

Are We Ricardian? Evidence from U.S. Counties

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“The national debt of the United States is the total of all the obligations of the Treasury to pay money to the federal government's creditors. It consists of bonds, notes, and bills issued to the creditors when they lend money to the government” (Heilbroner and Bernstein, 1989). Simply put, the national debt is the amount of money the government owes to its creditors. Its level has risen over the years as the government failed to finance payment to creditors. Abel and Bernanke state the deficit is the difference between government expenditures and tax revenues collected for a given year.

Alexander Hamilton stated in 1781, “A national debt, if it is not excessive, will be to us a national blessing.” James Madison disagreed and said in 1790, “a public debt is a public curse.” Each president, politician and American has had his or her own opinion. Reagan used deficits throughout his presidency and accumulated a large part of the current national debt. Clinton on the other hand, worked to decrease his budget deficit and in his final years as president even ran surpluses.

Economists too have argued for years how deficit spending can affect the economy. The Ricardian equivalence hypothesis postulates when the government issues a tax cut, and/or increases deficit spending; consumers will increase their savings, expecting future tax rates to be higher because the government will pay back its debt eventually and use future taxes to do so. Since aggregate demand does not change because government spending increased by the same amount as consumption decreased, output levels do not change and the economy is unaffected. Some believe Ricardian equivalence holds and the debt has no effect on the economy. Others believe Ricardian equivalence does not hold and the national debt has large impacts on the economy.

The main concerns associated with deficit spending and long term debt are the effect it has on real interest rates, productivity growth, and the national savings rate. Many people have studied the state of the economy during government surpluses and government deficits. As expected, most have developed their own explanation. The question is, “What effect does the debt really have?”

Recently, with government deficits rising, Ricardian equivalence has re-entered center stage of macroeconomic research. The re-occurrence of the deficit debates during modern times began with the Reagan presidency. With high government spending and low tax rates, Reagan had many supporters but also many critics. The question, ‘What effects would “Reaganomics” have on interest rates?’, seemed to be an issue of conflict. There was concern that government spending was crowding out investment by raising interest rates and hurting the American economy in the long run. However, Reagan continued with his economic policy until he completed his two terms of service.

While federal debt policy has been under scrutiny recently, “. . .in 2001 (local debt levels amounted) to approximately 25 percent of the total US national debt. . .Furthermore, unlike the federal debt, state and local debt cannot be liquidated by printing money.” (Rowley, 2002). County debt is a growing problem because many citizens do not fully comprehend its effects on their economy.

Many macro-economists have used macro level indicators to examine Ricardian equivalence at the national level, but my research uses county level indicators to examine the extent to which Ricardian equivalence holds at the county level. Hopefully a smaller scope will be able to capture more of what is actually happening because there can be more variance in the data since averages will not be used as they are in national studies. There is little literature about

county debt specifically as most of the previous research has focused on debt and deficits as a national problem.

I. Literature Review

Classical economists have mostly criticized budget deficits, believing firmly in the principles of Says Law: “total demand in an economy cannot exceed or fall below total supply in that economy” (CEPA, 2005), or “supply creates its own demand.” The debate between classical economists examined whether or not it was possible for a ‘general glut’ to overcome an economy where, as soon as a product is made, people must have it. Say believed it was impossible to have surplus because somewhere in the world there would be a demand.

It was Malthus and Ricardo who first began to examine the effects of budget deficits on the economy. Malthus believed governments could over save and in this case, Say’s Law would not apply, supply of savings would exceed demand. He writes in *Of Poor Laws* that when the government borrows, it increases demand, by increasing government revenue and government buying power. This would result in no change in the demand for money even though there was a decrease individual purchasing power, because of taxes, offset by an increase in government purchasing power. In the end, the net result is zero (Malthus, *Of Poor Laws*).

Malthus, like most classical economists, only justified debt when the government was involved in a war. This must be done because if the government increases taxes to increase net revenue, the people may not support the actions of the government. This could lead to a national disaster. Any other time, debt would not help the economy and should not be used as a form of fiscal policy. He did criticize the governments borrowing on reputation rather than collateral. A government could borrow any amount of money even if they neglected to establish a fund to repay the debt in the future. He argued this debt would ruin all the countries of Europe over time because it is simply a sinking fund account where the tax payers always have to pay the interest on the debt.

The government during David Ricardo’s time raised money through taxation policies, increasing the cost of goods. Ricardo’s research establishes taxation for the purpose of interest payments on national debt, as a transfer payment, negligible to the state of the economy. Ricardo believed government borrowing would blind the public of the true state of the economy because the common people did not care if the government borrowed millions of dollars, as long as they had to pay a minimal amount, which would usually be future taxes. If the common people were asked to pay back the loan in entirety the following year, they would understand the true nature of the debt and would be less likely to support the government.

Ricardo did not believe any sinking fund would be efficient in the payment of debt unless it was based on an excess of government revenues. This type of account, while in theory a sinking fund, does not have similar effects on the economy and instead provides the government with an efficient way of paying debt. He saw the economy in two situations. When war broke out, the people would pay for the war through increased taxes during the war or after the war, both perfect substitutes. It was easier for the government to borrow a given amount than it was to estimate exactly what future war expenses would be. If the government did not estimate correctly, it would enter national bankruptcy. Similar to Malthus, Ricardo did not support government borrowing except in a time of war to avoid national bankruptcy (Ricardo, “Taxes on Other Commodities than Raw Produce”).

The idea of Ricardian equivalence came about because of Ricardo’s examination of the reality consumers lived in. The use of borrowing and taxation to repay interest skewed the scope of the government debt. Consumers are rational, however, they understand that in time of war the government needs to borrow money, but they do not want to pay the total amount.

Consumers see this positively because it saves them money in the present, giving them time to save their money to pay for future taxes. Now we can justify this belief with the time value of money. A dollar today is worth more than a dollar tomorrow due to inflation. When the government during Ricardo's time borrowed to spend on the war, consumers would save for future taxes. The net result would be zero, and government borrowing would not change the economy.

In the 1930s John Maynard Keynes shook the world of economics with his idea of fiscal policy. He argued that the government could intervene in the economy to pull it out of a recession. With the world economy in an extended depression, Keynes was very popular because for the first time an economist understood why and what the government needed to do to pull the economy out of the depression. He argued for public works projects to transfer benefits to the public rather than private investors. This policy proved effective and was able to move the economy past the Great Depression. While Keynes argued for public works projects he did not require a balanced budget to do so. The imposition of the Keynesian ideals brought more acceptances for federal budget deficits. "Keynes himself strongly supported deficit financing throughout the 1930's in his polemical writings" (Rowley, 2002). The Keynesians saw almost no adverse effects of budget deficits. They simply saw an improving economy through an increase in spending and demand.

This Keynesian movement is documented by a history of budget deficits. "From 1961 to 1998, with only one year's exception in 1969, the federal budget moved into continuous deficit. The budget moved into surplus only in 1999 following several years of economic growth, coupled with a significant decline in defense expenditures as a response to the end of the Cold War" (Rowley, 2002).

During this time, many economists have examined the effects of popular deficit spending. Robert Barro has been the most prominent supporter of the Ricardian equivalence theory today. Barro's main argument contradicts the mainstream belief surrounding debt although it poses an interesting perspective on the existence of any effects from national debt. Previously, many economists believed an increase in debt gave consumers an increase in their perceived wealth because they held a government bond as an investment. Barro argues an increase in deficit does not change an individual's perception of their wealth because an individual foresees an increase in taxes to pay the interest on this government debt. Since no change in perceived wealth exists, the net result would be zero, supporting Ricardian equivalence. His paper uses time series data to create a model of the U.S. economy. Over time, Barro finds Ricardian equivalence does hold given his assumptions of the economic environment.

The difficulties many researchers find with Barro's model are its assumptions. First, that taxes and bonds must be perfect substitutes. Next, that taxes must be used to pay interest on the debt. Third, that consumers can invest at the same rate as the government and have perfect information about the future, and finally, that all taxes are lump sum. These specifications help simplify all of the variation and unpredictability of the economy; however, though some of these conditions may occur simultaneously, rarely are *all* of them met at once. Barro received a lot of criticism for the highly theoretical model, though it works when all conditions hold true. Most economists feel the theory should be revised until the model applies for the majority of the time in order to properly investigate how and why deficits may or may not have an effect.

Paul Evans has also done extensive work with the theory of Ricardian equivalence in opposition of Barro. He does not support the theory claiming high budget deficits do not lead to increased interest rates that crowd out private investment. His paper uses an early mathematical model by Blanchard to contradict Barro. Evans uses cross-country analysis and finds high budget deficits do increase the interest rate because consumers do not save a tax cut. They spend

and that spending increases aggregate demand and aggregate interest rates. Evans' model is not as rigid as Barro's because not as many restrictions/assumptions exist to undermine the validity of the model. This model can better predict the movement of the economy in reality as opposed to in theory.

The 1990's uncovered a new alternative to government debt, the balanced budget amendment. This has been discussed in Congress with a significant amount of support. In January 1995 the House of Representatives passed an amendment to balance the federal budget by 2002 and the Senate failed to pass it by one vote (Buchanan, 1997). James Buchanan has done significant research on this idea, as it has been a reoccurring one throughout the 20th Century. He believes it is impossible for modern day politicians to take control of the mounting federal debt and some sort of boundary must be established. The lack of restrictions allows debt to control itself because politicians refuse to. While he feels boundaries need to be put in place, a balanced budget may not be the best solution. With a balanced budget, troughs and booms in the business cycle are more extreme creating more variation from potential gross domestic product (GDP). Buchanan is just one of many frustrated economists who do not know exactly how to handle the debt. It has far exceeded what was intended and it seems it will continue until a viable solution can be reached.

Alberto Alesina has done recent research during the Clinton presidency about the deficit problem. He uses mounting concern over the future of social security to drive his research. Clinton is not known for his deficits but rather working to reduce deficit spending. Alesina feels when the government is running a surplus they should increase taxes further and deposit more funding to future social security expenses. This has been a popular issue, particularly today with Bush's high level of spending and proposal to reform social security. Alesina strongly disagrees with the concept of cutting taxes to promote program cuts in the future. A tax-smoothing model can be established where the government can charge consumers a constant tax over time regardless of the policies of the president. If a conservative spender, such as Mr. Clinton, is in office then the surplus can be used to fund future programs for a more liberal spender, such as Mr. Bush (Alesina, 2000). Alesina feels this idea could relieve tax stress from consumers and people can plan for the future because there is a constant tax rate.

While Ricardian equivalence may appear to be a macroeconomic theory there is a microeconomic basis for its results. According to the permanent income hypothesis, consumers want to smooth their consumption throughout their planning horizon, subject to a budget constraint. Consumers use borrowing and saving to accomplish this task. In times of lower income consumers borrow because in future periods they will have a higher income, thus equalizing the incomes in period t and $t+1$ (Romer, 1996).

If we assume consumers care about future generations then the planning horizon is infinite. In this case, budget deficits will have a significant effect on consumption paths because they will act as an adverse shock to the consumer, thus causing the consumer to change his long-term consumption path. If "consumption rises one-for-one with current income" (Romer, 1996) then as income decreases, due to a tax increase, consumption too will decrease.

David Romer (1996) presents one theory supporting the idea that both consumers and governments have strong preferences for a smooth consumption path and that both will maximize their consumption subject to some budget constraint. This theory is based on the assumption that both consumers and governments have an infinite planning horizon. They are not only planning for their lives but that of future generations. This assumption is key if we are to examine long run effects.

A tax-smoothing model exists to help explain how governments gain revenue. Like consumers under the permanent income hypothesis, governments want their income to have few

adverse shocks. There is evidence to suggest distortions occur less frequently under a steady tax policy than a variable tax policy (Romer, 1996). Similarly, governments have a preference to tax smoothing with certainty and the most predictable shocks to a governments spending path are wars and recessions. If the government can control these shocks by using deficit spending, some may argue the government can exist in an environment with certainty.

II. Model

Taking all previous research into account, I decided to focus on a smaller economic level. The majority of existing research looks at the economy on a national level instead of at a state or county level. Looking at the economy in the aggregate has the disadvantage of allowing less variation; all measures are smoothed out to find a mean. For example, on a federal level, a change in taxes does not affect all consumers similarly so the average may not be an accurate measure. At the county level, consumers' reactions to a change in taxes are more accurately captured. In addition, there is more likely to be variance between the effects of the tax change on consumers, creating a more precise model. County debt is used but it should, in theory, move the same direction as federal deficits. If the federal government cannot fund local projects because of lack of revenue, the county must borrow to fund local projects.

Closely examining the theory, I have created a model to predict whether or not deficits have an effect on consumption. My model using county level consumption (\hat{y}) as my dependent variable is

$$(1) \quad \hat{y} = \alpha + \beta_1(\%urban) + \beta_2(Age) + \beta_3(Income) + \beta_4(\%Employed) + \beta_5(deficit)$$

where *%urban* represents the percentage of the population living in urban areas in 1998, *Age* represents the median age county residents in 1998, *Income* represents per capita income of the county in 1998, *%Employed* represents the percent of the population holding a job in 1998, and *deficit* represents the nominal value of the county deficit in dollars as a percentage of income for the year 1998. Assuming Ricardian equivalence holds true, I expect deficits to be significant with a negative sign. I believe county level deficits will behave similarly to national deficit effects because consumers will have a more inelastic consumption when their county taxes are increased since consumers also benefit more from an increase in local public programs.

The *%urban* variable takes into account the cost of living. My assumption is people living in an urban county will have a higher level of consumption due to the increased cost of living. This coefficient should have a positive sign to capture the effects and costs of urban living.

The *Age* variable takes into account the life cycle model stating that as people age, their consumption rate will increase. A retired citizen will have minimal income to save. However, a retired citizen will also see less of county level benefits because the majority of county debt is held in school bonds. The only way a retired citizen would see these benefits is if he had a grandchild in the school system, assuming they gain utility from this.

Income also takes into account the poverty level of a county. A county with a poorer community will have a higher consumption rate where a richer community will have a lower consumption rate because they can save a larger percentage of their income. I expect the sign on this coefficient to be negative because as per capita income rises consumption levels will decrease.

% employed tries to capture this problem as well. If a county has a higher percentage of employed citizens, it is more likely to have fewer retired or impoverished citizens. A high

employed population suggests the county has a larger population with income to both save and consume. Therefore, I expect this variable to have a significant positive coefficient.

III. Regression Results

I was able to use deficit data collected by the Geostat Center at the University of Virginia as well as census data for all my other variables. After running a multiple regression, all of the coefficients were significant at the 95 percent level except *deficit*, which had a t-value of .03. *%Urban* had a negative sign demonstrating that as the urban area increased in a county, consumption decreased. *Age* has a positive sign, indicating that as the median age of the county increased, the population consumed more. *Income* has a negative coefficient because when per capita income of the county increased, consumption fell. *%Employed's* positive coefficient suggests as more of the population works, consumption increases. *Deficit*, although not significant, has a very small positive coefficient, signifying as the deficit increases, consumption may increase by a relatively small amount.

My adjusted R squared was 83.87 percent suggesting I had captured the majority of variability in my model. I tested for auto-correlation by running a Durbin Watson test. The Durbin Watson statistic was 1.7, which was indeterminate assuming N=100 with k=5. I graphed the residuals and found evidence of heteroscedasticity (See Appendix 1). I then looked at the Chi-Squared statistic to determine whether significant heteroscedasticity did exist. The Chi-Square value was 184.32, falling into the rejection region. This indicated heteroscedasticity did exist. My first attempt to correct this model was to take the natural log of income, since it was the only variable that could be normalized and was not.

Tables 1 and 2:

Root MSE	0.004	Durbin Watson D	1.763	DF	20
Dependent Mean	0.086	Number of Observations	3138	Chi Square	184.32
Coefficient Variance	4.690	1st Order Autocorrelation	0.119	Pr>ChiSq	<0.000
R-Square	0.839				
Adj. R-Square	0.838				

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr> t	Variance Inflation
Intercept	1	0.099	0.000	109.29	<0.000	0
% Urban	1	-0.000	0.000	-3.35	0.000	1.452
Age	1	0.000	0.000	22.44	<0.000	1.145
Income	1	-0.000	2.444E-8	-87.13	<0.000	2.100
%Employed	1	0.000	0.000	4.00	<0.000	1.772
Deficit	1	1.705E-11	5.114E-10	0.03	0.973	1.001

I created a second model to account for the heteroscedasticity by using the natural log of income:

$$(2) \quad \hat{y} = \alpha + \beta_1(\%urban) + \beta_2(Age) + \beta_3(Ln(Income)) + \beta_4(\%Employed) + \beta_5(deficit)$$

Again running a multiple regression using now the natural log of income, I still found heteroscedasticity, with a Chi squared value of 133.58 (See Appendix 1). The variance inflation factors indicate multicollinearity is not a problem in this model. In addition, the Durbin Watson statistic has decreased to 1.6, still indicating no autocorrelation, however, not quite as good a model, although the t-statistics indicated that all of my variables were significant. My *%urban* variable's coefficient changed from negative to positive to agree with my theory. However, *Ln(income)* still remains negative and *deficit* changes from a positive to a negative coefficient. Where before *deficit* was insignificant, in this model, it is significant, but heteroscedasticity may be inaccurately reporting the t-statistic. The sign of *deficit*, seems to support Ricardian equivalence theory because consumption rates are negatively affected by deficits; when *deficit* increases, consumption levels decrease. The adjusted R squared also increased to 90.1 percent improving my overall model once the log of income was taken.

Tables 3 and 4:

Root MSE	0.003	Durbin Watson D	1.640	DF	20
Dependent Mean	0.086	Number of Observations	3138	Chi Square	133.58
Coeff. Var.	3.674	1st Order Autocorrelation	0.180	Pr>ChiSq	0.000
R Square	0.901				
Adj. R-Square	0.901				
F Value	5713.78				
Pr>F	0.000				

Variable	DF	Parameter Estimate	Standard Error	T Value	Pr> t	Variance Inflation
Intercept	1	0.465	0.002	155.68	<0.000	0
% Urban	1	0.000	0.000	4.86	<.000	1.513
Age	1	0.000	0.000	36.12	<.000	1.165
Ln(Income)	1	-0.043	0.000	-119.84	<0.000	2.493
%Employed	1	0.000	0.000	22.10	<0.000	2.038
Deficit	1	-4.349	1.740	-2.50	0.012	1.001

I concluded *age* must be the variable creating the heteroscedasticity because it was not normalized. I could not take the natural log of age to correct this, so I decided to try a general least-squares regression model.

$$(3) \hat{y} = \alpha + \beta_1(\%urban / Age) + \beta_3(Income / Age) + \beta_4(\%Employed / Age) + \beta_5(deficit / Age)$$

In the general least squares regression model, The Durbin Watson statistic improved to 2 but the chi-squared value was still 130.26 indicating heteroscedasticity (See Appendix 1). None of the coefficients' signs changed. The adjusted R squared value continued to increase to 93.92 percent. The general least squared regression was overall a better model but it did not remove the heteroscedasticity. My VIF's all appear to indicate no multicollinearity except for the VIF of $Ln(Income)/Age$. I feel this statistic may not be accurate because I divided through by Age^1 . However, it should not be a problem in my next regression.

Tables 5 and 6:

Root MSE	0.000	Durbin Watson	2.002	DF	23
Dependent Mean	0.002	D		Chi Square	130.26
Coeff. Var.	3.767	Number of Observations	3138	Pr>ChiSq	<0.000
R-Square	0.939	1st Order Autocorrelation	-0.001		
Adj. R Square	0.939				
F Value	8072.27				
Pr>F	<0.0001				

Variable	DF	Parameter Estimate	Standard Error	T Value	Pr>t	Variance Inflation
Intercept	1	0.458	0.002	153.67	<0.000	0
%Urban/Age	1	0.000	0.000	1.18	0.239	1.650
Ln(Income)/Age	1	-0.042	0.000	-117.37	<0.000	46.095
%Employed/Age	1	0.000	0.000	21.80	<0.000	3.101
Deficit/age	1	-5.050	2.196	-2.30	0.021	1.003

My final attempt to remove the problem was White's Heteroscedasticity Correction Model. This model gives an asymmetric covariance table so as to recalculate the standard errors. This allows the researcher to re-compute t-statistics not affected by the heteroscedasticity. In doing this, I used Equation 2, not the general least squared model.

Tables 7 and 8:

Variable	Intercept	% urban	age	Ln (income)	Deficit	% employed
Intercept	1.419E-05	5.98E-09	6.35E-09	-1.67E-06	-0.000	3.16E-08
%urban	5.98E-09	7.94E-12	2.33E-11	-7.87E-10	-1.67E-06	9.32E-12
age	6.35E-09	2.33E-11	3.72E-10	-2.47E-09	-1.1E-05	6.84E-11
Ln(income)	-1.67E-06	-7.87E-10	-2.47E-09	2.09E-07	9.09E-05	-4.92E-09
deficit	-0.000	-1.67E-06	-1.1E-05	9.09E-05	18.237	4.30E-06
%employed	3.16E-08	9.32E-12	6.84E-11	-4.92E-09	4.30E-06	2.86E-10

Variable	Parameter	Standard Error	T-Value
Intercept	0.465	0.003	123.527
%urban	0.000	2.818E-06	3.995
Age	0.000	1.927E-05	30.276
Ln(income)	-0.043	0.000	-94.197
%employed	0.000	1.692E-05	17.745
Deficit	-3.95275	4.270	-0.925

After calculating the accurate t-values, I found everything except *deficit* is significant, supporting my theory that *deficit* does not have a significant effect on consumption rates. Ricardian equivalence does not hold in my model because if Ricardian equivalence theory held, *deficit* would have a negatively significant coefficient. These results suggest that on a county level, consumers are not Ricardian; and fiscal policy will not have an effect on county consumption. All variables in Equation 2, after recalculating t-scores, had the appropriate signs to match my theory. As the %urban population increased, consumption levels rose. When the median Age increases, consumption still increases; the life-cycle model holds. *Ln(Income)* has a positive effect on consumption. %Employed still has a positive coefficient signifying as more people have jobs, the county will spend more.

The final step in order to appropriately estimate county consumption, because *deficit* is insignificant, requires running a final multiple regression by omitting this variable. The new model is

$$(4) \quad \hat{y} = \alpha + \beta_1(\%urban) + \beta_2(Age) + \beta_3(Income) + \beta_4(\%Employed)$$

This model has a slightly lower R-squared value, 90.09 percent, because *deficit* has been removed. Unfortunately, my model still contains heteroscedasticity indicated by a Chi-square statistic of 107.08. This value is lower than in any previous model but unfortunately, if I reported the standard errors and t-statistics, my model would be inaccurate. %Urban has a positive sign holding the idea that the cost of living in a city is more expensive than a rural area true. Age also has a positive sign modeling life cycle theory that as you age, you consume more. *Ln(Income)* has a negative sign, as income increases consumption rates decrease. %Employed has a positive sign agreeing with my theory that as the population is employed, they will have a steady income and will be able to consume more. The Durbin Watson statistic of 1.787 suggests this estimate is a better model than the one in equation 2.

Tables 9 and 10:

Root MSE	0.003	Durbin Watson D	1.632	DF	14
Dependent Mean	0.086	Number of Observations	3138	Chi Square	130.84
Coeff Var	3.677	Pr>ChiSq	<0.000	1st Order Autocorrelation	0.184
R-Square	0.901				
Adj. R-Sq	0.900				

Variable	DF	Parameter Estimate	Standard Error	T Value	Pr>t	Variance Inflation
Intercept	1	0.465	0.002	155.67	<0.000	0
%Urban	1	0.000	0.000	5.00	<0.000	1.510
Age	1	0.000	0.000	36.12	<0.000	1.165
Ln(Income)	1	-0.043	0.000	-119.87	<0.000	2.491
%Employed	1	0.000	0.000	22.11	<0.000	2.036

Once again, I recalculated these values using the asymptotic covariance matrix to report an accurate model. All of the variables are significant, supporting the strength of this model in comparison to others.

Table 11 and 12:

Variable	Intercept	% Urban	Age	Ln(Income)	% Employed
Intercept	0.000	6.07E-09	6.69E-09	-1.68E-06	3.17E-08
% Urban	6.07E-09	8.11E-12	2.40E-11	-8.01E-10	9.47E-12
Age	6.69E-09	2.40E-11	3.74E-10	-2.53E-09	7.00E-11
Ln(Income)	-1.68E-06	-8.01E-10	-2.53E-09	2.11E-07	-4.93E-09
% Employed	3.17E-08	9.47E-12	7.00E-11	-4.93E-09	2.86E-10

Variable	Parameter	Standard Error	T-Value
Intercept	0.465	0.003	123.307
% Urban	0.000	2.847E-06	4.066
Age	0.000	1.933E-05	30.206
Ln(Income)	-0.043	0.000	-93.970
% Employed	0.000	1.692E-05	17.761

The results of my regression do not support Ricardian equivalence theory. Consumers at a county level will not change consumption habits to pay for future taxes when the county government has a deficit. This model contradicts Barro's original model as well as the Keynesian belief that only good can come from budget deficits. Instead, it shows no relation between deficits and consumption rates.

Subsequently, the model supports Evans' approach to budget deficits. Even at a county level where consumers are more likely to be affected by an increase in taxes and benefits, consumers do not change their habits based on deficit spending. Evans shows that consumers do not save in proportion to future taxes; however, he still links his research to budget deficits, a

practice not supported in this paper. My results do not link deficits to consumption, but rather show consumption is independent of deficit levels.

My explanation is consumers, when they feel their benefits will increase with deficits, will not change their spending to save for future taxes. Consumers believe the benefits will increase their net wealth and therefore they will not need to cut current consumption in order to finance future taxes. For example, when the county issues school bonds to increase education expenditures, or simply increases school expenditures, holding all else constant, citizens will see a public good's quality increased. For instance, perhaps parents will not have to buy student textbooks because the school will provide books. Since parents do not have to buy a textbook, they will have more disposable income to spend on something else, maintaining current private consumption levels and increasing benefits.

In this respect, Ricardo may not have seen the full scope of his theory. Barro made the argument that Ricardian equivalence does hold, however other economists have pointed out that very special conditions must exist. In my model, Ricardian equivalence is not supported, though the specifications under the Barro model for the economy are also not met in this case.

IV. Conclusion

This model suggests that an increase in the level of county deficits has no significant effect on current private consumption. This contradicts much of the previous research, which ties private consumption levels to government deficit spending and may have important government spending policy implications. In particular, that the county government should not be discouraged from issuing bonds to fund public works projects. The two schools of thought argue that either deficits have some effect on private consumption but in the long run the net effect is zero, or, that an increase in deficits leads to an increase in interest rates and crowds out investment. This paper does not support either argument.

As deficits continue to be a problem for the economy, politicians and government leaders may need to strongly re-evaluate the consequences of running a budget deficit. While this study shows no significant relationship between deficits and private consumption, it does not examine the relationship between county debt and interest rates. Part of the Ricardian equivalence hypothesis draws a positive relationship between interest rates and the deficit. Little research exists at the county level and it may be an area for research in the future to help politicians make informed decisions about spending.

Since I did not use time-series data, further research might look at county consumption over time to determine both short and long run actions of consumers. My research specifically examines short-term effects, though a long-term study may be able to capture more of the trend in private consumption. It may also be possible a time lag exists with the effects of deficits on private consumption, which my model is not able to capture because it looks at one year.

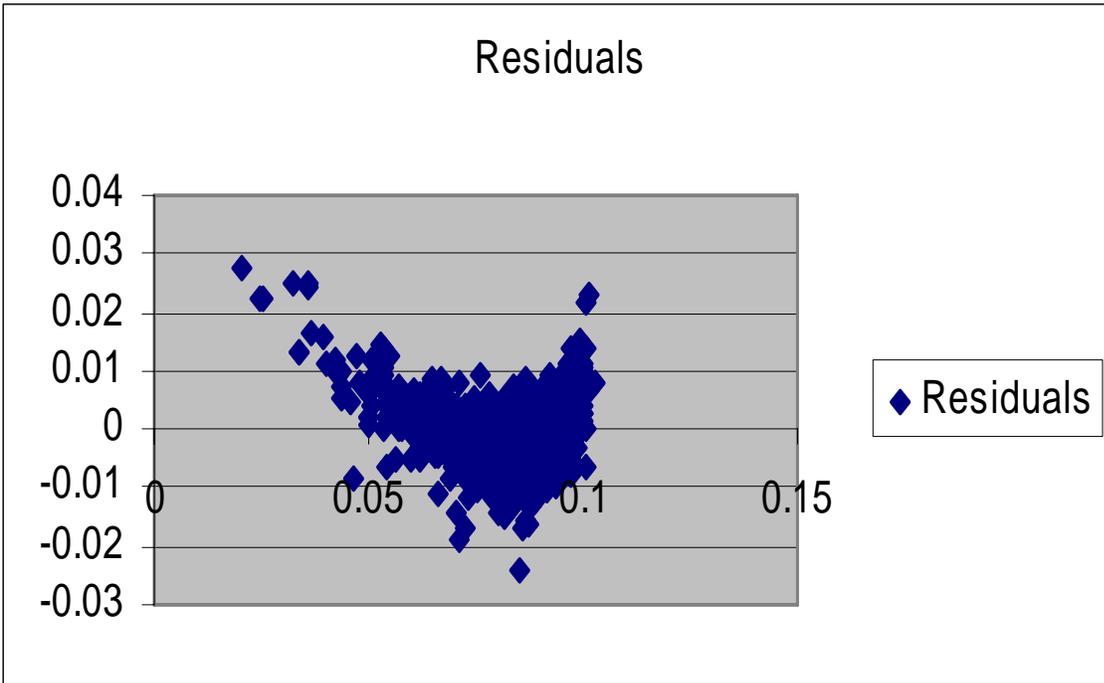
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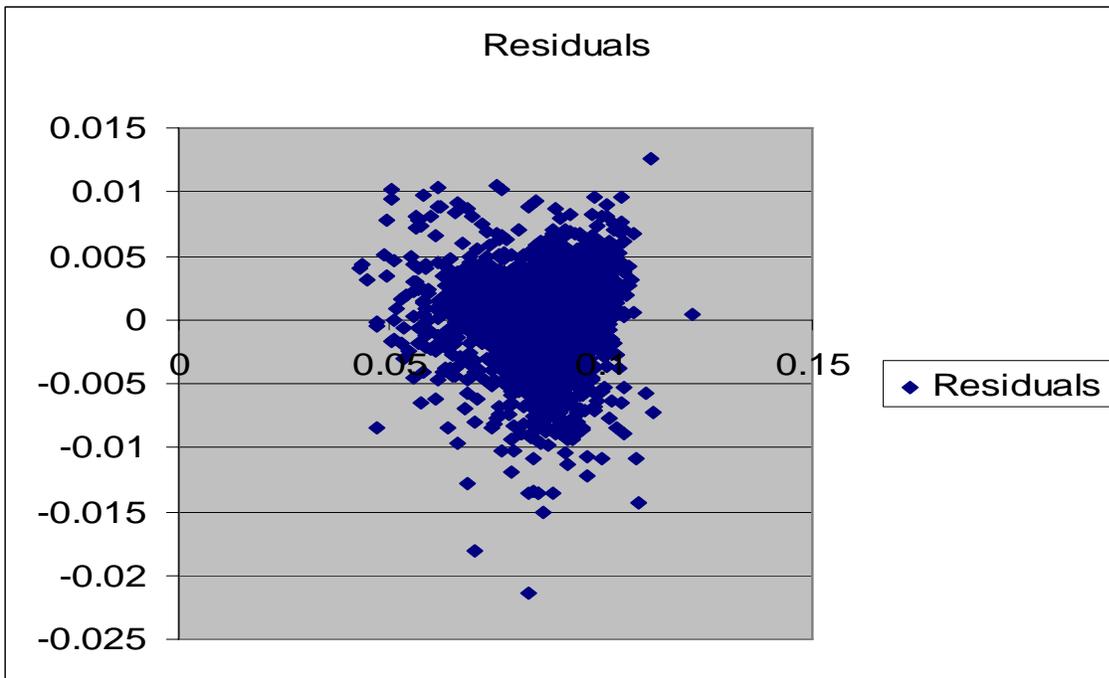
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VI. Appendix A: Graphs of Residuals from Regressions

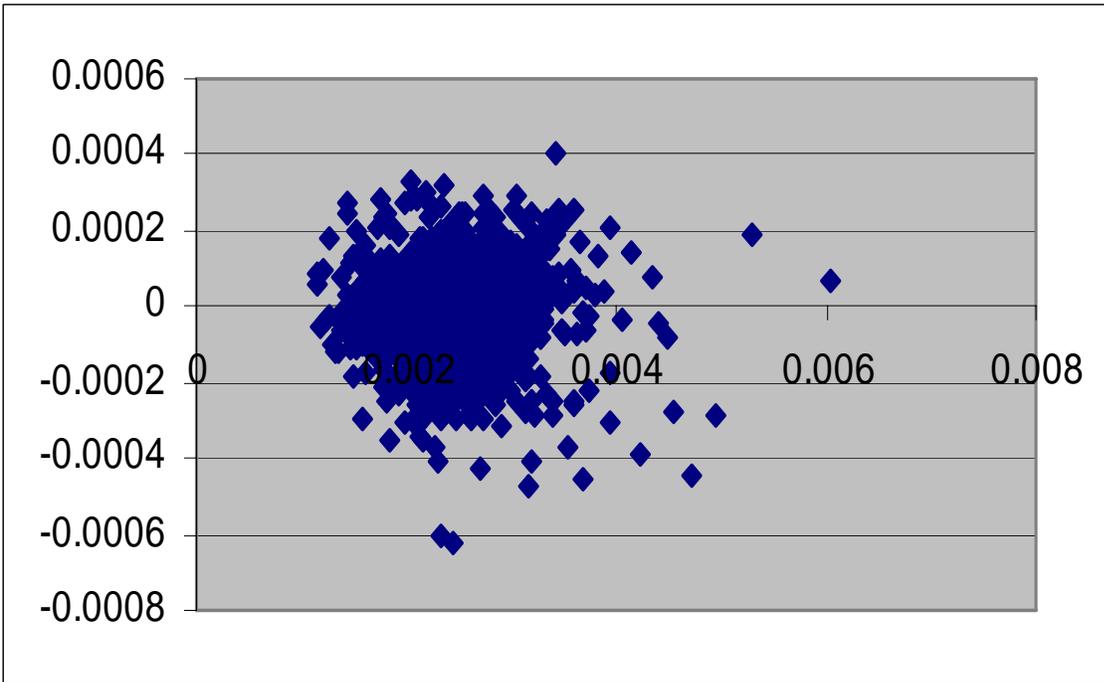
$$\hat{y} = \alpha + \beta_1(\%Urban) + \beta_2(\ln(Income)) + \beta_3(\%Employed) + \beta_4(deficit)$$



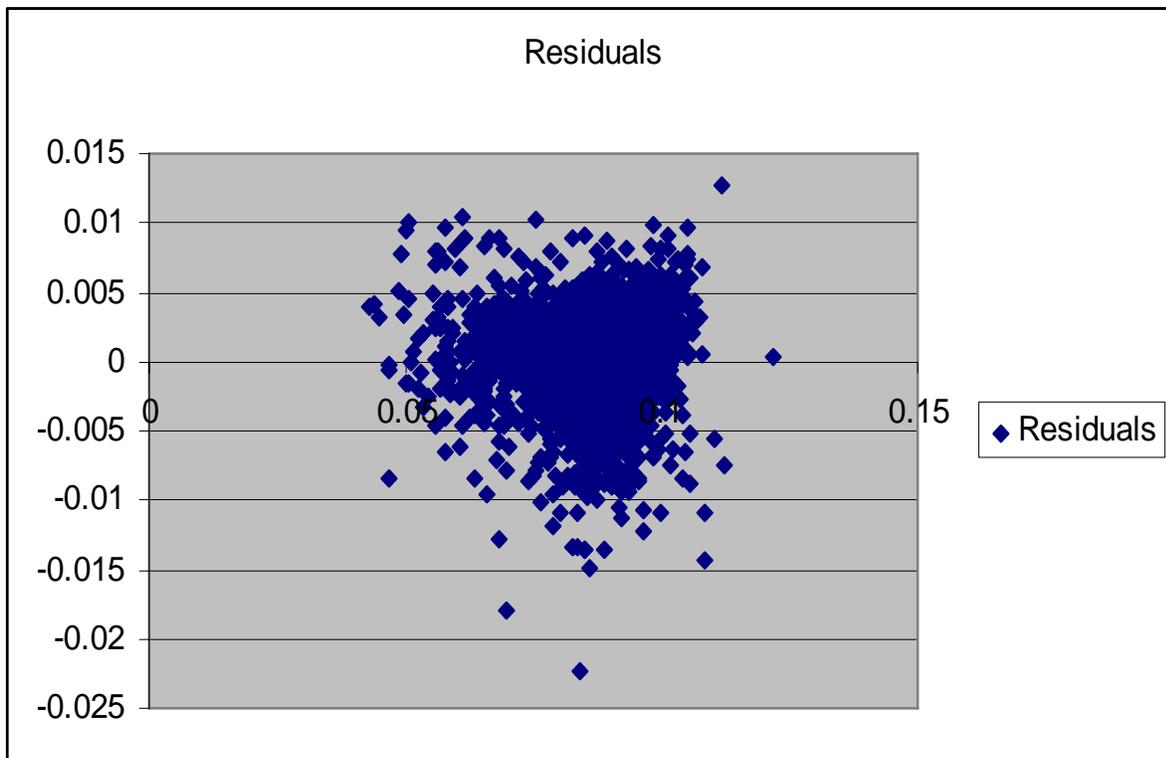
$$\hat{y} = \alpha + \beta_1(\%urban) + \beta_2(Age) + \beta_3(Income) + \beta_4(\%Employed) + \beta_5(deficit)$$



$$\hat{y} = \alpha + \beta_1(\%Urban / Age) + \beta_2(\ln(Income) / Age) + \beta_3(\%Employed / Age) + \beta_4(deficit / age)$$



$$\hat{y} = \alpha + \beta_1(\%urban) + \beta_2(Age) + \beta_3(\ln(Income)) + \beta_4(\%Employed)$$



VII. Endnotes

¹ Age was chosen because when its residuals were graphed against the independent variable it appeared to cause the most heteroscedasticity.