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## LOWER TAXES AND ECONOMIC GROWTH: RESPONSE TO A FLAWED ANALYSIS

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### Appendix 1 Technical Information about Econometric Analysis

In response to the Arduin, Laffer and Moore (ALM) report, we tried to reproduce their results to examine what factors might be driving the reported correlation between tax burdens and real personal income growth. Below is a set of explicit definitions of the variables and specifications we examined. Note in **all** cases the **only** results that were negative at a statistically significant level involved regressing personal income growth on taxes normalized by personal income. As explained in the body of this report, using personal income to explain personal income is not appropriate economic practice and will give anomalous results. We have included a sample set of results examining the relationship between percentage change in personal income and percentage changes in state and local taxes and gross domestic product (GDP) for 1990-2000 – more specifications are available from the authors upon request.

For all of our variables we examined both the relationship between percentage changes in real per capita personal income to both percentage changes in our various measures of tax burden and gross domestic product and changes in tax burden and GDP.

#### Testing the ALM Model

As far as we could tell, the ALM model used one of the two equations below (or some combination of percentage changes and differences):

**We will define:**

$Y = \text{Real Per Capita Personal Income} = (\text{Personal Income} / \text{Population}) / \text{Consumer Price Index}$

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$X = \text{State and Local Tax Burden Per } \$1,000 \text{ Personal Income} = \text{State and Local Taxes} / (\text{Personal Income} / \$1,000)$

$Z = \text{Real GDP} = \text{GDP} / \text{Consumer Price Index}$

The relationship between growth rates (or the percentage change in variables):

$\% \text{ change in real per capita personal income} = \alpha + \beta (\% \text{ change in tax burden per } \$1,000 \text{ personal income}) + \chi (\% \text{ change GDP}) + \varepsilon$

or

$$(Y_t - Y_{t-1}) / Y_{t-1} = \alpha + \beta (X_t - X_{t-1}) / X_{t-1} + \chi (Z_t - Z_{t-1}) / Z_{t-1} + \varepsilon$$

The alternative specification that may have been used was the relationship between differences in variables.

Regression Results of Correlation of Income Growth and Tax Burden (Percent Changes in State and Local Taxes) 1990-2000 Results Excluding AK and WY				
% Change State and Local Taxes/Personal Income	-0.211 (0.021)			
% Change Real Per Capita State and Local Taxes	0.081 (0.025)			
Lagged % Change State and Local Taxes/Personal Income		0.076 (0.023)		
%Change (State and Local Taxes/Lagged Personal Income)			0.077 (0.022)	
% Change In GDP	1.099 (0.091)	1.138 (0.099)	1.208 (0.097)	1.186 (0.097)
Constant	-0.045 (0.005)	-0.049 (0.005)	-0.051 (0.005)	-0.050 (0.005)
State Fixed Effects	no	no	no	no
Adjusted R-Squared	0.3401	0.2336	0.2340	0.2354

Change in real per capita personal income =  $\alpha + \beta$  (change in tax burden per \$1,000 personal income) +  $\chi$ (change GDP) +  $\varepsilon$

or

$$(Y_t - Y_{t-1}) = \alpha + \beta(X_t - X_{t-1}) + \chi(Z_t - Z_{t-1}) + \varepsilon$$

### Avoiding the ALM pitfall

To avoid the problem of having the same personal income variable on both sides of the equation we varied the specifications by replacing the authors' tax burden variable with:

**Real per capita state and local taxes** = (State and Local Taxes/Population)/Consumer Price Index,

**Lagged state and local tax burden per \$1,000 personal income** –this examined the relationship between income growth in year t on tax changes in year t-1 (normalized by personal income

$$((Y_t - Y_{t-1})/Y_{t-1}) = \alpha + \beta(X_{t-1} - X_{t-2})/X_{t-2} + \chi(Z_t - Z_{t-1})/Z_{t-1} + \varepsilon$$

**Current year state and local tax burden per \$1,000 of the prior years personal income.**

$$X_t = \text{State and Local Taxes}_t / (\text{Personal Income}_{t-1} / \$1,000)$$

and

$$(Y_t - Y_{t-1}) / Y_{t-1} = \alpha + \beta(X_t - X_{t-1}) / X_{t-1} + \chi(Z_t - Z_{t-1}) / Z_{t-1} + \varepsilon$$

We performed standard statistical analysis for 1980-2000 and 1990-2000. We also replaced our tax burden variable with a broader measure of state and local activity by including state and local general revenues instead of state and local taxes. We examined the relationship including and excluding indicator variables for each state. We also tried replacing national gross domestic product measures with year indicator variables to control for specific effects in each year.

In all cases we only found a negative and statistically significant result for the ALM specification while all of our other specifications that corrected for the simultaneity of including personal income on both sides of the equation were statistically significant and positive.

## Appendix 2: State and Local Tax Burden vs. 10-Year Economic Performance

Growth Between 1995- 2005								
	State & Local Tax Burden (2004)*	Gross Domestic Product Growth**	Personal Income Growth	Personal Income Per Capita Growth	Population Growth	Non-Farm Payroll Employment Growth	Net Domestic In-Migration as a % of Population (2005-2006)	Unemployment Rate, December 2006 (Seasonally adjusted)
Alabama	8.30%	61.25%	61.6%	52.4%	5.85%	7.74%	6.9%	3.6
South Dakota	8.35%	73.63%	76.0%	67.4%	5.01%	13.48%	2.5%	3.2
Tennessee	8.55%	68.97%	63.6%	46.2%	11.80%	9.80%	8.4%	4.7
New Hampshire	8.57%	71.27%	73.0%	52.9%	12.89%	17.64%	1.7%	3.5
Colorado	8.86%	100.42%	88.5%	54.6%	21.86%	21.32%	6.3%	4
Texas	9.37%	94.99%	87.2%	55.2%	20.94%	21.34%	9.4%	4.5
Missouri	9.37%	57.11%	56.6%	45.2%	7.80%	8.22%	2.3%	4.9
Virginia	9.36%	89.72%	77.1%	56.1%	13.40%	19.50%	0.6%	2.9
Oregon	9.46%	80.12%	65.0%	44.3%	14.27%	16.93%	9.4%	5.4
Montana	9.47%	71.82%	68.2%	57.5%	6.64%	19.96%	7.0%	2.9
Oklahoma	9.44%	74.60%	70.1%	58.6%	7.11%	14.86%	3.5%	3.8
Georgia	9.67%	82.71%	78.1%	43.9%	24.62%	17.57%	13.1%	4.6
Florida	9.50%	97.73%	83.9%	50.3%	22.22%	30.26%	9.2%	3.3
South Carolina	9.83%	62.71%	67.5%	47.5%	13.29%	13.02%	11.2%	6.6
Arkansas	9.83%	62.75%	61.6%	47.4%	9.48%	10.20%	7.0%	5.1
Indiana	9.95%	61.21%	56.0%	45.5%	7.08%	6.08%	0.8%	4.8
North Carolina	9.90%	80.94%	72.3%	45.7%	18.08%	13.09%	11.9%	4.9
Iowa	9.86%	57.92%	57.2%	51.9%	3.42%	9.06%	0.0%	3.5
Massachusetts	10.09%	66.90%	65.8%	59.2%	4.75%	7.35%	-7.7%	5.3
North Dakota	10.29%	68.08%	62.7%	65.5%	-2.04%	14.35%	-3.3%	3.2
Illinois	10.21%	55.68%	53.4%	44.3%	6.30%	4.86%	-5.4%	4.1
Washington	9.95%	76.63%	70.6%	48.7%	14.79%	18.42%	6.8%	5.0
Maryland	10.09%	79.22%	75.8%	59.1%	10.25%	17.05%	-4.6%	3.9
Mississippi	10.21%	51.05%	58.4%	47.6%	6.83%	5.15%	-5.1%	7.5
Arizona	10.02%	108.13%	102.8%	51.3%	34.30%	39.64%	21.5%	4.1
Michigan	10.45%	49.89%	45.7%	39.3%	4.39%	2.58%	-6.4%	7.1
Idaho	9.99%	74.14%	77.4%	46.2%	21.41%	28.35%	15.5%	3.2
Kentucky	10.23%	55.32%	61.0%	50.0%	7.34%	11.12%	2.3%	5.2
Delaware	10.17%	105.34%	75.6%	51.9%	15.35%	17.50%	6.4%	3.4
Pennsylvania	10.33%	55.49%	52.6%	49.8%	1.70%	8.58%	0.0%	4.6
Nevada	10.03%	127.35%	120.1%	44.2%	52.52%	55.75%	21.6%	4.4
Utah	10.44%	96.05%	82.5%	48.8%	23.64%	26.67%	5.9%	2.6
Minnesota	10.52%	78.56%	70.7%	55.0%	10.01%	13.89%	-0.9%	4.2
California	10.59%	78.46%	74.1%	52.7%	14.06%	19.02%	-7.9%	4.8
Alaska	10.70%	58.49%	52.6%	38.9%	9.74%	18.37%	-2.6%	6.7
Louisiana	10.70%	54.10%	33.1%	28.9%	2.94%	5.52%	-54.8%	4.3
Kansas	10.80%	65.74%	61.3%	52.8%	5.66%	11.41%	-2.7%	4.5
New Mexico	10.72%	66.12%	69.8%	51.5%	11.95%	18.58%	4.5%	3.8
New Jersey	10.87%	61.62%	63.3%	51.4%	7.67%	12.30%	-8.3%	4.2
Connecticut	10.84%	60.38%	61.6%	53.1%	5.31%	6.49%	-4.8%	4.2
West Virginia	10.98%	45.89%	46.3%	46.8%	-0.53%	8.55%	2.2%	5.1
Ohio	11.11%	50.35%	45.0%	41.7%	2.39%	3.98%	-4.2%	5.6
Nebraska	11.29%	58.80%	61.1%	51.8%	6.11%	14.64%	-3.2%	3.1
Rhode Island	11.47%	70.60%	60.5%	51.6%	5.56%	11.70%	-11.7%	5.2
Wisconsin	11.57%	61.32%	59.8%	49.7%	6.61%	10.98%	-0.6%	4.9
Vermont	11.69%	66.03%	64.9%	55.8%	5.67%	13.03%	-1.1%	3.8
Hawaii	11.69%	47.71%	46.9%	37.8%	6.39%	13.01%	-2.5%	2.0
Maine	12.67%	62.66%	62.6%	53.0%	6.01%	13.68%	0.7%	4.7
Wyoming	12.67%	87.20%	86.0%	77.1%	4.87%	19.93%	5.8%	3.0
New York	13.68%	61.14%	53.8%	48.0%	4.27%	8.06%	-11.7%	4.0
<b>Median</b>	<b>10.19%</b>	<b>66.5%</b>	<b>64.2%</b>	<b>50.8%</b>	<b>7.2%</b>	<b>13.3%</b>	<b>1.9%</b>	<b>4.3</b>

\*State & local tax burden is state and local taxes divided by personal income.

\*\*Gross Domestic Product uses SIC classification for 1995 and NAICS for 1996-2005.

Sources: State & local tax burden: US Census Bureau and Bureau of Economic Analysis (BEA), Gross Domestic Product: BEA, Personal Income Growth: BEA, Personal Income Per Capita Growth: BEA, Population Growth: US Census, Non-Farm Payroll, Employment Growth: Bureau of Labor Statistics (BLS), Net Domestic In-Migration as a % of Population: US Census, Unemployment Rate: BLS