Bias in Government Revenue Forecasting

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Ⅰ. Introduction

Forecasting revenues is a central aspect of virtually all public sector budgetary processes. At the federal level fiscal policy priorities forge a link between forecasted revenues and acceptable spending levels. At the state and local level, the influence of forecasted revenues on budgetary allocations is even more direct since such jurisdictions must generally produce balanced budgets and any changes in revenues must be matched by comparable changes in spending or in offsetting changes to the level of taxation.[1]

In the past several years, a small but growing literature has examined the nature of public sector revenue forecasting. One concern of this literature has been whether such forecasts are "optimal" in the sense of fully exploiting available information about future revenues. A related concern has been whether public sector revenue forecasts are systematically biased.

1) E.g. all of the states except Vermont have enacted mandatory budget-balancing by law.

The existing empirical work on public sector revenue forecasts has produced varying results. A variety of works dating back to Gerwin(1969), Meltsner(1971), and Caiden and Wildavsky(1974) has argued that officials have an incentive to estimate revenues conservatively, with greater conservativeness associated with a greater degree of uncertainty. More recent investigations by Klay (1983), Larkey and Smith(1984, 1989), Bretschneider and Schroeder(1985), and Feenberg, et al. (1989) report findings consistent with this view. In contrast, Kamlet, Mowery, and Su(1987) at the federal level and Cassidy, Kamlet, and Nagin(1990) at the state level find little systematic evidence of such conservativeness in budget forecasts.

In examining bias, Kamlet et al. (1987) and Feenberg et al. (1989) employ the concepts of " weak" and "strong enonomic rationality." Weak rationality is determined by regressing actual revenues on a constant term and forecasted revenues and testing the joint hypothesis that the constant term coefficient is zero and the forecasted revenue coefficient is one. Strong rationality is determined by including as regressors various types of information available at the time forecasts are made and testing whether jointly these influences are statistically significant.

As useful as the concepts of weak and strong rationality are for examining revenue forecasting they are largely descriptive: are forecasts biased? Do they use available information? As such, they do not directly test for causal influences on forecasting bias. Indeed, there has been little systematic theory developed or tested about forecasting bias.

This paper examines revenue forecasting by local school districts. It makes several distinct contributions to the literature. First, we provide a simple theory of "managerial rationality" that takes into account political and organizational constraints encountered by policy makers. We develop several hypotheses that contrast "economic rationality" with "managerial rationality." We test and find substantial support for several of these hypotheses.

Second, local school districts do not have the separation of powers that characterize federal and state budgeting, and their revenue forecasts are made using less sophisticated techniques of analysis. Insofar as competition between branches of government and use of sophisticated forecasting techniques may attenuate underlying tendencies toward biased forecasts(see Bretschneider and Gorr 1987, Bretschneider et al 1989), local school districts become an especially good level of analysis to find such bias and test for its causes.

Third, while most existing work in the area has used time series data, our data set has been carefully constructed to provide consistent accounting procedures across time and school districts. This provides a panel data set that has a large sample size compared to those typically used in the literature. It preludes having to assume stability in forecasting behavior over multiple decades(e.g., Feenberg, et al. 1989). It also provides a data set that better allows for an examination of manag-

erial, organizational, and political variables on forecasting behavior.

Fourth, the time period and location of the data used in this paper provide an unusual opportunity to study the impact of fiscal stress on revenue forecasting behavior. The study period, 1982−1986, has its first year in the second of two consecutive recessions with subsequent years in recovery and then growth of the general economy. The geographical area we examine, Allegheny County, Pennsylvania(which contains the city of Pittsburgh), had many school districts heavily dependent on the region's steel industry. Three out of the five integrated steel mills in the county closed in 1981 / 1982, causing some 50,000 jobs to be lost(the largest loss of any county during this period) and ruining the economies of several school districts in the sample(e.g., McKeesport, Clairton, South Allegheny, and Steel Valley). Other districts in the county, while suffering a slowdown, recovered strongly. Still other districts faired well with no impacts on revenue collections at all.

Finally, rather than restrict ourselves to "total revenues" or isolated sources of revenues, as has been done in previous studies, we also examine separately the different components of local revenues as well as total local revenue. Insofar as different revenue streams are subject to substantially different amounts of uncertainty, the impact of uncertainty on forecasting bias can be examined more directly.

Ⅱ. Towards a Theory of "Managerial Rationality" in Revenue Forecasting

It may be that revenue forecasts are biased and not "rational" in the economic senses mentioned above, but nonetheless are very explainable in terms of the managerial, organizational, and political constraints on policy makers. To test this, we posit influences on managers that could bias revenue forecasts.

1. Management of Uncertainty

The early works examining revenue bias(e.g., Gerwin 1969, Meltsner 1971, and Caiden and Wildavsky 1974) argued that officials have an incentive to estimate revenues conservatively, with greater conservativeness associated with a greater degree of uncertainty. One rationale for this is that it may be much harder to deal with unanticipated deficits than unanticipated surpluses. Feenberg et al. (1989) and Shkurti and Winefordner(1989) discuss the havoc that unanticipated def-

icits can cause on proposals scheduled for funding and for projects that are already in place.

"Unanticipated deficit(surplus)" as used here refers to a situation in which, as the budget fiscal year progresses, the initial budget turns proves to be in deficit(surplus). The fact that it is more difficult organizationally and generally causes more harm to the public to have to cut back or interrupt existing commitments than to allocate to agencies additional money that was not originally budgeted leads to an asymmetry in the loss function for unanticipated deficits and surpluses. In particular, from a manager's perspective the loss associated with an unanticipated deficit is larger than the loss associated with a comparably sized unanticipated surplus.[2)]

The prospects of an unanticipated deficit is one managerial influence on revenue forecasts. Another is the degree to which projected revenues allow for the "current services budget" to be met. The current services buget is the budget reguired to continue into the following year programs and activities at their present level. Cuts from current services imply layoffs and other reductions. Such cuts are also very difficult managerially. From a manager's perspective the difficulties stemming from having one fewer employee in the forthcoming year are much greater when it means laying off an existing employee rether than simply not hiring a new employee.

Concern with experiencing an unanticipated deficit and concern with the ability to fund current service levels, together, imply a particuar relationship between the fiscal stress being experienced by a community and the direction and degree of bias in its revenue forecasts. Figure 1 shows the anticipated bias in revenue forecasts as a function of fiscal stress, holding constant the level of uncertainty about future revenues. Fiscal stress may be measured, for instance, as the difference between expected revenues for the coming year and the current services budget.

To understand the shape of Figure 1, consider a community with fiscal stress at point E. This community is in good shape fiscally, with expected revenues somewhat more than covering the current services budget. It is optimal from a manager's perspective in this situation to forecast revenues somewhat conservatively. This will constrain budgeted expenditures and thereby lessen the odds of an unanticipated deficit.

Consider what happens as one moves from point E. As the fiscal situation facing a community worsens, moving left from point E, the desire to avoid an unanticipated deficit must be balanced against the fact that unduly conservative revenue forecasts will lead to cuts from current service levels. This leads to a revenue forecast that is less conservative than at point E. Moving still further left from point E, at a certain point, labelled point D in Figure 1, the desire to avoid unanticipated

2) Note that cognitive psychologists have found that individuals generally have asymmetric loss functions with regard to changes from the status quo, with losses being weighted more heavily than gains (see Kahneman and Tversky 1979 and Tversky and Kahneman 1981).

deficits gives way fully to concerns over the impact of cuts from the current service level. For example, suppose that a community has just suffered a plant closing and substantial loss of tax base. There would typically be no immediate, offsetting reduction in expenditures—public safety, education, etc. would still be required. Then, rather than cutting planned expenditures, laying-off employees and reducing services, public officials are likely to use an optimistic revenue forecast and produce a balanced budget "on paper"(Larkey and Smith 1984, 1989). Painful cuts in service are postponed and, after all, economic circumstances might improve. Also, new opportunities to cut or postpone expenses may arise during the budget period.

Conversely, as the fiscal situation facing a community improves from point E, a revenue forecast can be increasingly conservative without risking cuts from current service levels. As a result, revenue forecasts are expected to be even more conservative.

The monotonic relationship between fiscal stress and the conservativeness of revenue forecasts probably only holds within a certain zone. Booming communities with rapid tax base growth have less need for the safety stock of funds provided by conservative forecasts. This is reflected by less conservative revenue forecasts beyond point F in Figure 1. At the other extreme, in sufficently grim fiscal circumstances the strategy of balancing the budget on paper is no longer viable. Such cases occur when local governments become insolvent and their officials are unable to deal with severe cutbacks. In such a situation fiscal management may be taken over by some external body, as was the case with Clairton, Pennsylvania in our data sample. The purpose of external management is to implement tough fiscal policies, including unbiased or slightly conservative revenue forecasts.

The curve in Figure 1 is drawn for some given level of uncertainty about future revenues. As uncertainty about future revenues increases, the tendency toward biased revenue forecasts is anticipated to increase as well. This would be reflected by an upward vertical movement in the curve as uncertainty about future revenues increases.

Large revenue sources, such as the property and income taxes, often have less noise and uncertainty associated with them. They are also carefully monitored by interest groups. Thus, we would anticipate less need and ability to bias revenue forecasts for these sources. Smaller revenue sources, such as investement on earnings and various specialty taxes are much noisier and less closely monitored by interest groups and so ought to be more heavily biased.

A final factor in using revenue forecasts to manage uncertainty is the possibility of using positive fund balances from prior years to offset unanticipated deficits. A positive fund balance decreases the need to bias revenues downward in fiscally non-stressed governments. Fiscally-stressed governments tend to have zero or negative fund balances, the latter of which tends to exacerbate the

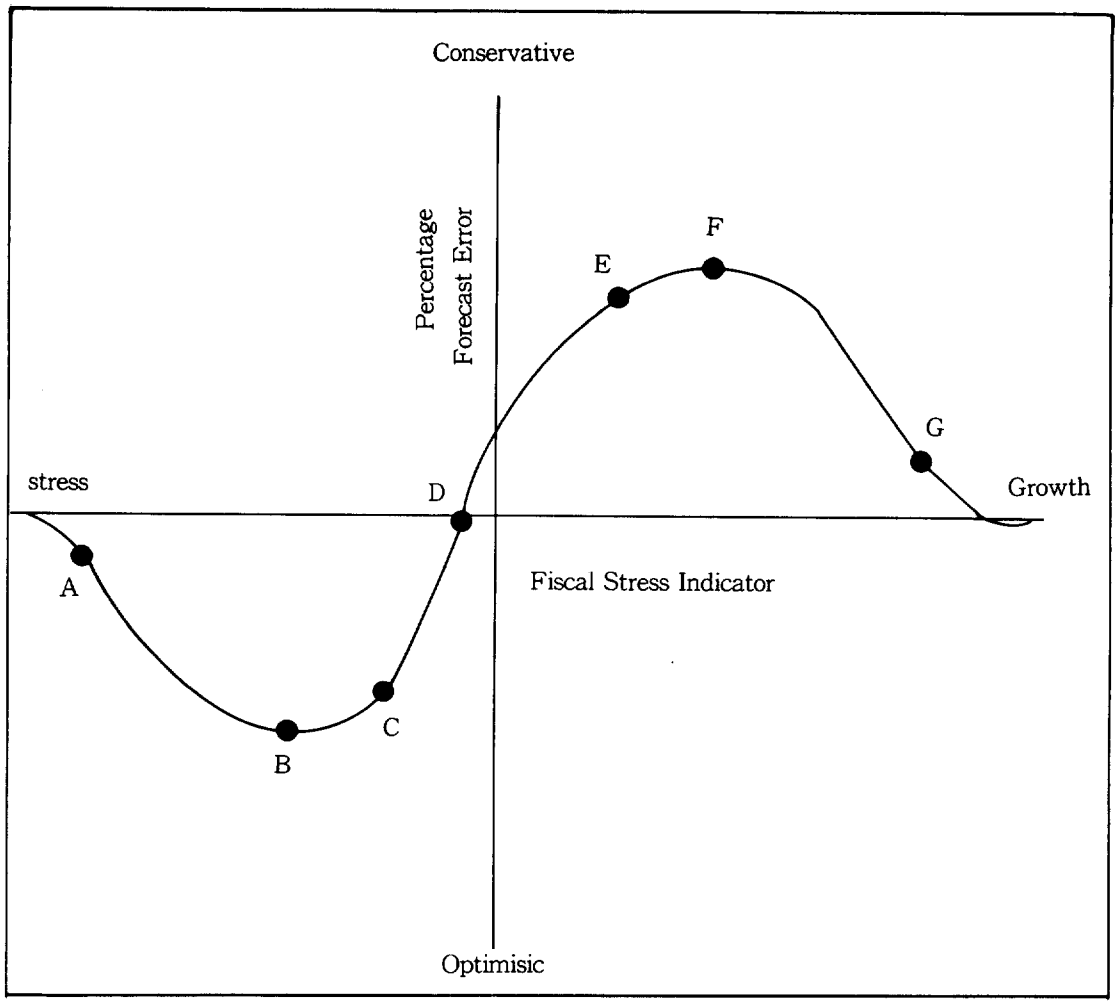

Figure 1. Conjectured Relationship of Revenue Forecast Bias Versus fiscal Stress

need to forecast optimistically.

2. Organizational Influenese

Economies of scale cause the larger local governments(in a class such as school districts) to have proportionally smaller fixed costs than the smaller ones. Thus larger local governments tend to have proportionally more discretionary spending which can be cut back if there is a revenue shortfall.[3)]

3) This, like the fund balance, is a substitute for conservative forecasting.

In addition, larger governments have more staff and highly trained staff, computer facilities, other resoures that can contribute to increased revenue forecast accuracy and reduced uncertainty. Lastly, larger local governments, by definition, have revenues aggregated over more individual transactions and economic entities, thereby reducing underlying unecertainty in revenue time series. The effect of increasing scale is, therefore, to reduce the need for conservative forecasting bias.

A factor important for local governments is the experience and level of sophistication of their forecasters, which can have wide variations. We argue that the experienced forecasters will be more accurate and overall slightly more conservatively biased than inexperienced forecasters.

3. Political Influences

A biased forecast can be a tool for meeting political ends. If any party or ideology dominates in a governmènt, then forecast errors in either direchtion can increase. For example, to reduce spending conservatives may under-forecast; to avoid a tax increase they may over-forecast to narrow the perceived revenue gap. Liberals will oppose with under-and over-forecasts respectively. If there is a dominating party, its biases will generally prevail(Bretschneider et al. 1989, Cassidy et al. 1989).

Government financing follows a cycle that periodically requires tax rate or base increases. In years that officials seek a tax rate increase, they have an incentive to bias forecasts downward to accentuate the revenue gap and maximize the rete increase. Lastly, in election years proponents of " political cycle" theory suggest that politicans will avoid tax increases. One way to accomplish this is to forecast optimistically.

Ⅲ. Data

We investigate forecast biases for earned income tax receipts, property tax revenues, an aggregate of all "other" local revenue sources, and the total local revenue sources of the 42 school districts in Allegheny Conty, Pennsylvania, excluding the large city of Pittsburgh school district. The property tax is the largest component of total local taxes, making up about 70% of the total. The income tax and other category each roughly make up half of the remainder. We collected five years (1982-1986) of annual tax revenue collections data and corresponding one-year-ahead forecasts used in budgeting. Thus the data set allows the computation of 210 forecast errors per revenue stream.

All school districts in Pennsylvania use the same chart of accounts for revenues and expenditures,

and report data in a common format to the state in audited annual finacial reports. Thus there is a good deal of consistency and accuracy in these data across school districts and over time. We obtained these financial reports form the Pennsylvania Department of Education.

In addition, we collected the corresponding five year's data on business managers' experience on the job and the number of students in each school district. One more variable for this study is the political party composition of school district board members. A school board consists of nine members and each member has a four year term. There is an election in odd years for either four or five out of nine members. For instance, in 1989, four new board members were elected in each district. We use the political party composition of 1989 as an indicator of the ideology of a school district, as this is likely to be stable over time.[4)]

The values for this variable range from −1, if all four elected members were Democrats, by increments of 0.25 to 1, if all four were Republicans.

Ⅳ. Models

1. Weak Rationality

Panel data, such as used in this paper, can have large scale differences across organizational units. The test of weak rationality for such data cannot, therefore, be based on the level of revenue data, but needs to use dimensionless or scaled quantities. Since it is quite common to investigate the performance of annual economic forecasts using percentage changes(e.g., Nelson 1984, McNees 1 988), We use the following percentage change model specification:

$$R'_t=\beta_0+\beta_1 \cdot R^{f\prime}{}_t+\varepsilon_t$$

Where

R_t=actual revenue collected during time t,

$R'_t=100(R_t-R_{t-1},$

R^f_t=revenue forecast for time t made at t−1,

$R^{f\prime}{}_t=100(R^f_t-R^f_{t-1}) / R^f_{t-1}$, and

β_0, β_1, ε_t are the usual parameters and normal error term.

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4) The data were obtained from the Pittsburgh Press, November 8, 1989.

2. Managerial Rationality

The school district data set we collected has several measures for factors discussed in Section Ⅱ. The dependent variable, like that of the weak rationality model, is a dimensionless quantity, the percentage forecast error:

$$PE_t=100(R_t-R'_t)/R_t.$$

Positive values of this quantity signify conservative forecasts.

Included in this study are two continuous measures of fiscal stress for the horizontal axis of Figure 1. One is TREND, which is the average of the last two percentage changes, R'_{t-1} and R'_{t-2}, given that t is in the forecast period. This is a measure of the change in nominal tax collections and it has a range over negative values up to small positive values for stressed school districts, and larger positive values for healthy and growth districts. FUNDBAL, the second firscal stress variable, is computed as the fund balance divided by total local revenue collections. It too ranges from negative values, for stressed districts with unbalanced budgets, to positive values for healthy districts. In Allegheny County, during the study period we expect to observe biasing behavior over the domain from very high stress to healthy growth(A to E in Figure 1), but not boom-town growth (E to G). We thus need to introduce nonlinear functions of TREND and FUNDBAL, but limit them to quadratics in this study sine such a function can accommodate stress behavior over the scope of our data. We expect the linear and squared term coefficients of these functions to both be positive.

Lee(1990) provides evidence that a major source of variation in local government revenue time series is discrete economic and other events in local economies that cause discontinuities and times series pattern changes. For example, steel mill closings lead to step down changes in levels and reductions in time trend slopes. Generally, the larger sample sizes are for estimating time series trends, the more accurate are forecasts(Makridakis and Hibon 1979). However, pattern changes in the data invalidate this relationship as data prior to a pattern change may no longer be relevant for forecasting. Hence we introduce STABILITY, the number of years in the historical data of a forecast since the most recent pattern change.

The school district data set includes an additional ten year's revenue collections data(1972—1981), permitting implementation of this variable. Following Lee(1990), we use a set of objective rules to identify pattern changes. These are based on threshold values for absolute percentage changes

computed from counterfactual forecasts. If an absolute percentage forecast error exceeds 20% for the "other" revenue category or 10% for the income tax revenue, then the rules indicate that a pattern change has occurred. The property tax change variable has no pattern changes in our sample. The expected sign for STABILITY is negative since as it increases there is a longer relevant history to use for extrapolation purposes. This has the effect of reducing conservative bias needs and is a force in the direction of optimistic forecasts.

Another measure of discrete changes is RATECHNG. The income tax rarely has rate changes and the "other" and "total revenue" aggregate variables have no convenient measures of rate changes. Thus the property tax is the only source having values for this variable in our sample. RATECHNG is a binary variable taking the value one in forecast periods having a property tax millage increase exceeding three mills.[5] It's expected sign is positive since officials are likely to bias forecast conservatively to widen revenue-expenditure gaps to make the case for a substantial tax rate increase.

Two measures directly correspond to the factors discussed in section Ⅱ.B on organizational influences. ENROLLMENT, a measure of school size, is the number of students enrolled in a school district each year. The expected sign for this variable, as discussed earlier, is negative, with a tendency to reduce conservative forecasting. EXPERIENCE is the number of years a business manager has in his / her current position. We speculate that the seasoned manager will forecast accurately but then bias conservatively, so that the sign of this variable's coefficient should be positive.

The data collected have two measures for political influences. ELECTION is a binary variable taking the value one during the election years of 1983 and 1985 in the sample. We expect optimistic forecasting in these years to avoid tax increases, so the coefficient of this variable should be negative. PARTY is the indicator variable of party explained in section Ⅲ, ranging from -1 for all democrats elected to 1 for all republicans.

Lastly, inertial forces of an organizational nature may exist, in which case we could expect serial correlation. In addition, if significant serial correlation exists, then we have an added test of "economic rationality" while correcting for "managerial rationality" factors. Hence we have added a first order term, $LAGPE_t = PE_{t-1}$ as an independent variable.

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5) Some school districts seek a small increase every year, generally less than three mills. Others, of interest here, wait until there is a need for a large increase, generally in exess of three mills.

V. Results

1. Weak Rationality

Table 1 contains descriptive statistics for the dependent variable of this study, revenue forecast percentage error. This table shows, overall, that the income tax is slightly optimistically biased, but not significantly so, with a mean percentage forecast error(MPE) of −0.90%; the " others" category, which has a great deal of randomness, has a conservative bias of 10.02%; the property tax, with low randomness, has a significant optimistic bias of −0.66%; and total local tax has a slight, but significant conservative bias of 1.01%. These statistics, along with further results on weak rationality below provide an indication of systematic biases.

Table 1
Descriptive Statistics: Percentage Forecast Errors(n=210)

Revenue Source	Mean	t-ratio	Std.Dev.	Minimum	Maximum
Income Tax	−0.90	−1.28	10.20	−37.62	34.65
"Other" Taxes	10.02	6.24***	24.19	−146.18	82.41
Property Tax	−0.66	−3.68***	2.58	−9.96	13.19
Total Local	1.01	3.18***	4.58	−17.33	31.51

Significance levels: *=10%, **=5%, ***=1%

The results on weak rationality in Table 2 contribute additional evidence on overall biasing. The F-tests on the joint hypothesis that the intercept is zero and slope one are all significant, indicating that the forecasts are not weakly rational.

In terms of biases, the property tax estimates, with a negative intercept and slope less than one, are optimistic throughout the experienced range of forecasted changes. This is perhaps because many property owners contest property reassessments, and adjustment boards reduce assessments in many such cases. Forecasters tend not to take this potential loss of tax base into account. The other three regressions predict conservative forecasts for all but the larger forecasted changes, which, quite naturally, are optimistic. Unusually large forecasts can be expected to be too large relative to correspond ing realized valuess. The estimated income tax line crosses the weak ration-

Table 2
Weak Rationality Estimates(n=168)
(t-statistics in parenthesis).
Dependent Variable: Actual Percentage Change

Revenue	Income	Others	Property	Local
Intercept	1.77*** (4.34)	13.83*** (3.74)	−0.14*** (20.46)	2.40*** (10.09)
Forecasted Percentage Change	0.22*** (4.34)	0.59*** (3.74)	0.90*** (20.46)	0.70*** (10.09)
Dep. Var. Mean	2.41	9.91	5.04	4.94
Adj. R^2	0.10	0.07	0.72	0.38
F-Value	19.0	14.0	418.6	101.8
Prob.>F	0.0001	0.0003	0.0001	0.0001
F-value, Joint 0 intercept, 1 slope	117.6	13.1	7.4	14.4
Prob.>F	0.0001	0.0001	0.0001	0.0001

Significance levels: *=10%, **=5%, ***=1%

ality line (with zero intercept and slope one) at a 2.3% forecasted annual increase, the "others" revenue category at a 33.7% increase, and the total local at a 8.0% increase. These results are consistent with the amount of uncertainty in the various revenue source time series, with the " others" category having the most uncertainty.

Thus there is evidence of a slight, but significant overall conservative bias, as predicted by many researchers in this area. The next task is to see if the posited behavior on managerial rationality is evidenced in multiple regression estimates.

2. Managerial Rationality: OLS Estimates

Table 3 contains descriptive statistics for the independent variables of the managerial rationality model. The sample size is 168 instead of the original 210 because 42 data points were lost in computing the LAGPE variable. Note that the stress variables, TREND and FUNDBAL, have substantial variation on the negative side. Also of interest is that the average value of STABILITY ranges from 2.88 to 5.60 years for the various revenue sources, with a range of zero to fourteen years. Thus there is a high level of uncertainty in the revenue data caused by pattern changes.

Table 3
Descriptive Statistics for Independent Variables:
Managerial Rationality (n=168).

Variable	Mean	Std Dev	Minimum	Maximum
STABILITY	2.88	2.37	0.00	12.00
(Income)				
(Others)	2.18	1.82	0.00	9.00
(Property)	5.60	3.91	0.00	14.00
(Local)	5.72	4.02	0.00	14.00
RATECHNG	0.40	0.49	0.00	1.00
TREND	5.92	4.54	−18.70	22.71
$TREND^2$	55.56	73.06	0.02	515.74
FUNDBAL	0.07	0.13	−0.29	0.69
$FUNDBAL^2$	0.02	0.06	0.00	0.48
ENROLLMENT	3155	1727	840	8751
EXPERIENCE	5.21	6.51	0.00	33.00
ELECTION	0.40	0.49	0.00	1.00
PARTY	−0.11	0.35	−0.75	0.75

Table 4 contains corresponding OLS estimates for the three componet and total local revenue sources. Results in this table for the overall F-test show all four regressions to be significant at conventional levels, indicating that, as expected, strong rationality is not achieved.

The TREND and $TREND^2$ variables have significant coefficients for some of the component revenue sources; however, the interesting result is for total local revenues where both variables have significant and positive coefficents as expected. To interpret the latter result, in Figure 2 we graph the estimated model over the observed range of values for TREND using mean values for all other variables. Evidently school district officials in Allegheny County have biased their forecasts as predicted for fiscal stress and normal conditions with the full left half of Figure 1 represented. FUNDBAL, however, has only its linear component significant. It has the expected sign for Allegheny County, however, showing evidence of optimistic and then conservative behavior as fiscal stress is reduced.

STABILITY is significant only for the "others" category of revenues. It has the predicted negative sign, indicating that the more relevant historical data available, the more accurate are forecasts and less need to bias conservatively. The "others" category is the one most likely affected by STABILITY since it is extremely volatile. RATECHNG is also significant and has the correct sign for the property tax(the only tax in this sample which has rate changes), providing evidence that

Table 4

Managerial Rationality Model: OLS Estimates (n=168).

Dependent Variable: Percentage Forecast Error

Revenue	Income	Others	Property	Local
Intercept	−4.04*	14.69**	−2.25**	−2.73**
	(−1.95)	(2.67)	(−2.74)	(−2.46)
LAGPE	0.333***	0.028	0.159**	0.097
	(4.71)	(0.39)	(2.09)	(1.44)
STABILITY	0.13	−2.61**	0.02	0.10
	(0.50)	(−2.80)	(0.27)	(1.08)
RATECHNG			0.84*	
			(1.95)	
TREND	0.29	1.38**	0.14**	0.37***
	(1.49)	(3.40)	(2.35)	(4.44)
TREND^2	0.00818	0.057*	0.0009	0.0296***
	(0.63)	(1.89)	(0.023)	(5.08)
FUNDBAL	−3.39	33.02*	6.30**	8.12**
	(−0.45)	(1.84)	(2.65)	(2.39)
FUNDBAL^2	44.89**	42.00	−13.13**	2.89
	(2.78)	(1.13)	(−2.59)	(0.40)
ENROLLMENT	−0.0002	−0.0044***	0.0005	−0.00046**
	(−0.47)	(−4.46)	(0.40)	(−2.41)
EXPERIENCE	0.076	0.776**	−0.015	0.084*
	(0.73)	(3.16)	(−0.44)	(1.68)
ELECTION	1.94	−1.90	0.34	0.19
	(1.50)	(−0.63)	(0.84)	(0.34)
PARTY	1.97	4.93	−0.21	−0.76
	(1.02)	(1.05)	(−0.35)	(−0.87)
Kendall's Corr.	0.39***	0.44***	0.29****	0.43***
Adj. R^2	0.28	0.35	0.10	0.44
F-Value	7.49	9.83	2.65	13.77
Prob. >F	0.0001	0.0001	0.004	0.0001
K-S Normality Test	0.057	0.091***	0.143***	0.042

Significance levels: *=10%, **=5%, ***=1%

officials bias revenues more conservatively to widen the revenue-expenditures gap when seeking to obtain tax rate increases.

Only the "others" revenue and the total revenue categories have significant results for the two organizational variables. Both of these variables have negetive coefficients for ENROLLMENT,

indicating that the larger the school district the less tendency to bias conservatively, as expected. Both of these reveue sources have a tendency for EXPERIENCE to increase conservative biases, also as expected. The political influence variables are not significant in the conditional mean forecast model.

Lastly, the lag dependent variable, LAGPE, is positive and significant for the two major revenue sources, the property and income taxes, as predicted. This is further evidence rejecting strong rationality for school district revenue forecasts.

3. Managerial Rationality: LAD Estimates

Use of OLS estimation was augmented by the use of least absolute deviation(LAD) regression because of the latter's robust properties in the presence of outliers. LAD estimates provide conditional median percent forecast errors. One major difference between these two approaches is in their assumptions about the distribution from which the model population is drawn(Bassett and Koenker 1978). Typically, it is assumed that the model error distribution is normal in order to derive the appropriate hypothesis tests for OLS estimates. This assumption is not necessary, however, to derive tests for LAD estimates, which are based on asymptotic large sample theory(Bassett and Koenker 1978, Dielman and Pfaffenberger 1982). Simulation studies suggest that sample sizes of 100 should be sufficient to obtain large sample conditions(Dielman and Pfaffenberger, 1988).

Table 5 contains LAD estimates for the managerial rationality model. The results are qualitatively the same as those obtained from the OLS estimates with few exceptions. Only six out of forty-five estimated coefficients have sign reversals, and only three of these are statistically significant in one of the two models. No inconsistencies with postulated theories arise. The LAD estimates tend to be smaller in absolute magnitude than the OLS estimates. This was expected since medians are less extreme than means in the presence of outliers bounded below by zero.

The LAD parameter estimates, as expected, are generally more efficient than those from OLS, thereby increasing significance levels of the individual parameter t-tests. Indeed, the political variables, which have insignificant OLS parameter estimates, become significant with LAD and have the expected signs. Income, property tax, and total local revenues are estimated more conservatively in election years. We speculate that the "others" category is dominated by managerial attention to buffer conservatively against its high uncertainty, and so is not significant here. Also, for the same revenue sources, democrats bias forecasts optimistically and republicans conservatively. This suggests that school districts dominated by liberal ideology attempt to increase spending whereas coservatively-minded districts try to decrease it, each kind by biasing forecasts in the appropriate,

Table 5

Managerial Rationality Model: LAD Estimates (n=168).

Dependent Variable: Percentage Forecast Error

Revenue	Income	Others	Property	Local
Intercept	−3.35**	5.98	−2.04***	−2.56***
	(−3.12)	(1.62)	(−4.26)	(−5.61)
LAGPE	0.44***	0.27***	0.26***	0.37***
	(11.88)	(5.52)	(5.75)	(13.32)
STABILITY	0.05	−1.58**	−0.02	0.03
	(0.38)	(−2.52)	(0.44)	(1.83)
RATECHNG			0.47*	
			(1.89)	
TREND	0.17*	1.35***	0.05	0.23***
	(1.65)	(4.44)	(1.52)	(6.59)
$TREND^2$	0.02***	0.05**	0.0032	0.02***
	(3.63)	(2.52)	(1.36)	(6.50)
FUNDBAL	3.75	14.01	8.30***	−0.38
	(0.96)	(1.16)	(5.99)	(−0.27)
$FUNDBAL^2$	34.71***	49.08**	−10.78***	16.92***
	(4.13)	(1.97)	(−3.64)	(5.76)
ENROLLMENT	−0.0003	−0.003***	0.0002*	−0.0005
	(−1.51)	(−3.84)	(1.95)	(0.65)
EXPERIENCE	0.14**	0.67***	0.02	0.07***
	(2.56)	(4.05)	(0.83)	(3.46)
ELECTION	1.68*	−0.03	0.37*	0.53**
	(2.49)	(−0.02)	(1.54)	(2.26)
PARTY	3.49***	0.36	0.65*	1.03**
	(3.47)	(0.11)	(1.81)	(2.85)
Kendall's Corr.	0.38***	0.47***	0.33****	0.46***

Significance levels: *=10%, **=5%, ***=1%

opposite direction.

The results for the stress variables also support the theory illustrated in Figure 1. Plots of estimated models for the income, "Others," and total local revenues taxes analogous to Figure 2 all have the same general shape as in that figure.

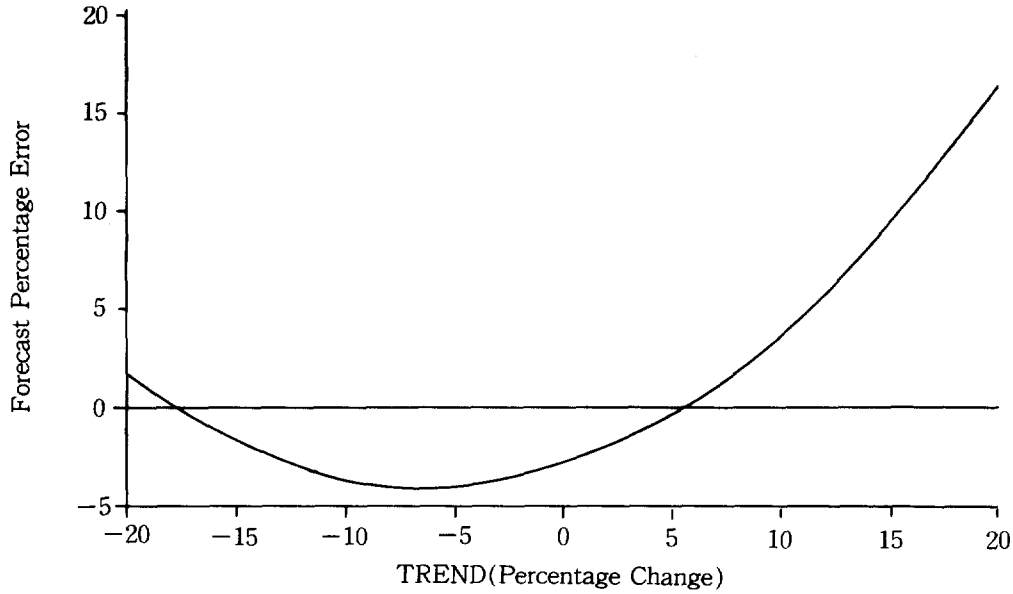

Figure 2. Estimated Mean Revenue Forecast Bias Versus the TREND Indicator of Fiscal Stress.

Ⅵ. Conclusion

School district budget forecasters bias their revenue forecasts. This paper has demonstrated that biases are in opposite directions for fiscally stressed versus healthy school districts. The former balance their budgets "on paper" by over-forecasting and the latter protect themselves against uncertainty by under-forecasting. The greater the degree of uncertainty, the greater the tendency to forecast conservatively. The large local revenue sources, like the property and income taxes, have low uncertainty and low biases, whereas the "others" category with highly erratic components like earnings on investments and mercantile taxes have large conservative biases. The overall result is a slightly conservative bias for total local revenues. Seasoned budget forecasters tend to be more conservative in their forecasts. Large school districts have more sophistication, more highly aggregated and therefore less uncertain revenues, more discretionary funds, and thus less need to conservatively bias their forecasts.

Strong rationality, as a concept, presumes that the goal of revenue forecasting is to obtain the most accurate forecast. This paper has demonstrated that other goals are more likely operative in

local governments, ones that serve the needs of managers and politicians and lead to the desirability, from their perspective, of biased forecasts.

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〈國文抄錄〉

政府의 稅入豫算에 대한 偏見

李 英 姬

이 논문은 美國 小地方政府인 教育自治區(school district)의 稅入豫測이 "經濟的 合理性"을 띠고 있는지 관하여 經驗的 分析을 통하여 검토하여 보았다. 豫算의 豫測은 中央政府 또는 모든 地方政府들에게 가장 중요한 업무로서 한 회기년도 중 상당히 많은 부분을 다음 會期年度의 세입예측을 위하여 시간을 보낸다.

지난 몇년간에 걸쳐 이 분야에 대한 흥미가 높아가고 있는데 우선 관심은 예산을 정할 때 과연 모든 객관적인 자료를 사용하여 "最適(optimal)"의 예산치를 정하는가에 있고 그 다음으로는 豫算値가 政治的인 偏見에 의하여 정하여 지는가하는 의혹심에 있다. 일부 학자들이 주장하기를 관료들은 미래의 불확성에 비례하여 세입예측을 保守的으로 하는 경향이 있다고 한다. 그러나 일부 학자들은 이와는 대조적으로 예산측에 있어 체계적인 保守性이 있다고 증명할 수 없다고 주장하기도 한다.

따라서 본 논문은 "弱 經濟的 合理性(weak economic rationality)"과 "強 經濟的 合理性(strong economic rationality)" 개념을 도입하여 예산편성과정에 있어서 體系的인 偏見이 존재하고 있는가? 또한 존재한다면 어떠한 편견인가를 분석하는데 연구의 촛점을 맞추었다.

이 논문의 분석을 위하여 펜실베니아주에 있는 42개의 교육자치구를 중심으로 所得稅, 財産稅, 그 이외의 稅目 그리고 總 地方政府稅入 항목 모두의 실제 징수액과 1년전 관료들의 예측값을 5년동안 수입하여 사용하였다.