

## ***FEDERAL FUNDS AND TEXAS STATE EXPENDITURES: SOME PRELIMINARY RESULTS***

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### **INTRODUCTION**

Fiscal federalism in the U.S. implies that a higher level of government would provide grants to their respective lower levels of government. This implies that state governments in the U.S. would be entitled to receive grants from the federal government. Further, local governments would be entitled to receive grants from both the federal government and their respective state governments.

Government size in the United States has grown rapidly since the 1930's, especially since the World War II. Further, this trend has continued to the present and is expected to continue in the future. This phenomenal growth is observed at all levels of government within its federalist structure. But in the 1980's, concern arose over the volume of spending and the resulting deficits at different levels of government. The federal government is reporting to have large budgetary deficits in recent years. Similar budgetary problems are experienced many state and local governments as well.

As these state and local governments fall into bigger holes, under fiscal federalism, the state and local governments would be expecting the federal government to provide greater financial assistance and support in terms of federal grants to these governments. Since federal budget itself is having serious deficits, it is doubtful how generous the federal government could be in extending a helping hand to the state and local governments. In this context, a critical look at the relationship between federal fund transfers and the level of state and local government expenditures would be timely and insightful for public policy purposes. Accordingly, this paper would examine such a relationship within the context of federal fund transfers and its impact on state expenditures with particular reference to the state of Texas.

### **THE THEORETICAL FRAMEWORK**

Various theoretical explanations have been provided by researchers towards a better understanding of the growth of government in the U.S. and other countries. One of the explanations of the government growth has been the well-known Wagner's law, which states that the government sector has a tendency to grow at a faster rate than the growth of the economy (Wagner, 1893). Thus, the Wagner's law could provide a basic framework within which one can explain the growth of real Texas state expenditures (Henrekson, 1990 and Islam (2001a; 2001b). In this formulation, real state expenditures per capita (e) in Texas would be used as the dependent variable and the real gross state product per capita (y) in Texas as the explanatory variable, the latter variable being expected to have a positive impact on the former. Further, It is also expected that real federal fund transfers per capita (f) would have a positive influence on real Texas state expenditures per capita. The general form of the relationship between e as the dependent variable with y and f as

two explanatory variables is specified as follows:

$$(1) \quad e = f(y, f)$$

Since Wagner's hypothesis does not specify any specific functional form of this relationship, this study proposes to use a log-linear functional form because of it has two advantages over a linear specification. Firstly, the coefficients in this form can be interpreted directly as elasticity values (Islam 2001a; Islam 2001b; Henrekson, 1990; and Maddala, 1992). Secondly, this formulation may reduce the problem of heteroskedasticity in the data (see Maddala, 1992; and Khan, Rahman and Islam, 1997). Using a log-linear functional form and using  $t$  as the time subscript and adding a random error term  $w$ , equation (1) can be rewritten as:

$$(2) \quad e_t = a y_t^b f_t^c w_t$$

where  $a$ ,  $b$ , and  $c$  are the unknown parameters to be estimated. Taking logarithms on both sides, the following equation is obtained:

$$(3) \quad \ln e_t = \ln a + b \ln y_t + c \ln f_t + \ln w_t$$

In the lg-linear specification above, the coefficients  $b$ , and  $c$  are to be interpreted as the respective elasticity parameters. Two testable hypotheses follow from equation (3):

**Hypothesis 1:** Wagner=s Law is supported if the elasticity coefficient  $>b=$  exceeds zero ( $b > 0$ ). **Hypothesis 2:** Federal Funds have positive impact on state expenditures if the elasticity coefficient  $>c=$  exceeds zero:  $c > 0$

## THE EMPIRICAL FRAMEWORK

A simple multivariate log-linear regression analysis will be utilized to estimate equation (3) above. Since the data series involves annual time series data, the data may suffer from serious autocorrelation (time dependence of the error term), which may seriously bias the coefficient estimates. The paper will test for the presence for autocorrelation using the Durbin-Watson test. If this problem is found to exist based on this test, an appropriate correction will be made to overcome this problem so that estimated coefficients are free of autocorrelation problem. In this situation, multivariate linear regression will still be applied but with appropriate correction for autocorrelation.

## DATA AND VARIABLES

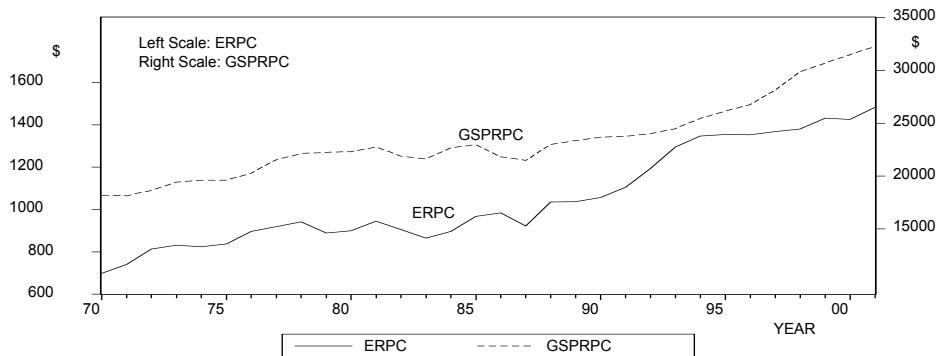
The dependent variable ( $e$ ) in equation (3) will be measured by LERPC which is the natural logarithm of real Texas state expenditures per capita. The first explanatory variable ( $y$ ) will be measured by LGSPRPC, which stands for the natural logarithm of real Gross State Product (GSP) per capita. Finally, the second explanatory variable ( $f$ ) will be measured by LFFRPC, which is the natural logarithm of real federal fund transfers to the state of Texas per capita. The letter  $>L=$  at the beginning of each variable stands for natural logarithm. The data is collected from the State of Texas: Revenue and Expenditure History, which was obtained from the office of the Controller of Public Accounts, the State of Texas, Austin, Texas, various issues. The time period covered is from 1970 to 2001 with annual frequency.

### SOME PRIMINARY EMPIRICAL RESULTS

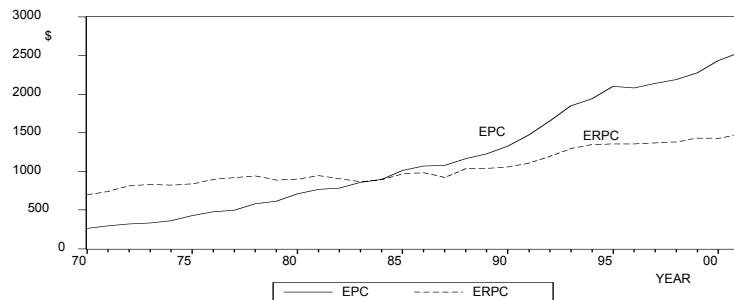
Figure 1 shows the trend in both nominal and real Texas state expenditures per capita from 1970 to 2001. The nominal one is represented by the variable EPC and real variable by the ERPC. Both curves have grown significantly over the years. The nominal per capita state expenditures (EPC) has increased from 262 dollars in 1970 to 2,536 dollars per head in 2001, an increase of 868% over the entire 31-year period covered in the sample period with an average growth rate of 27.99% per year.

Figure 2 shows the relationship over time between real state expenditures per capita (ERPC) and the real Texas state GSP per capita (GSPRPC) from 1970 to 2001. The relationship appears to be positive, which is in consistency with the Wagner's law of expanding state expenditures with the progress of the state economic activities as reflected by the Texas GSPRPC (hypothesis #1). Similar positive relationship is depicted by real Texas state expenditures per capita (ERPC) and real federal fund transfers per capita (FFRPC) over this period in Figure 3, lending preliminary support to our second hypothesis discussed earlier, i.e. federal funds tend to have a positive impact on state expenditures (hypothesis #2).

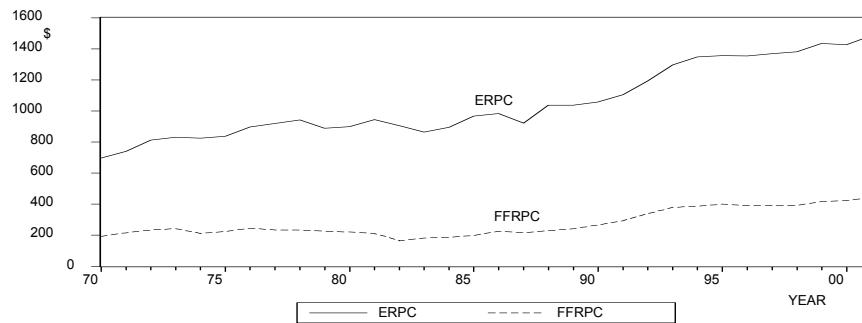
**Figure 1  
Nominal and Real State Expenditures Per Capita: 1970 - 2001**



**Figure 2:  
Real State Expenditures and Real Gross State Product Per Capita: 1970 - 2001**



**Figure 3**  
**Real State Expenditures and Federal Funds Per Capita: 1970 – 2001**



The two hypotheses were also tested using a multivariate log-linear regression analysis. The regression model was initially estimated in standard form without correction for autocorrelation and then the estimated residuals were tested for the presence of autocorrelation using the Durbin-Watson (D-W) test statistic. The D-W test indicated the presence of serial correlation in the data. As a result, the regression coefficients from the preliminary regression (not reported here to save space) were deemed to be unsatisfactory. To overcome the presence of autocorrelation, the regression model was re-estimated using the AR1 process with appropriate correction for first order autocorrelation. These regression results with LERPC as the dependent variable and GSPPRC and FFRPC as explanatory variables are shown in Table 1. As can be seen here, the coefficient of the AR1 term is highly significant, indicating that the original data has significant autocorrelation, which were corrected by inclusion of this term in this regression. Thus, the regression results reported in this table are free from autocorrelation biases. This is also evident from the fact that the D-W test statistic in this regression is 2.08, which clearly indicate that the autocorrelation problem has been successfully resolved.

**Table 1**  
**Standard Regression Results with Correction for Autocorrelation**

<b>Variable</b>	<b>Coefficient</b>	<b>Std. Error</b>	<b>t-Statistic</b>	<b>Probability</b>
CONSTANT	-1.515222	1.345991	-1.125730	0.2702
LGSPRPC	0.677828	0.148186	4.574174	0.0001
LFFRPC	0.296121	0.064092	4.620208	0.0001
AR(1)	0.723212	0.118606	6.097624	0.0000
R-squared	0.980515	Mean dependent var	6.947230	
Adjusted R-squared	0.978350	S.D. dependent var	0.207566	
S.E. of regression	0.030541	Akaike info criterion	-6.857458	
Sum squared resid	0.025184	Schwarz criterion	-6.672428	
Log likelihood	66.30351	F-statistic	452.8977	
Durbin-Watson stat	2.081943	Prob(F-statistic)	0.000000	
Inverted AR Roots	0.720000			

In addition, it can be noted here that the regression results are quite strong as shown by the adjusted  $R^2$  value of 0.99, indicating that about 98% of the variation in the dependent variable is explained by the two explanatory variables included in the empirical model. Further, the overall regression as judged by the estimated F-value of 452.89 is also quite high, indicating that the overall regression is highly statistically significant at better than 1% level. Thus, it is evident from the above discussion that the regression results reported in Table 1 are quite satisfactory in terms of usual statistical and econometric criterion.

It is now time to discuss the sign, magnitude, and statistical significance of the individual regression coefficients in order to shed light on the two hypotheses being tested in this paper. The elasticity coefficient with respect to the LGSPRPC variable is found to be about 0.68. With a t-value of 4.57, this coefficient is positive as expected and is highly statistically significant at better than 1% level, thus lending strong support to the Wagner's law for Texas (hypothesis #1). These results on Wagner's law for Texas are in consistency with the empirical findings by other researchers such as Henrekson (1990), Islam (2001a, 2001b), and Ram (1987).

However, the main relationship examined in this paper is the possible impact of federal funds on state expenditures. The elasticity coefficient with respect to the LFFRC variable is found to be about 0.30. With a t-value of 6.09, this coefficient is positive as expected and is highly significant at better than 1% level, thus lending strong support to the other hypothesis, i.e. the federal funds have a strong tendency to exert an encouraging and expanding influence on state expenditures in Texas.

### **CONCLUDING REMARKS**

The paper empirically tested for the validity of the Wagner's law and the possible impact of federal fund transfers on state expenditures using a multivariate log-linear regression model with appropriate correction for autocorrelation. The data period covered from 1970 to 2001, a 31-year sample period for the state of Texas. The overall regression result was found to be quite satisfactory using the usual statistical and econometric criterion. In terms of the two hypotheses tested, the regression results provided strong supports to both hypotheses. A la Wagner's law, the Per Capita Real GSP was found to have a strong positive effect on real Texas state expenditures per capita. The results also provided strong support to the other hypothesis, i.e. the transfers of federal funds on a real per capita basis have a strong positive effect on real Texas government expenditures per capita. Thus, federal funds have a tendency to encourage expansion of state expenditures, which happens over and above and independent of the positive influence of expanding state economic growth.

The results reported in this paper are only preliminary nature and may not be highly reliable. This is because more sophisticated and advanced econometric tests were not applied in this paper. More advanced research requires the application of sophisticated econometric tests such as the application of using unit root tests to detect the non-stationarity in the time-series data and the application cointegration analysis in case the data shows strong non-stationarity (time trends) based on unit root tests. These advanced tests were not performed in this paper. The author intends to conduct these more advanced tests in the near future.

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