CONVERGENCE OF STATE AND LOCAL FISCAL POLICIES: AN APPLICATION OF PANEL UNIT ROOT TESTS

Christopher N. Annala, State University of New York at Geneseo
Shuo Chen, State University of New York at Geneseo

ABSTRACT

This paper uses two panel unit root tests to show that state and local tax revenues and spending exhibit unconditional convergence between the forty-eight contiguous United States. Results from the Im, Pesaran, and Shin test and the Levin, Lin, and Chu test provide evidence that tax revenues and most government expenditure categories are stationary, implying convergence. The two categories for which we do not find evidence of unconditional convergence are public welfare expenditures and health and hospital expenditures.

INTRODUCTION

Conventional wisdom holds that States compete for economic activity through a variety of policies and initiatives; one such method of attracting economic activity is through fiscal competition or more specifically, tax-competition. For example, Tiebout (1956) demonstrates that fiscal policy decisions are based on the response of economic agents, as they are free to move between jurisdictions to find their most preferred combination of taxes and spending. Simple observation reveals that on a case-by-case basis State governments provide large tax incentives and tax holidays to individual firms to encourage either new plant location or relocation of existing plants from one State to another. States have also developed a system of Enterprise Zones as a means of fostering economic development. In a survey article Wasylenko (1997) concludes that based on the existing evidence taxes do not have a significant impact on economic activity among states. These results must be somewhat disconcerting to policymakers who generally propose lower taxes in an effort to encourage firms and industries to enter their jurisdictions. Reed (2008) provides evidence that several of these studies lacked the appropriate lag structure for the impact of taxes on economic growth.

This paper employs the Im, Pesaran, and Shin test (IPS) (1997, 2003) and the Levin, Lin, and Chu test (LLC) (2002) to study the stationarity of real per capita State and Local tax revenues and broad categories of public spending, among the United States. Research has shown that per capita incomes in the U.S. have been converging both in the long-run and over shorter time periods. Barro and Sala-i-Martin (1995) and Mankiw, Romer and Weil (1992) cover the

topic of income convergence in detail, providing evidence of both unconditional and conditional convergence. The empirical methodology employed by Barro and Sala-i-Martin (1995) and Mankiw, Romer, and Weil (1992) has been used in the public finance literature to demonstrate that under the condition that taxes/expenditures are a constant share of income the Solow (1956) model of economic growth leads to convergence of fiscal policies. Under conventional assumptions where taxes are assumed to be proportional to income, (i.e. $T = \tau Y$, where T represents total tax revenue, τ represents the tax rate, and Y represents income), then convergence of income leads to convergence of taxes. Barro's (1990) endogenous growth model further implies that a government would hold taxes/government spending as a constant share of output, under certain assumptions. The work of Annala (2003) builds on previous research by Scully (1991), where it is shown that convergence in income leads to convergence in fiscal policies. Skidmore, et al. (2004) employ the same empirical techniques, however the authors provide a more formal theoretical explanation for convergence in fiscal policies. Skidmore et al. argue that diminishing marginal returns to government spending leads to convergence of government spending across countries. That is, nations with higher levels of government spending in the past will have lower growth rates in current government spending.

Recent research provides evidence that state and local taxes and expenditures exhibit convergence using a traditional estimation approach, based on Baumol (1986) and Barro and Sala-i-Martin (1995), where the growth rate of taxes and spending are regressed on the initial tax level or the initial spending level. There is also evidence that the distribution of taxes and spending have grown smaller, based on declining coefficients of variation. Using this traditional estimation method, Annala (2003), Merriman and Skidmore (2001), and Skidmore, et al (2004) provide evidence of convergence in government spending among states and across countries. Coughlin, et. al. (2007) extend this line of research through the use of spatial econometrics and show that state expenditure growth is dependent on expenditure growth in economically and demographically similar states.

The contribution of this paper is to provide a more robust test of unconditional convergence in fiscal policies among the United States. Past studies that rely on cross-sectional analysis usually have small sample size, especially in time dimension. Using panel data increases sample size, but applying simple OLS regression technique to panel data can show spurious relations. An alternative to the conventional regression estimation is to employ unit root tests to determine whether or not data exhibit convergence. According to Bernard and Durlauf (1995) convergence exists if the long-run differences between one or more countries tend to zero as the time series tends to infinity, that is the time series is stationary. Rejection of the null hypothesis of a unit root provides evidence of convergence; i.e. the data is stationary. A significant advantage of using panel unit root tests as opposed to univariate ADF tests is that the use of a panel introduces cross-sectional heterogeneity, which increases the power of the unit root test. A second advantage is that some time series are relatively short, and by using a panel unit root test approach the number of observations can be increased dramatically, as it is well known that the

ADF test has low power with a short time series as pointed out by Shiller and Perron (1985). Panel unit root tests have recently been used in a variety of applications including Lee and Wu (2001), Straus (2000), Funk and Strauss (2000), Coakley and Fuertes (1997). However, there has not been any application of panel unit root tests to fiscal policy convergence.

The paper is organized as follows, the next section briefly describes the panel unit root tests used here, the third section describes the data and results, and the fourth section provides some concluding remarks.

PANEL UNIT ROOT TESTS

The following section provides a brief description of panel unit root tests, the Im Pesaran and Shin (IPS) test, the Levin, Lin and Chu (LLC) test. The IPS panel unit root test allows for individual unit root processes so that the autoregressive lag may vary across cross-sections. The equation to be estimated for each cross-section is given by equation (1). For consistency, notation in this section follows that of EViews 5 User's Guide, 2004, Quantitative Micro Software, LLC (see pages 518-525).

$$\Delta y_{i,t} = \alpha y_{i,t-1} + \sum_{j=1}^{p_i} \beta_{i,j} \Delta y_{i,t-j} + X'_{i,t}\delta + \varepsilon_{i,t} \qquad (1)$$

For each cross-sectional unit an ADF test is performed where the lag length is selected by the Schwarz Information Criteria. The test statistic is derived by taking the average of the individual t-statistics on α_i from the individual ADF regressions above and used to estimate equation (2).

$$t_{NT} = \frac{\sum_{i=1}^{N} t_{i\tau_i}(p_i)}{N} \qquad (2)$$

where t_i represent the individual ADF test statistics for each cross-section, with potentially varying autoregressive lags, (p_i). Im, Pesaran, and Shin (1997, 2003) calculate exact sample critical values for the test statistic for varying T and N. The null hypothesis of the IPS panel unit root test is that each series contains a unit root.

Im, Pesaran, and Shin (1997, 2003) show that a properly standardized t_{NT} has an asymptotic standard normal distribution and is represented by the IPS W-statistic. The IPS test has the null hypothesis that each individual time series in the panel has a unit root, against the alternative that all individual units taken as a panel are stationary.

The LLC test statistic also begins with the basic ADF estimation given by equation (1), however in this case it is assumed that the unit root process is common across all cross-sections with potentially varying AR lags. From the above estimation results the proxies $\Delta\bar{y}_{i,t}$ and $\bar{y}_{i,t}$ can be created using the following two equations (3) and (4):

$$\Delta\bar{y}_{i,t} = y_{i,t} - \sum_{j=1}^{p_i} \beta_{i,j} \Delta y_{i,t-j} - X'_{i,t}\delta \quad (3)$$

$$\bar{y}_{i,t-1} = y_{i,t-1} - \sum_{j=1}^{p_i} \beta_{i,j} \Delta y_{i,t-j} - X'_{i,t}\delta \quad (4)$$

At this point $\Delta\bar{y}_{i,t}$ and $\bar{y}_{i,t}$ are standardized by dividing by the standard error from the estimated regression equation (1) to create $\Delta\tilde{y}_{i,t}$ and $\tilde{y}_{i,t}$, and are used to estimate the pooled regression given by equation (5).

$$\Delta\tilde{y}_{i,t} = \alpha\tilde{y}_{i,t-1} + \varepsilon_{i,t} \quad (5)$$

According to LLC the resulting modified t-statistic for α (t_α^*) is asymptotically normally distributed. The LLC test has the null hypothesis that there exists a common unit root. Levin, Lin, and Chu (2002) provide critical values for the test statistic as well as an adjustment for the t-statistic under different assumptions regarding the deterministic trend.

DATA AND RESULTS

The data used to test for convergence of state and local tax revenue and expenditures are from the United States Census Bureau series, *State and Local Government Finances,* and cover the forty-eight contiguous States from 1977 through 2000, for a total of 1,152 observations (U.S. Census Bureau *State and Local Government Finances* series can be found on the Internet at: www.census.gov/govs/www/estimate.html. The Census Bureau does not provide state and local finance data, by state, for 2001-2002). To account for differences in state size, total tax revenues are deflated by state population, so that the unit of analysis is the per capita value. The fiscal variables under consideration in this paper are: Total Taxes, Property Taxes, Sales and Gross Receipts Taxes, Individual Income Taxes, Corporate Income Taxes, Total Income Taxes, Direct General Expenditures, Education Expenditures, Public Welfare Expenditures, Health and Hospital Expenditures, and Highway Expenditures. All fiscal policy variables are converted to real values, based on the seasonally adjusted CPI for all goods, for all urban consumers with base year 1982-84.

Table 1 provides basic descriptive statistics for each of the real per capita fiscal variables. The state of New York has eleven of the fifteen highest values for real per capita total taxes over all states and all years, with the state of Connecticut filling the other four spots. The state of Connecticut had the highest real per capita total tax value for the entire period, which occurred in the year 2000. The lowest level of real per capita taxes over all states for all years occurred in Arkansas in 1981, additionally, Arkansas had six of the lowest fifteen values for real per capita

taxes. In terms of direct general expenditures, New York again dominates the highest real per capita spending over all years and states, with ten of the highest fifteen levels, the other five highest values all occurred in Wyoming. Not surprisingly, eight of the lowest fifteen values for real per capita spending occurred in Arkansas.

Table 1: Descriptive Statistics for all years, all states, 1,152 observations for each series. [All data in real per capita terms (1982-84 = Base-year)]

	Mean	Standard Deviation	Minimum	Maximum
Total Taxes	1378.19	338.17	743.94	2668.62
Property Tax	430.56	192.31	91.59	1092.92
Total Sales & Gross Receipts Tax	490.95	163.47	93.02	1131.27
Individual Income Tax	264.71	181.51	0.00	876.49
Corporate Net Income Tax	59.16	37.91	0.00	204.57
Total Income Tax	323.86	204.45	0.00	1061.57
Direct General Expenditure	2373.44	523.76	1390.63	4285.24
Education Expenditure	854.99	168.55	484.66	1553.26
Public Welfare Expenditure	313.07	140.61	74.67	898.17
Health & Hospital Expenditure	201.01	81.01	48.36	546.77
Highway Expenditure	215.65	72.32	70.39	653.86

Table 2: Correlation Matrix for all years, all states, 1,152 observations for each series. [All data in real per capita terms (1982-84 = Base-year)]

	TT	PT	SGRT	IIT	CIT	TIT	TGEX	EEX	PWEX	HHEX	HIEX
Total Taxes	1.000										
Property Taxes	0.733	1.000									
Sales & Gross Receipt Taxes	0.318	0.002	1.000								
Individual Income Taxes	0.567	0.213	-0.247	1.000							
Corp. Income Taxes	0.466	0.327	-0.219	0.539	1.000						
Total Income Taxes	0.590	0.250	-0.260	0.988	0.664	1.000					
Total General Expenditures	0.886	0.591	0.326	0.451	0.311	0.458	1.000				
Education Expenditures	0.738	0.514	0.176	0.394	0.158	0.379	0.871	1.000			
Public Welfare Expenditures	0.706	0.478	0.215	0.557	0.470	0.582	0.737	0.528	1.000		
Health & Hospital Expenditures	0.267	-0.007	0.337	0.104	0.020	0.096	0.433	0.303	0.259	1.000	
Highway Expenditures	0.197	0.211	0.058	-0.180	-0.218	-0.200	0.392	0.484	-0.043	0.038	1.000

Table 2 presents the correlation matrix for each of the fiscal policy variables, for all states and all years. Interestingly, the revenue category most highly correlated with real per capita Total Taxes is real per capita Property Taxes. This is also represented on the expenditure side where the highest correlation among expenditure variables is between real per capita Direct General

Expenditures and real per capita Education Expenditures. This would seem logical as education is the largest component of state and local spending and much of the revenue for education expenditures is generated through property taxes. To better appreciate the data used in this analysis we present a comparison of real per capita Total Taxes and real per capita General Expenditures in 1977 and 2000 and also the average annual growth rate over the time period, displayed in Table 3. Over this time period the highest average annual growth rate in real per capita taxes occurred in Connecticut, with an average annual growth rate of 2.59 percent. The lowest growth rate in real per capita taxes occurred in Wyoming, with an average annual growth rate of 0.40 percent. On the expenditures side the highest average annual growth rate of real per capita expenditures during this period occurred in South Carolina, with an average annual growth rate of 3.00 percent. The lowest growth rate in real per capita expenditures occurred in Nevada, with an average annual growth rate of 1.05 percent.

Table 3A: All data in real per capita terms
(1982-84 = Base-year)

	Real Per Capita Total Taxes			Real Per Capita Direct General Expend		
	Year		Average	Year		Average
State	1977	2000	Growth Rate	1977	2000	Growth Rate
AL	818.85	1229.55	1.77%	1644.40	2881.21	2.44%
AR	789.26	1295.19	2.15%	1412.65	2402.33	2.31%
AZ	1308.96	1509.15	0.62%	1981.17	2632.91	1.24%
CA	1762.14	2058.60	0.68%	2409.32	3356.51	1.44%
CO	1317.54	1784.53	1.32%	2143.22	3041.77	1.52%
CT	1470.13	2668.62	2.59%	1955.85	3652.19	2.72%
DE	1345.58	1939.75	1.59%	2364.24	3474.60	1.67%
FL	990.97	1523.88	1.87%	1723.42	2735.88	2.01%
GA	976.18	1649.70	2.28%	1646.41	2701.39	2.15%
IA	1225.91	1605.80	1.17%	2007.47	3088.87	1.87%
ID	1021.19	1478.46	1.61%	1832.52	2615.54	1.55%
IL	1396.71	1882.49	1.30%	2075.79	3011.68	1.62%
IN	1050.26	1563.00	1.73%	1536.08	2745.16	2.52%
KS	1200.47	1645.53	1.37%	1960.66	2783.66	1.52%
KY	959.58	1461.56	1.83%	1634.04	2732.81	2.24%
LA	1026.30	1414.82	1.40%	1912.48	2894.91	1.80%
MA	1664.51	2199.15	1.21%	2356.55	3454.84	1.66%
MD	1452.18	2005.63	1.40%	2336.98	3009.72	1.10%
ME	1070.70	1941.36	2.59%	1788.53	3167.78	2.49%
MI	1435.76	1839.26	1.08%	2252.93	3199.45	1.52%
MN	1492.09	2145.53	1.58%	2393.19	3679.57	1.87%
MO	993.72	1485.75	1.75%	1535.61	2576.07	2.25%
MS	848.09	1285.89	1.81%	1638.10	2844.00	2.40%
MT	1247.13	1372.57	0.42%	2240.14	2912.09	1.14%

Table 3B: All data in real per capita terms (1982-84 = Base-year)						
	Real Per Capita Total Taxes			Real Per Capita Direct General Expend		
	Year		Average	Year		Average
State	1977	2000	Growth Rate	1977	2000	Growth Rate
NC	950.26	1546.93	2.12%	1593.38	2917.41	2.63%
ND	1129.88	1599.42	1.51%	2232.81	3323.19	1.73%
NE	1293.67	1687.93	1.16%	1973.68	2853.14	1.60%
NH	999.06	1540.38	1.88%	1806.42	2661.21	1.68%
NJ	1547.91	2266.53	1.66%	2215.74	3259.93	1.68%
NM	1007.61	1532.67	1.82%	1882.65	3224.21	2.34%
NV	1376.53	1693.07	0.90%	2228.78	2835.54	1.05%
NY	2082.83	2658.54	1.06%	2901.47	4285.24	1.70%
OH	1038.20	1751.44	2.27%	1807.09	2948.95	2.13%
OK	969.94	1388.58	1.56%	1670.13	2316.82	1.42%
OR	1281.01	1597.74	0.96%	2262.00	3422.55	1.80%
PA	1258.15	1729.86	1.38%	1920.60	3114.94	2.10%
RI	1278.69	1890.95	1.70%	2035.81	3081.12	1.80%
SC	870.21	1381.36	2.01%	1470.58	2932.66	3.00%
SD	1037.88	1335.05	1.09%	1962.86	2648.77	1.30%
TN	904.54	1269.01	1.47%	1587.47	2579.87	2.11%
TX	1022.97	1454.56	1.53%	1629.80	2667.06	2.14%
UT	1035.12	1527.46	1.69%	1917.25	2864.09	1.75%
VA	1101.76	1729.61	1.96%	1771.23	2848.95	2.07%
VT	1304.48	1788.54	1.37%	2115.51	3286.42	1.92%
WA	1313.67	1845.89	1.48%	2192.53	3298.38	1.78%
WI	1446.70	2008.00	1.43%	2210.68	3330.54	1.78%
WV	999.43	1401.22	1.47%	1711.61	2798.18	2.14%
WY	1615.21	1768.88	0.40%	2592.89	3914.39	1.79%

Table 4 presents the results of the IPS panel unit root tests for each of the fiscal policy variables. The null hypothesis is that the series contains a unit root, therefore rejecting the null hypothesis of a unit root, indicates that the series is stationary, or mean reverting, in other words the rejection of a unit root implies convergence of the fiscal policy variable. In the estimation of the IPS W-statistic the AR lag is selected based on the Schwarz Information Criterion (SIC). The IPS W-statistic presented is based on individual intercepts and linear trends for all series, all tests are performed on the data in levels. One perceived potential advantage of the IPS test over the LLC test is that the IPS test allows for individual unit root processes for each cross-section, whereas the LLC test assumes a common unit root process for a given series. Below we discuss the results of the IPS test in detail and briefly summarize the results of the LLC test presented in Table 5.

The results of the IPS test indicate that we can reject the null hypothesis of a panel unit root at the 5-percent level for all of the fiscal variables except real per capita public welfare expenditures and real per capita health and hospital expenditures, implying convergence of most

of the fiscal policy variables over the period 1977 to 2000 (The number of AR lags by cross-section are available from the authors upon request). A summary of the results of the IPS test is provided in Table 4. The IPS statistic for the Total Taxes variable is -8.663, therefore we reject the null hypothesis and conclude that Total Taxes exhibit convergence.

Table 4: Results of IPS Panel Unit Root Test on Real Per Capita Values. Null Hypothesis is Individual Unit Root Process. [P-values are computed assuming asymptotic normality.]

	IPS W-Statistic	P-value	AR Lags	Cross-Sections	Obs.
Total Taxes	-8.663	0.000	0 to 4	48	1057
Property Tax	-6.516	0.000	0 to 4	48	1060
Total Sales & Gross Receipts Tax	-6.839	0.000	0 to 4	48	1053
Individual Income Tax	-4.185	0.000	0 to 4	45	995
Corporate Net Income Tax	-4.532	0.000	0 to 3	44	991
Total Income Tax	-2.616	0.005	0 to 3	45	1008
Direct General Expenditure	-6.131	0.000	0 to 4	48	1049
Education Expenditure	-5.377	0.000	0 to 4	48	1063
Public Welfare Expenditure	-0.768	0.221	0 to 4	48	1075
Health & Hospital Expenditure	-1.580	0.057	0 to 4	48	1075
Highway Expenditure	-3.650	0.000	0 to 4	48	1074

The AR lag length varies between 0 and 4, depending upon the cross-section, based on SIC. There were a total of 48 cross-sections used in the analysis resulting in 1,057 observations after lags are accounted for. The IPS statistic for the Property Tax variable is -6.516, therefore we reject the null hypothesis and conclude that Property Taxes exhibit convergence. The AR lag length varies between 0 and 4 depending upon the cross section, based on SIC. There were a total of 48 cross-section used in the analysis resulting in 1,057 observations after lags are accounted for. The IPS statistic for the Sales and Gross Receipts Tax variable is -6.839, therefore we reject the null hypothesis and conclude that Sales and Gross Receipts Taxes exhibit convergence. The AR lag length varies between 0 and 4, depending upon the cross-section, based on SIC. There were a total of 48 cross-sections used in the analysis resulting in 1,053 observations after lags are accounted for.

The IPS statistic for the Individual Income Tax variable is -4.185, therefore we reject the null hypothesis and conclude that Individual Income Taxes exhibit convergence. The AR lag length varies between 0 and 4 depending upon the cross section, based on SIC. There were a total of 45 cross-section used in the analysis resulting in 995 observations after lags are accounted for. The three cross-sections excluded from the analysis were Nevada, Washington, and Wyoming. The other states that have no state individual income taxes, Florida, South Dakota, and Texas, were included in the analysis, given that during the time period under consideration each of these states collected a very small amount of individual income taxes in at

least one year, according to the *Census Bureau* data. Obviously, for those states that do not utilize individual income taxes (or corporate income taxes) we will not see convergence among all states. However, the data indicates that we do see convergence in individual income taxes among those states that do utilize individual income taxes as part of a state's revenue system. The IPS statistic for the Corporate Income Tax variable is -4.532, therefore we reject the null hypothesis and conclude that Corporate Income Taxes exhibit convergence. The AR lag length varies between 0 and 3 depending upon the cross section, based on SIC. There were a total of 44 cross-section used in the analysis resulting in 991 observations after lags are accounted for. The four cross-sections excluded from the analysis because they collected zero revenue from corporate income taxes were Nevada, Texas, Washington, and Wyoming. When all income taxes are combined, the IPS statistic for Total Income Taxes is -2.616, therefore we reject the null hypothesis and conclude that Total Income Taxes exhibit convergence. The AR lag length varies between 0 and 3 depending upon the cross section, based on SIC. There were a total of 45 cross-section used in the analysis resulting in 1,008 observations after lags are accounted for.

We now turn to the expenditure categories and find that for Direct General Expenditures the IPS statistic is -6.131, therefore we reject the null hypothesis and conclude that Direct General Expenditures exhibit convergence. The AR lag length varies between 0 and 4 depending upon the cross section, based on SIC. There were a total of 48 cross-section used in the analysis resulting in 1,049 observations after lags are accounted for. The IPS statistic for the Education Expenditure variable is -5.377, therefore we reject the null hypothesis and conclude that Education Expenditures exhibit convergence. The AR lag length varies between 0 and 4 depending upon the cross section, based on SIC. There were a total of 48 cross-section used in the analysis resulting in 1,063 observations after lags are accounted for. The IPS statistic for the Highway Expenditure variable is -3.650, therefore we reject the null hypothesis and conclude that Highway Expenditures exhibit convergence. The AR lag length varies between 0 and 4 depending upon the cross section, based on SIC. There were a total of 48 cross-section used in the analysis resulting in 1,074 observations after lags are accounted for.

Using a 5-percent level of significance, the two fiscal categories for which we do not find evidence of convergence are Public Welfare Expenditures and Health & Hospital Expenditures. The IPS statistic for the Public Welfare Expenditure variable is -0.768, therefore we fail to reject the null hypothesis and conclude that Public Welfare Expenditures do not exhibit convergence. The AR lag length varies between 0 and 4 depending upon the cross section, based on SIC. There were a total of 48 cross-section used in the analysis resulting in 1,075 observations after lags are accounted for. The IPS statistic for the Health & Hospital Expenditure variable is -1.580, therefore we fail to reject the null hypothesis and conclude that Health & Hospital Expenditures do not exhibit convergence. The AR lag length varies between 0 and 4 depending upon the cross section, based on SIC. There were a total of 48 cross-section used in the analysis resulting in 1,075 observations after lags are accounted for. The results for these two categories are discussed in more detail below.

Table 5 presents the results of the LLC panel unit root tests for each of the fiscal policy variables. The AR lag length in this case is also chosen based on the SIC, additionally the Bartlett kernel technique is used to estimate the necessary ratio, and the Newey-West techniques is used to select the bandwidth for the kernel. Here the null hypothesis is that there exists a common unit root process. In this case we also include individual intercepts and linear trends and all tests are performed on the data in levels. The results of the LLC test support those of the IPS test, where all of the fiscal policy variables exhibit stationarity, (rejection of the null hypothesis), of real per capita values at the 5-percent level, except for real per capita public welfare expenditures and real per capita health and hospital expenditures. The results of the LLC test provide additional evidence of unconditional convergence among most fiscal policy variables during the period 1977 to 2000 among the contiguous United States.

Table 5: Results of LLC Panel Unit Root Test on Real Per Capita Values. Null Hypothesis is Common Unit Root Process. [P-values are computed assuming asymptotic normality.]

	LLC-Statistic	P-value	AR Lags	Cross-Sections	Obs.
Total Taxes	-4.361	0.000	0 to 4	48	1057
Property Tax	-4.982	0.000	0 to 4	48	1060
Total Sales & Gross Receipts Tax	-3.980	0.000	0 to 4	48	1053
Individual Income Tax	-2.301	0.012	0 to 4	45	995
Corporate Net Income Tax	-1.681	0.046	0 to 3	44	991
Total Income Tax	-2.165	0.015	0 to 3	45	1008
Direct General Expenditure	-4.132	0.000	0 to 4	48	1049
Education Expenditure	-4.514	0.000	0 to 4	48	1063
Public Welfare Expenditure	-1.522	0.064	0 to 4	48	1075
Health & Hospital Expenditure	-0.422	0.337	0 to 4	48	1075
Highway Expenditure	-3.165	0.001	0 to 4	48	1074

The lack of unconditional convergence of real per capita public welfare and real per capita health and hospital expenditures presents a puzzling and interesting area for future research. Using an alternative estimation technique over a similar time period, Wang (2009) found that there was evidence of moderate unconditional convergence in health care expenditures. However the estimated coefficient was only significant at the 15 percent level. Wang did find evidence of conditional convergence in health care expenditures, and in this case the convergence coefficient is significant at the 5 percent level. Given the findings of Wang, it may be the case that both public welfare and health and hospital expenditures may be experiencing conditional convergence and not unconditional convergence. This implies that these two fiscal categories are approaching state specific steady-states, or perhaps "group" specific steady-states. Assuming that states may be approaching different steady-states in public welfare and health and hospital expenditures, some potential reasons for the lack of

unconditional convergence would include differences in population growth rates and demographics across states and across time, for example age distributions. There are also potential issues with our system of funding both public welfare and health and hospitals through both the federal government and state and local governments, however, this should be less of a problem given that the variables under consideration are in fact state and local expenditures and would have included intergovernmental transfers from the federal government. Aside from these two categories the evidence strongly supports unconditional convergence in fiscal policies between states.

CONCLUDING REMARKS

The results from the panel unit root tests in this paper support the findings by previous researchers, including Scully (1991), Annala (2003), and Skidmore et. al. (2004), that there is consistent empirical evidence of unconditional fiscal convergence among the United States over the past twenty-four years. Using the broad categories of taxes and expenditures we find strong, and supportive, evidence of unconditional convergence of real per capita total taxes, real per capita property taxes, real per capita sales and gross receipts taxes, real per capita individual income taxes, real per capita corporate income taxes, real per capita total income taxes, real direct general expenditures, real per capita education expenditures, and real per capita highway expenditures. We reject the notion of unconditional convergence in real per capita public welfare expenditures and real per capita health and hospital expenditures. The conclusions are based on similar results from two different panel unit root tests, the Im, Pesaran, and Shin test and the Levin, Lin , and Chu test. The results indicate that over the period 1977 to 2000 fiscal policies have become increasingly similar, or have exhibited unconditional convergence over that time period. These results have implications for cross-state comparisons studying the impact of taxes on economic growth. Reed (2008) discusses the reasons why previous research may have had difficulties identifying the relationship between taxes and state economic growth, and the convergence of taxes and spending may be a part of the issue. Tables A1 and A2 in the Appendix provide the results of the IPS test and the LLC test on each of the fiscal policy variables as a share of state personal income. These results support the per capita results discussed in the paper with the exception of (health and hospital expenditure$_i$)/(Personal Income$_i$) for which the IPS test rejects the null hypothesis of a unit root, whereas the LLC test fails to reject the null of a unit root process.

The convergence of tax revenues has important implications for models of fiscal competition such as Case, Rosen, and Hines (1993) where state fiscal policies have spillover effects on neighboring States. With evidence that state and local tax revenues are converging this implies that differences in taxes *among* States will have less of an effect on policymakers attempting to attract economic activity. The ramifications of convergence in state and local taxes are important for both policymakers and economic agents. The results indicate that policymakers

may have to seek alternative means of attracting economic activity to their region, such as emphasizing educational levels, amenities, etc. Furthermore, convergence of fiscal policy variables also has an impact on an agents ability to "vote with her feet" as in Tiebout (1956), that is if all states become increasingly similar it will become more difficult for individuals to move to states where they receive their most preferred package of taxes and public goods. As with states attempting to attract firm location, states also compete for labor and if state fiscal policies become increasingly similar states will have to attract labor through alternative means.

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APPENDIX

Table A1: Results of IPS Panel Unit Root Test on Share of Personal Income. Null Hypothesis is Individual Unit Root Process. [P-values are computed assuming asymptotic normality.]		
	IPS W-Statistic	P-value
Total Taxes	-8.915	0.000
Property Tax	-5.217	0.000
Total Sales & Gross Receipts Tax	-6.440	0.000
Individual Income Tax	-6.049	0.000
Corporate Net Income Tax	-5.488	0.000
Total Income Tax	-5.880	0.000
Direct General Expenditure	-4.185	0.000
Education Expenditure	-7.089	0.000
Public Welfare Expenditure	2.295	0.989
Health & Hospital Expenditure	-2.893	0.002
Highway Expenditure	-6.850	0.000

Table A2: Results of LLC Panel Unit Root Test on Share of Personal Income. Null Hypothesis is Common Unit Root Process. [P-values are computed assuming asymptotic normality.]		
	LLC-Statistic	P-value
Total Taxes	-6.575	0.000
Property Tax	-3.652	0.000
Total Sales & Gross Receipts Tax	-3.820	0.000
Individual Income Tax	-4.529	0.000
Corporate Net Income Tax	-2.781	0.003
Total Income Tax	-4.429	0.000
Direct General Expenditure	-3.359	0.000
Education Expenditure	-6.668	0.000
Public Welfare Expenditure	0.461	0.678
Health & Hospital Expenditure	-0.004	0.499
Highway Expenditure	-6.482	0.000