5 percent level

*** Significant at 1 percent level

The robust regression result (OLS results are given in appendix) shows that the variation in property tax is largely explained by PC PROF, which is a proxy for buildings housing formal institutions. Its coefficient is statistically significant for all the districts (Table 5.3). As expected the RB HH and PC RENT are not significant in any of the districts.

Table 5.3: Robust Regression Results of Property Tax on its Respective Tax Bases

District	Constant	RB HH	PC PROF	PC RENT	R ²	N
Kasaragod	0.431 (-1.15)	-0.273 (-0.41)	0.786*** (-2.68)	0.001 (-0.07)	0.25	39
Kannur	0.716 (7.82)	0.058 (1.32)	0.558*** (8.98)	-0.004 (-0.91)	0.69	79
Wayanad	0.851 (2.97)	0.436 (0.58)	0.604*** (3.74)	0.005 (0.35)	0.89	24
Malappuram	0.998 (6.34)	0.147 (1.18)	0.433*** (3.93)	0.008 (0.89)	0.46	69
Palakkad	1.311 (6.07)	-0.049 (-0.17)	0.439*** (2.74)	0.012 (1.19)	0.24	89
Ernakulam	0.770 (8.46)	0.043 (0.58)	0.548*** (10.34)	0.004 (0.56)	0.61	57
Kottayam	0.382 (3.14)	0.042 (0.14)	0.725*** (9.12)	-0.013 (-1.62)	0.19	72
Pathanamthitta	1.104 (6.59)	0.289 (0.55)	0.239*** (2.29)	0.002 (0.18)	0.63	51

Source: Panchayat Level Statistics 2006, Kerala State Resource Group

*** Significant at 1 percent level

Note: Figures in the parenthesis are t values, N= Total Number of Observations

In section 5.3, we argued that the elements of tax system would have an influence on the property tax collected and pointed to the need for incorporating elements of tax system in any approach to measure the tax effort. One of the ways suggested was to weigh the number of buildings by age rather than using the total number of buildings as an explanatory variable. Ideally, one should be computing weighted RB HH for all the districts and re- run the regressions. But the lack of data does not allow us to do such a computation. But using the limited data weighted RB HH (WRB HH) was computed for Kottayam as follows. The stock of residential buildings in 1991 + the additional residential buildings constructed post 1991 multiplied by 1.25, the whole divided by the number of households is taken as WRB HH. Here 1.25 is taken as the weight assuming that the cost of houses built post-1991 will be 25% higher than those built prior to 1991. A similar variable is constructed using a weight of 1.5. Taking a weight of 1.25 or 1.5 is arbitrary but it serves the limited purpose of illustrating the influence of the tax system elements on the regression coefficients.

In order to understand the tax system effect, robust regressions are run for Kottayam by taking the two new variables separately. The results show that the coefficient of residential buildings becomes significant in both the cases when we incorporate the

tax system element by weighing the number of residential buildings by its age (Table 5.4). It is remarkable that such a crude measure of tax system could yield such a significant result. By taking two different values (1.25 and 1.5) we have measured its sensitivity. In both the cases the coefficient values are significant.

Table 5.4: Robust Regression Results of Property Taxes on its Respective Tax Bases, Kottayam

District	Constant	WRBHH	PC PROF	PC RENT	R ²	N
Kottayam (1.00)	0.382 (3.14)	0.042 (0.14)	0.725*** (9.12)	-0.013 (-1.62)	0.19	72
Kottayam (1.25)	0.48 (2.96)	0.12** (2.01)	0.65*** (8.6)	-0.023 (-1.72)	24	72
Kottayam (1.50)	.50 (2.64)	0.11** (1.99)	0.68*** (8.2)	-0.021 (-1.74)	22	72

Source: Panchayat Level Statistics 2006, Kerala State Resource Group

*** Significant at 1 percent level

** Significant at 5 percent level

Note: Figures in the parenthesis are t values, N= Total Number of Observations

5.6: Discussion of the Results

As already mentioned robust regression method has been applied here to minimise the influence of outlier Gram Panchayats. A comparison of ordinary least squares estimates with that of robust regression results shows the extent to which outliers can influence the OLS estimates (the ordinary least square regression result is given in Appendix 1). While the coefficients of PC PROF of all the districts have changed as we move from OLS to robust regression, the largest influence could be seen in the case of Kottayam and Kasaragod. In the case of Kottayam not only that the R² showed large improvement (0.09 to 0.19) the coefficient of PC PROF turned statistically significant. In the case of Kasaragod too, the coefficient became significant. It may be recalled that Kottayam had about 11 percent of the Gram Panchayats as outliers. While Kasaragod had only about 7 percent of the Gram Panchayats as outliers, their distant from the mean was greater (Chapter 4, Section 4.4). Thus, ignoring the influence of outliers in the regression estimates could be at great cost.

The implications of this major finding need to be highlighted. As elaborated earlier, in the whole class of studies discussing the methodological approaches and regression analysis to estimate tax effort the standard method applied is that of ordinary least square techniques. There has hardly been a mention of the influence of outliers and the problems that could arise in the regression estimates. As brought out by the results above coefficients that are truly significant turn non-significant when OLS method is applied. A non-significant coefficient would tend to depress the predicted value which in turn would inflate the estimates of tax effort. Thus, conventional estimates of regression coefficients and associated measures of tax effort could turn out to be misleading. In this regard ours is a definite methodological advancement in estimation.

The most important result coming out of property tax regression model is that the coefficient of PC PROF is significant across all the districts (at 1 percent level of significance). This is a very important finding as researchers have not so far included the non-residential buildings as a tax base of own source revenue and property tax of Gram Panchayats. Here, profession tax used as a proxy for buildings housing formal institutions with all its limitations, explains a large part of the variation in property tax across the Gram Panchayats. This is in line with our findings in Chapters 3 and 4; in the former we had observed that there was not much variation in the number of residential buildings across the Gram Panchayats and that the variation was large in the case of non-residential buildings (Table 3.7). In the latter, we had found a positive relationship between the number of formal institutions and own source revenue in Wayanad, Palakkad and Kasaragod the districts for which we had carried out the exercise. In fact non-residential buildings explaining the variations in property tax would sound too commonsensical but it required the methodological rigour of this study to bring it out. This is what sets apart our study from the earlier ones, such as Shaheena (2005) and Oommen (2004), conforming the well known observation of Bird (1978) that the simplistic comparisons of the tax effort approach leaves most of the relevant information completely out.

As already discussed in Chapter 2 (section 2.7), the World Bank study explains the variations in revenue mobilisation across the Gram Panchayats by taking population, type of economic activity, land area and SC/ST population as explanatory variables.

They run a multiple regression equation taking 615 Gram Panchayats and are able to explain 25 percent of the variation in own source revenue. In addition to the well known criticisms like aggregate regression, ordinary least squares and simplistic explanatory variables, the study has poor explanatory power. The move towards RTS, robust regression and the relevant variable selection boosted the explanatory power beyond 60% for most of the districts. This confirms that our approach is in the right direction.

5.7 Conclusion

This chapter sought to explore some methodological issues in the measures of tax effort of Gram Panchayats. Generally, the estimation of tax effort using standard regression methods could be vitiated by the effect of influential observations. In order to obviate this problem we have adopted robust regression techniques. The literature on the methodology of tax effort suggests the need to move out of the aggregate regression approach to representative tax system approach. In representative tax system approach, the constituents of own source revenue, namely profession tax, property tax, and 'others' need to be taken separately. For reasons elaborated earlier regressions could not be run for profession tax and 'other' revenue. Robust regression carried out for property tax, which is the single major component of own revenue of the Gram Panchayats, showed that non-residential buildings explain most of the variation in property tax. The estimation of tax effort at any level of government would require the incorporation of the system of taxation in the methodology. Our exploration of incorporating the system element by weighing the residential buildings by age showed that it, in fact, makes a significant difference to the result.

Our explorations in three distinct directions yielded significant results showing us the directions to be pursued in estimating tax efforts. But we could not pursue these directions for the following reasons. As the 'other' constituent of own source revenue is a composite of multiple items, the identification of its respective tax bases takes one to the specificities of Gram Panchayats ruling out any general analysis. In the case of profession tax the weak database did not provide room for regression analysis. A slightly better database of property tax allowed us to carry out robust

regression analysis yielding most significant results, but the direction of estimating tax effort could not be pursued as the required information on the age composition of residential buildings was lacking. We have explored a few methodological directions which could not be brought to fruition in the estimation of tax effort owing to serious limitations of the database.

Appendix 5-1

Table 5-1: Regression Coefficients of Property Taxes on its Respective Tax Bases

District	Constant	RBHH	PC PROF	PC NTR	R ²	N
Kasaragod	40.19 -2.67	-22.57 (-1.85)	0.67 -1.99	0.098 -1.5	0.2	39
Kannur	17.85 -8.2	0.65 -1.27	0.48*** -8.58	0.59*** -2.89	0.53	81
Wayanad	-38 (-0.75)	60.05 -1.23	00.72*** -4.43	0.199** -2.7	0.83	24
Malappuram	16.96 -2.38	1.77 -0.41	0.91*** -5.59	-0.002 (-0.26)	0.36	69
Palakkad	20 -1.91	0.46 -0.05	0.21** -2.1	-0.07 (-0.19)	0.04	89
Ernakulam	33.08 -5.38	0.23 -0.28	0.380*** -7.53	-0.005 (-0.28)	0.51	58
Kottayam	-23.6 (-1.00)	39.3 -2.19	0.34 -1.67	-0.01 (-0.29)	0.09	73
Pathanamthitta	-0.127 (-0.01)	8.22 -0.58	0.96*** -6.71	-0.016 (-0.036)	0.53	53

Source: Panchayat Level Statistics 2006, Kerala State Resource Group

*** Significant at 1 percent level

** Significant at 5 percent level

Note: Figures in the parenthesis are t values, N= Total Number of Observations