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Diminishing Health, Rising Health Care Costs and Long-run Growth in Local Government Spending

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Abstract

Real local government spending in the United States has increased by 240% between 1972 and 2012, faster than can be explained by population growth (a 48% increase), growth in median household income (a 32% increase), or changes in other economic, demographic, and institutional variables typically used to explain the pattern in local government spending. In this paper we examine the role of other potential drivers of local government growth such as growing income disparity, the increasing number of single female-headed households, increasing number of household living in mobile homes, rising healthcare costs, and diminishing health such as increasing in obesity (and associated physical health problems) as well behavioral problems such as hyperactivity, anxiety, depression, and violence associated with the changing diet of the American people. Since the 1970s, the obesity rate in the United States has increased from 12% to 35%. Using the obesity rate as a proxy for changing health, we find that increasing mental/emotional/physical health problems accounts for a significant portion of increased local government spending growth, particularly in human services such as education that require behavioral management. We also find that as local government spending in other spending categories decline with obesity. These findings suggest that deteriorating mental/emotional/physical health resulting from dietary changes and other factors has increased local government spending and shifted spending priorities.

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I. Introduction

Between 1972 and 2012 local government spending grew by 240 percent, much faster than can be accounted for by changes in income and demographics. Growth in government spending among industrialized countries has been studied by scholars for many years. Berry, et al. (2012) offer an excellent review of the research seeking to explain government growth, and then present a detailed empirical examination of the determinants of local government growth aggregated to the county level for all local units in the United States for years 1962 through 2002. While their analysis shows that a variety of economic, demographic and institutional factors explain a significant portion of growth, there is still much that remains unexplained. Their work, while very comprehensive, is similar to previous attempts at explaining growth in that the standard variables motivated by models of government (Median Voter—Bowen and Black, 1957; Leviathan—Brennan and Buchanan, 1980) and a range of other considerations do not fully explain the local government growth experience in the United States. The purpose of the present study is to consider other factors may have led to increased pressures on local governments. In particular, we consider changing cultural forces such as the growing income disparity, increasing numbers of female-headed households, increasing numbers of households living in mobile homes, increasing costs of health care, and deteriorating mental/emotional/physical health that has occurred over the past forty years.

As a prelude to the full analysis, our local government spending regressions show that income in the top income category, rising educational attainment, an aging population, and rising healthcare costs have led to small but significant increases in local government spending. Traditional factors such as population growth, median household income, and institutional features are also important. However, deteriorating emotional/mental/physical health (using the

obesity rate as a proxy for changing health) has led to substantial increases in local government spending in the United States over the 1972 to 2012 period; the average rise in the obesity rate is correlated with a 14% increase in overall local government spending, with spending on education and public safety increasing by 31% and 17%, respectively. Interestingly, increasing obesity is correlated with a drop in spending on other spending (capital outlays and other areas) by 8%. These results suggest that deteriorating societal mental/emotional/physical health has resulted in increased spending pressures at the local level primarily in provision of human services, and that these pressures also resulted in a reprioritizing of spending toward human services and away from other spending categories. In the next section, we provide a review of the most relevant literature on the growth of government and on the relationship between diet and mental/emotional/physical health problems. In section 3, we offer a discussion of the data and empirical approach we use in our evaluation. Section 4 presents the empirical analysis and findings, and section five concludes.

II. Literature Review

The literature review is divided into two components. In first part, we offer a limited discussion of the most relevant research that has addressed growth of government. This work includes both theoretical and empirical research. In the second portion of the review, we focus on research examining the effects of sugar and high fructose corn syrup (HFCS) consumption on mental/emotional/physical health. These studies include controlled clinical research (using rats) as well as research on humans. Below, we begin our discussion of the literature on government growth.

1. Growth in Local Government

Economists often times rely on the Median Voter Model as a starting point for understanding the demand for public goods and thus government spending patterns and pressures. As first argued by Bowen (1943) and Black (1958), the Median Voter Model suggests that a community's choice of public services under majority rule is the median of the individual demands; that is, under certain restrictive conditions, a political equilibrium under majority rule reflects the preferences of the median voter. Borcharding and Deacon (1972) and Bergstrom and Goodman (1973) use this framework to demonstrate that a jurisdiction's demand for public services depends upon the income of the median voter, the median (tax) price of the public good, the preferences of the median voter, as well as other variables that capture the demand side of the political process. This approach has been usefully applied to a wide range of empirical research to examine government spending and priorities. In general, this line of reasoning suggests that changing community economic and demographic forces ought to play a role in changing government spending levels, patterns, and priorities.

In this context, we consider a number of economic and demographic variables in our empirical analysis of local government growth, including county median household income, county household income of the top 10th percentile, county poverty rate, share of county households that live in mobile homes, county population, the share of county households with a single female head, share of county population over the age of 65, share of county population under that age of 18, and the share of county population that is white/Caucasian. It is somewhat difficult to summarize the anticipated effects of changing economic and demographic forces on different types of local government spending. Rising median incomes and higher levels of

education may lead to greater demand for some types of services such as education and public safety, and less for other services like welfare. Increasing mobile home rates, poverty, and single female-headed households are expected to reduce local government spending in general, but again poverty may lead to increased spending for other types of human services. While population growth is expected to have a positive impact on local spending, other demographic variables such as the shares of the population over the age of 65, under 18, and Caucasian may have mixed signs, depending on local government expenditure category.

Another approach to thinking about growth of government is that of Brennan and Buchanan (1980). In this framework, government is seen as having “leviathan” powers, and therefore citizens may call for constitutional constraints to limit government power to tax and issue debt.¹ Beginning the 1970’s both legislative and referenda processes have been used across the states to enact new tax and expenditure limitations (TELS) on local governments’ ability to tax and spend.² In our evaluation, it is important to include explanatory variables that characterize the imposition of newly imposed constraints on local government spending. However, as noted in Blankenau and Skidmore (2002), the imposition of TELS often times coincide with major changes in the financing of public schools, which increased state governments’ role in funding of k-12 education and significantly reduced local government education spending and control. Indeed, a number of new TELS applying to the local governments were imposed with the specific purpose of limiting local control. It is therefore also important to incorporate information on changes in school finance that occurred during the period of analysis through legislation or judicial rulings. Another strategy that might be used for the public sector to gain increased bargaining power over citizens and thus act as “leviathan” is to develop and support strong

¹ See Mueller, chapter 21 (2003) and Oates (1989) for more detailed discussions.

² See Skidmore (1999) for a review of the literature on TELS.

public sector unions. However, a number of states either have or have enacted “Right to Work” (RTW) laws, which may weaken the negotiating power of public sector unions because in RTW states employees are not required to pay union dues (Reed 2003). RTW legislation may also encourage efficiency and flexibility of government operations and thus reduce local spending. As we discuss in more detail in the next section, we control for these three institutional features in our analysis of local government growth.

There are also several other possible explanations of government growth. Wagner’s Law (1893) posits that government provided infrastructure complements private inputs in the production of economic output, which could lead government expansion as economies grow.³ Baumol (1967) proposed a “cost disease” explanation of government growth. Baumol observed that technology helps reduce the costs of goods production relative to the costs of service provision. Since government is relatively labor intensive and demand for most public services is generally inelastic, Baumol argues that government spending should grow more quickly than the general economy. Along similar lines, in general the costs of healthcare provision and insurance have grown rapidly over the period analysis. To address the increases in the costs of services, at least in part, we include a state level health care cost index in our analysis. While a health care cost index for providing services to public employees is not available to our knowledge, we use state health care spending as a proxy variable for the increases in cost of services.

While there are many empirical studies that have examined the growth of government in a variety of contexts, the overview presented here provides a basic theoretical foundation for our empirical analysis. To summarize, past research suggests that we should include an array of economic, demographic, and institutional factors in order explain variability in local government spending growth over time. Controlling for these factors will increase the confidence we have in

³ See Biehl (1998) and Peacock and Scott (2000).

our assessment of the effect of changing mental/emotional/physical health of citizens on local government spending. We now turn our attention to the research that links changing dietary patterns to deteriorating health.

2. Deteriorating Health

It is widely understood that medical advances have greatly expanded life expectancy in the United States through the 20th century. Between 1900 and 2000 life expectancy in the U.S. increased from 47 to 77 years; the revolution in healthcare has clearly resulted in significant improvements in both the length and quality of life. However, beginning in the late 1970s and early 1980s there was the emergence of a new set of health issues resulting from changing diet. Since the 1970s, the obesity rate increased from about 12 percent of the population nationwide in 1970 to 35 percent in 2014. Importantly, there is a strong association between obesity and chronic diseases such as type 2 diabetes, cardiovascular disease, several types of cancer (endometrial, postmenopausal breast, kidney, and colon), musculoskeletal disorders, sleep apnea, and gallbladder disease. Finkelstein (2003) estimates that obesity-attributed medical spending in 1998 was \$92 billion (in 2002 dollars). According to a recent study by Menke, et al. (2015), about half of the adult U.S. population is either diabetic or pre-diabetic.

What is perhaps less well-understood by the general public is the correlation between diet, obesity, and the diagnoses of mental/emotional disorders. Nationwide, the rates of depression, anxiety, and related disorders has been on the rise; as of 2010, 20% of U.S. citizens were taking at least one medication to treat a mental disorder. This alarming trend may have important implications for public education spending and other human service demands.⁴

⁴ To our knowledge, changing diet is not a significant determinant of increasing rates of autism. We note the increase here because it is correlated with general increase in other mental disorders that have also been on the rise.

What underlying societal changes may have contributed to declining societal mental/emotional/physical health? While this is a complex issue, one contributing factor is the marked change in diet that has occurred over time. Sugar consumption increased from 50 lbs per year per person to about 80 lbs between 1900 and 1950, but sugar intake stabilized between 1950 and 1980. Then sugar consumption resumed its upward trend, increasing to more than 100 lbs per person per year by the mid-2000s. The recent surge in sugar consumption is highly correlated with the development and marketing of high fructose corn syrup (HFCS) beginning in the mid-1970s. Corn subsidies made HFCS cheap relative to sucrose and so it rapidly became embedded in the U.S. food system, particularly in processed foods and drinks.

While understanding the effects of sugars and HFCS on physical health is important, in the context of the present study what is of greater relevance are the potential mental/emotional impacts. Numerous clinical studies show that excessive sugar consumption results in: Reduced impulse control and behavioral problems (Goldman, et al.,1986; Suglia, et al.,2013); hyperactivity and Attention Deficit and Hyperactivity Disorder (Prinz, 1980; Johnson, 2011; Schnoll et al., 2003; Howard, et al., 2011); depression (Shi et al., 2010; Westover, 2002); anxiety (Lien et al., 2006; Souza, 2007; anti-social and criminal behavior (Benton, 2007), reduced memory recall (Chepulis, et al. (2009), aggression (Werbach, 1992; Denson, 2010); and other negative cognitive impacts (Molteni, et al., 2002; Pan and She, 2011; Solnick and Hemenway, 2013; Ye, 2011). There is an even more specific literature on the detrimental effects of excessive fructose consumption on depression (Ledochowski, et al., 1998; Ledochowski, et al., 2000; Ledochowski, et al., 2001) as well as cognitive function (Stephan, et al., 2010; Lakhan and Kirchgessner, 2012; Chiavaroli,et al., 2014; Ross, et al., 2009).

In the context of the study of local government spending pressures, a citizenry with a reduced capacity for impulse control and increased mental/emotional issues may require increased attention from public sector human service professionals. Along similar lines, students who have reduced cognitive function and increased mental/emotional challenges may require supplemental educational services. The primary hypothesis in this study is that increased sugar consumption in general, and increased HFCS in particular, have led to new pressures on local governments. For example, we know from Hanushek and Rivkin (1996) that between 1970 and 1990 the pupil to staff ratio fell from 20.5 to 15.4 students, and that spending on non-instructional resources significantly outpaced instructional spending. Perhaps the observed changes in educational spending priorities are in part a response to deteriorating student mental/emotional health. Similarly, we might expect increased sugar intake among adults to lead to more erratic behavior among some people, particularly those who are hypoglycemic, and this may require additional public safety services. This is not to say that all those who consume excessive amounts of sugar and/or HFCS will experience the same types or degree of mental/emotional/physical health impacts. Some are more sensitive to excessive sugar consumption than others. Excessive sugar consumption for those with lower metabolism rates will lead to weight gain and the associated physical health problems such as hypertension and diabetes. Those who are hypoglycemic are more likely to experience significant emotional swings and impulsive/erratic behavior as a result of high and variable sugar/HFCS intake. Based on the large body of research, increased sugar/HFCS consumption in the general population appears to have played an important role in the observed changes in overall mental/emotional/physical health, and thus local governments may respond by adjusting spending levels as well as spending priorities.

Including subnational data on sugar and/or HFCS consumption would be the most direct approach to examine the potential sugar-health-local government spending linkages, but unfortunately subnational data on sugar consumption are to our knowledge unavailable. However, given that the obesity rate is correlated with sugar consumption over the period of analysis, we use the state level obesity rate as a proxy for reduced mental/emotional/physical health resulting from increased sugar (and/or HFCS) consumption. Unavailability of county level obesity data introduces potential aggregation issues; even so this analysis offers a first empirical examination of the role of changing diet and the associated deterioration of mental/emotional/physical health on local government spending. To reiterate, obese people do not necessarily exhibit mental/emotional problems. Excessive sugar consumption affects people differently; some may gain weight, others may experience emotional swings, reduced impulse control, difficulties with cognition, whereas others may experience minimal impacts. The obesity rate serves as proxy for the potential linkages between declining health associated with sugar/HFCS consumption and local government spending. In the next section, we offer a more complete description of the data and empirical approach we use to evaluate the determinants of local government spending growth, with an emphasis on health.

III. Data and Empirical Approach

Our local government fiscal data come from the United States Census of Governments. Data are aggregated to the county level and include revenues and expenditures for all the overlying jurisdictions: county government, municipalities, townships, school districts, and special districts. The data for the overlying jurisdictions are available in five-year intervals (1972, 1977, 1982, 1987, 1992, 1997, 2002, 2007, and 2012). Summary statistics for local government fiscal

information and the explanatory variables are found in Tables 1 and 2, respectively. Appendix Table A provides definitions and data sources for all variable used in the analysis. We estimate regressions for total revenue, own source revenue, intergovernmental revenue, current operating expenditures, and capital outlays (see Table 3), as well as for the following spending categories: Total expenditures, k-12 education expenditures, public safety expenditures, utilities and waste, and all other expenditures (see Table 4).

The economic and demographic variables come from the United States Census Bureau (1970, 1980, 1990, 2000, and 2010) and the Minnesota Population Center (2011). We use linear trends to match the ten year Census data with the five year government finance data. Data on Right to Work (RTW) laws were collected from the United States Department of Labor (2009). Detailed information on tax and expenditure limitation laws come from the Advisory Commission on Intergovernmental Relations 1995) and Amiel, et al. (2009), and data for school finance reform are from Jackson, et al. (2014). RTW is characterized as an indicator variable (yes=1 and no=0) for whether or not a state has RTW legislation. We capture TEL activity with a count of the number of TELs that apply to each type of local unit. While some TELs are much more restrictive than others, the count variable captures the average effect of newly imposed TELs on revenue/spending growth over time. To account for changes in school finance, we include a count variable for the number of legislative or judicial school finance reforms within a given state. We expect school finance reforms to increase overall education spending, but also reapportion spending responsibilities away from local own sources to state intergovernmental transfers. However, the effect on aggregate local spending for all overlying jurisdictions is ambiguous. One the one hand, increased state assistance for education will give aggregate local spending a boost. We also know that increase state spending was coupled with reductions

property tax burden and thus local spending for schools. Further, the reduction in school property taxes may have provided an opportunity for municipalities and other overlying jurisdictions to gain support from citizens to increase spending in other local public services. Finally, state level data on the obesity rate is taken from the National Center for Disease Control and Prevention (CDC). The CDC began to track obesity in 1985; thus data for back years 1982, 1977, and 1972 were generated using information on state trends from 1985-2010 in combination with national obesity rate trends from 1970 and 1985.⁵

If our primary hypothesis is correct, we expect to see a positive coefficient on human service-related spending, but perhaps not all local government revenue/expenditure variables. We expect positive coefficients on “human service” spending variables such as education and public safety. However, increased pressures to manage mental/emotional/physical health-related issues may lead local decision makers to reprioritize spending away from “non-human service” expenditures to “human service” expenditures. As overall health diminishes, we may see reductions in capital expenditures and other non-human service-oriented expenditures.

Our logarithmic specifications are based on the following equation:

$$Exp_{ij} = Econ_{it}\alpha_1 + Pop_{it}\alpha_2 - Inst_{it}\alpha_3 + Health_{it}\alpha_4 + c_i + t_t + e_{it} \quad (1)$$

where **Exp** represents the natural logarithm of local expenditure (or revenue) for county i in period t for expenditure category j, **Econ** represents a vector of economic variables that include the natural logarithm of median household income, the natural logarithm of income of the top 10 percent of households, the poverty rate, and the share of population that lives in a mobile home. **Pop** represents a vector of demographic characteristics, including the share of households headed by a single female, share of the population over the age of 65, share of population under the age

⁵ Data on obesity were unavailable for a few states between 1985 and 1992; in those cases we also extrapolated to obtain obesity estimates. The obesity rate was flat from 1972 until about 1980, and then it began a steady trend upward; extrapolating to obtain estimates of prior years is a straightforward task.

of 18, the share of the population that is Caucasian, and *Inst* is a vector of institutional variables that includes variables that indicate whether or not a state is a RTW state, the number of tax and expenditure limitations, and the number of school finance reform efforts. Finally, *Health* includes two variables—a health care cost index and the share of the state population that is obese.⁶ *C* represents a vector of county level fixed effects and *t* is vector of time effects; the coefficients on vector of time effects can be interpreted as the growth in spending not explained by the the independent variables. We estimate two-way fixed effects regressions using a cluster approach in which we cluster our standard errors at the county level to address temporal autocorrelation. Cluster-standard errors perform well when the number of clusters is reasonably large (Bertrand et. al., 2004; Kezdi, 2004). This specification is convenient in the sense that the coefficients on the key variables can be interpreted as elasticities. Expenditure/revenue categories included in *j* are: Total local government expenditure/revenue from all overlying jurisdictions; own source revenues, intergovernmental transfers from state and federal governments, operating expenditures, capital expenditures, K-12 education expenditures, public safety expenditures, utilities and waste, and all other expenditures.

Figure 1 illustrates trends over time in total local government revenue, own source revenue, intergovernmental transfers, median household income, top 10% income, and obesity. From the graph it is clear that median household income grew much more slowly than did local government revenues. In fact, in 2002 median household income began to fall. However, top 10% income and obesity tended to match the trend upward in local revenues/spending. Though not on the graph, the share of household living in mobile homes also increased substantially over the period; the county average increased from 6.1% to 14.9% between 1972 and 2007. These

⁶ To capture changes in health care costs, we create an index for state level health spending, including Medicare and Medicaid. In the absence of a true subnational health care cost index that spans the period of analysis, we use this index as a proxy for the increasing costs of providing medical services.

trends suggest that in order to isolate the effect of obesity we must control for other changing factors. In addition, since we are using two-way fixed effects we rely on the within county variation in in our dependent variables to generate the coefficient estimates. Figures 2 and 3 together demonstrate that there is significant variation across space and over time in local government revenues/spending and obesity. These figures suggest that there is an opportunity to capture a potential relationship between local government spending and obesity with the two-way fixed effects regressions. Next, we now present the estimates generated from our regression analysis.

IV. Empirical Analysis

Consider first the estimates presented in Table 3, which include regressions for total local government revenue, own source revenue, intergovernmental revenue, operating expenditures, and capital outlay. With the exception of capital outlay which has an R^2 of 0.36, the regressions capture most of the variation in local government spending/revenues; between 81 and 91 percent of the variation in local government spending/revenues. Note, however, that the coefficients on the time indicator variables reveal a trend of local government growth that is unaccounted for by the explanatory variables. The coefficient on the 2012 indicator variable in column 1 indicates that about 110% of the 240% growth in local revenues over the period is unaccounted for by the other explanatory variables. Most of this unaccounted for growth is generated from increases in intergovernmental transfers as shown in the column 3 regression, whereas the own source revenue regression reported in column indicates the most growth is accounted for by the explanatory variables. The unexplained trend in local government growth, and especially intergovernmental transfers, is consistent with Berry, et al. (2012). Nevertheless, the regressions

capture a substantial portion of growth and a number of variables are statistically significant and of meaningful magnitude.

Before discussing the role of obesity/health in local government spending growth, consider the coefficients on the control variables. In this portion of the discussion, we focus on the total, own source, and intergovernmental revenue regressions. We leave it to the reader to peruse the operating and capital outlay estimates. Median income is a positive and statistically significant determinant of total and own source revenues, and the elasticity estimate is in the range of other studies, though somewhat smaller than the elasticity estimate reported in Berry, et al. (2012). The coefficients on income of the top 10% and the percent of people with a college degree are also positive and statistically significant in the total and own source regressions; the rising income of the highest income earners and college graduates appear to drive local spending higher than that demanded by the median household. Interestingly, the share of households living in mobile homes is also a significant and positive determinant of total and own source local government revenues; a higher proportion of mobile home dwellers may place additional pressures on local governments even though the revenue generating capacity of mobile homes is less than traditional housing. Also, increasing costs of health care has generated positive and statistically significant spending pressures on local governments, but the magnitude of the coefficient is not large.

Turning to the demographic and institutional variables, we see that population is a positive and significant determinant of local revenues. The elasticity estimate on population is about 1; that is, for every 1% increase in population local spending increases by about 1%. However, the coefficient on the share of households headed by single females is insignificant. The elderly population has a significant and small positive effect on local government growth. Also note that

counties with fewer school age children have lower overall growth, and this is driven by reductions in intergovernmental transfers. Finally, counties with a higher share of Caucasian population tend to have higher own source but lower intergovernmental transfers. The institutional variables are also statistically significant. RTW laws and TELs have a reduce local revenue growth, whereas school finance reforms serve to substantially increase intergovernmental revenues and decrease own source revenues, but the net effect on overall local government spending/revenues is positive over the period of analysis. In general, these results are consistent with our *a priori* expectations. We now turn our attention to our primary interest in the role of changing mental/emotional/physical health using the obesity rate as a proxy for overall health.

The coefficient on obesity is large and highly significant in the total and own source revenue regressions. A coefficient of 0.75 in the total revenue model indicates that an average increase in a county's obesity rate resulted in a 14% rise in local government revenues/spending, where the increase is primarily attributable to increased own source revenue of 20%. Also note that operating expenditures increased substantially with obesity, but obesity reduces capital outlay. These estimates support the notion that reduced mental/emotional/physical health may have altered local government priorities away from "non-human" services expenditure categories to "human services" to address changing societal needs.

To gain additional insight on this potential pattern, consider the regressions of various local spending components presented in Table 4. In these regressions we focus on the obesity coefficients, leaving reader to review the other variable coefficients on his/her own. The coefficient on obesity in the education spending regression is large, indicating that declining mental/emotional/physical health as proxied for with obesity is responsible for about 31% of the

growth in education spending between 1972 and 2012. Given that education spending grew by more than 290% over the period, changes in obesity accounts for about 11% of the growth in education spending. Outside of the increase in population, changing health (using obesity as proxy) is the single largest contributor to increased education spending over this period. Public safety spending also increased by 17%. Note, however, that capital and all other spending fell by 8% as obesity increased. Overall, the estimates provide support for the hypothesis that declining mental/emotional/physical health has resulted in increased overall local government spending pressures as well as a shift in spending priorities toward “human services” and away from capital and other “non-human service” spending categories.

While this analysis offers new findings, they are not definitive. One important consideration is that we may have significant aggregation bias; our obesity measure is aggregated to the state level, whereas our local government data are aggregated to the county level. Consider Figure 4, which presents plots between the residual generated from a total local government total revenue regression (without the obesity and time indicator variables) and the obesity variable. In Panel A the residual is generated from a regression in which $\ln(\text{Local Revenues})$ is the dependent variable. Also presented is a simple regression where the residual is regressed against a constant term and obesity (with t-value in parentheses). The plot and simple regression reveal a modest positive correlation between the residual and obesity. As a further examination, we also present a similar plot except the residual is generated from a regression in which local revenues per capita is used as the dependent variable. This plot and associated simple regression shows a stronger positive association between the residual and obesity. This additional analysis provides some additional evidence regarding the changing diet-diminishing health-increased local government

spending hypothesis. It is also important to acknowledge that obesity does not fully capture changes in health over time; it is, however, the best available proxy we could find.

V. Implications and Conclusions

In this study we consider a wide array of potential determinants of long-run growth in local government spending/revenues. Of particular interest is the potential role of changing diet and the associated diminishing mental/emotional/physical health of citizens and the potential impact on local revenue/spending growth and priorities. Given that data on actual dietary intake is to our knowledge unavailable at the subnational level, we use as a proxy the state obesity rate, which increased nearly three-fold between 1970 and 2014. Importantly, while the rise in obesity occurred nationwide the timing and rate of increase in obesity varies across the states.

Controlling for county and time fixed effects and a range of socio-economic factors, our regression analysis suggests that diminishing health as measured by increasing obesity is associated with sizable increases in total local spending (+14%), education spending (+31%), and public safety spending (+17% increase). Interestingly, as the obesity rate rises we observe decreases in capital outlay (-14%), and other expenditures (-14%). These estimates offer support for the hypothesis that diminishing mental/emotional/physical health associated with changing diet has placed new pressures on local governments, particularly in the areas of education and public safety. As a robustness check, in regressions that are not reported but are available from the authors upon request, we also included county-specific time trends in the specifications. In these estimates the effect of obesity on education spending and intergovernmental transfers retain statistical significance. However, obesity in the other revenue/expenditure categories retain their signs but lose statistical significance. These estimates indicate that diminishing health has had the largest and most robust impact in the provision of educational services.

These findings, though not conclusive, may inform policies. First, the clinical, biological, and sociological research offers evidence that diet can and does have important effects not just on physical but also mental and emotional health. When education officials face student behavioral challenges, one low cost intervention is to conduct a basic evaluation of diet and if needed recommend adjustments. It may be that a child is particularly sensitive to sugars and therefore exhibits erratic behavior and reduced educational performance. Similarly, poor diet can lead to erratic and potentially violent behavior among adults. Research by Benton (2007) suggests that dietary changes may reduce anti-social behavior. Clearly, not all trouble cases in schools or communities can be resolved with dietary change.

More generally, if diet is leading to mental/emotional/physical health issues, and this in turn is leading to negative externalities in form of higher health care needs and increased government spending on human services, then this is a justification for increasing the price of sugar via the elimination of subsidies and perhaps the addition of taxes. The estimates provided in this paper may inform the range of the price change that may be needed to correct for the externality.

As society became more aware of the detrimental health effects of smoking and alcohol consumption, government implemented warning labels, informational campaigns, and limited advertising. For example, cigarette advertising targeted at children is now prohibited, and for good reason. No such limitations exist in the case of sugar and in fact advertising for high sugar content such as soda are explicitly targeted at young people (Kraak V, Pelletier, 1998). In conclusion, the scientific evidence revealing the detrimental mental/emotional/physical effects of excessive sugar/HFCS consumption is substantial. This study adds to both the literatures on diet/health and local government public finance by offering new evidence of the implications of eroding health associated with changing diet for local government service provision. Our hope is

that this work in conjunction with other research will serve to motivate and inform both public discussion and policy responses.

Finally, despite the inclusion of a wide range of explanatory variables, a significant portion of local government growth is unaccounted for. The largest portion of unexplained growth is attributable to intergovernmental revenues. Within specific spending categories, most of the unaccounted for growth in spending is found in the public safety and utilities and waste categories. The growth in public safety spending may partly be the result of increased pressures from drug enforcement; nationally the number of drug-related arrests increased from about 500,000 to 1.5 million over the 1982 to 2007 period. While factors such as changing health examined in the present study offer new insights about changing local government spending pressures and priorities, further research is needed to account for more of the unexplained growth in local government revenues/expenditures.

Table 1: Summary Statistics for Local Government Revenues and Expenditures

	1972	1977	1982	1987	1992	1997	2002	2007	2012
Revenues									
Total Revenue	148,003 (973,309)	179,200 (1,099,747)	196,631 (1,057,892)	253,491 (1,429,411)	301,538 (1,733,840)	355,562 (1,925,368)	416,278 (2,036,159)	516,991 (2,831,187)	503,687 (2,547,815)
Intergovernmental Revenue	52,853 (360,064)	72,548 (442,998)	75,329 (410,561)	87,605 (490,594)	104,781 (618,409)	125,558 (685,593)	159,861 (861,237)	178,078 (916,561)	177,593 (902,878)
Own-Source Revenue	95,151 (619,007)	106,651 (661,071)	121,301 (654,801)	165,886 (954,393)	196,757 (1,136,043)	230,004 (1,264,293)	256,417 (1,207,506)	338,912 (1,937,942)	326,094 (1,670,545)
Expenditures									
Total Expenditures	152,301 (1,025,566)	178,176 (1,037,893)	194,717 (1,028,255)	249,223 (1,365,191)	302,950 (1,684,290)	347,854 (1,816,338)	434,396 (2,273,508)	499,333 (2,558,281)	500,899 (2,564,061)
Current Operations	110,093 (692,887)	133,462 (738,788)	147,724 (737,221)	184,688 (931,241)	227,113 (1,132,099)	263,015 (1,231,441)	328,366 (1,579,184)	382,120 (1,788,537)	396,388 (1,861,249)
Capital Outlays	24,415 (148,025)	25,026 (111,655)	26,200 (130,827)	32,295 (164,228)	38,721 (217,762)	45,670 (240,881)	62,517 (326,132)	70,408 (370,557)	64,003 (411,021)
Education	59,846 (250,127)	64,984 (247,001)	65,684 (233,131)	83,140 (309,239)	103,451 (382,294)	121,483 (422,833)	156,243 (592,468)	177,563 (668,992)	174,025 (658,534)
Public Safety	7,549 (67,938)	10,222 (75,282)	12,296 (72,726)	17,672 (114,388)	23,264 (150,085)	27,566 (169,367)	34,218 (203,450)	38,598 (208,907)	40,475 (219,459)
Utilities and Waste	18,222 (142,832)	25,831 (159,934)	34,135 (206,485)	42,886 (251,180)	47,869 (303,525)	51,954 (318,990)	62,149 (364,528)	72,954 (420,069)	77,505 (494,284)
All Others	65,408 (589,598)	75,508 (597,303)	81,077 (567,439)	103,726 (735,739)	126,324 (887,929)	144,924 (954,276)	179,488 (1,168,759)	207,479 (1,326,321)	205,400 (1,237,921)

Standard deviation in parentheses. Adjusted to 2009 dollars, in thousandths.

Table 2: Summary Statistics for Control Variables

	1972	1977	1982	1987	1992	1997	2002	2007	2012
Economic									
Median Income	32,589 (8,318)	34,961 (7,982)	37,508 (8,593)	40,317 (10,074)	43,798 (11,365)	48,285 (12,042)	49,402 (11,897)	45,450 (10,965)	43,078 (10,995)
Top Ten Income	67,114 (11,984)	69,415 (11,016)	74,276 (13,134)	83,006 (19,444)	102,348 (26,244)	137,652 (40,322)	172,553 (41,820)	206,799 (20,575)	241,054 (17,097)
Poverty Rate	0.163 (0.089)	0.139 (0.071)	0.126 (0.062)	0.129 (0.065)	0.126 (0.066)	0.144 (0.060)	0.119 (0.057)	0.149 (0.059)	0.168 (0.062)
Pct BA Degree	0.080 (0.040)	0.100 (0.047)	0.116 (0.054)	0.126 (0.059)	0.138 (0.065)	0.153 (0.071)	0.168 (0.077)	0.182 (0.083)	0.191 (0.084)
Mobile Home Rate	0.057 (0.038)	0.071 (0.042)	0.085 (0.049)	0.102 (0.060)	0.0114 (0.070)	0.119 (0.076)	0.122 (0.083)	0.126 (0.085)	0.133 (0.094)
Demographic									
Population	66,738 (260,062)	70,492 (260,672)	74,160 (266,738)	77,695 (280,204)	81,917 (294,667)	87,166 (309,971)	92,094 (323,254)	96,468 (333,243)	99,107 (339,563)
Female HH Rate	0.074 (0.026)	0.080 (0.029)	0.085 (0.032)	0.092 (0.036)	0.098 (0.038)	0.102 (0.039)	0.106 (0.040)	0.110 (0.041)	0.118 (0.045)
Pct Over 65	0.113 (0.036)	0.119 (0.037)	0.126 (0.039)	0.135 (0.040)	0.140 (0.040)	0.139 (0.039)	0.141 (0.039)	0.146 (0.038)	0.149 (0.039)
Pct Under 18	0.338 (0.038)	0.311 (0.035)	0.290 (0.033)	0.276 (0.033)	0.266 (0.032)	0.259 (0.031)	0.251 (0.031)	0.240 (0.031)	0.234 (0.032)
Pct White	0.896 (0.151)	0.890 (0.148)	0.884 (0.148)	0.880 (0.149)	0.872 (0.151)	0.858 (0.155)	0.848 (0.158)	0.841 (0.159)	0.836 (0.161)
Institutions									
Right to Work	0.535 (0.499)	0.555 (0.496)	0.555 (0.496)	0.570 (0.495)	0.570 (0.495)	0.570 (0.495)	0.596 (0.490)	0.596 (0.490)	0.623 (0.484)
Tax & Expenditure Limits	3.730 (1.397)	3.940 (1.581)	4.873 (2.139)	5.155 (2.351)	5.783 (2.860)	5.979 (3.116)	6.069 (3.196)	6.099 (3.200)	6.099 (3.200)
School Finance Reform	0.127 (0.333)	0.501 (0.658)	0.620 (0.700)	0.836 (0.696)	1.365 (1.168)	1.809 (1.122)	2.062 (1.225)	2.373 (1.355)	2.454 (1.393)
Health									
Public Health Cost Index	71.36 (10.52)	80.86 (14.65)	83.64 (16.02)	100 (0)	128.75 (23.06)	130.81 (30.20)	149.27 (37.85)	155.89 (39.61)	162.51 (48.51)
Obesity Rate	0.097 (0.012)	0.102 (0.013)	0.111 (0.014)	0.123 (0.015)	0.150 (0.019)	0.172 (0.022)	0.229 (0.023)	0.272 (0.024)	0.291 (0.029)

Standard deviation in parentheses. Adjusted to 2009 dollars.

Table 3: Local Government Growth Regressions – All Local Units

All Units	Total Revenue	Own-Source Revenue	Intergov Revenue	Current Operations	Capital Outlays
1977	0.144*** (0.00608)	0.0194** (0.00849)	0.311*** (0.00740)	0.163*** (0.00551)	0.176*** (0.0215)
1982	0.250*** (0.0102)	0.130*** (0.0142)	0.412*** (0.0119)	0.282*** (0.00911)	0.0961*** (0.0297)
1987	0.396*** (0.0134)	0.273*** (0.0186)	0.559*** (0.0156)	0.447*** (0.0120)	0.175*** (0.0372)
1992	0.467*** (0.0181)	0.312*** (0.0249)	0.688*** (0.0210)	0.549*** (0.0165)	0.280*** (0.0486)
1997	0.574*** (0.0222)	0.394*** (0.0304)	0.847*** (0.0263)	0.652*** (0.0203)	0.471*** (0.0597)
2002	0.640*** (0.0287)	0.396*** (0.0398)	1.005*** (0.0340)	0.741*** (0.0264)	0.590*** (0.0766)
2007	0.732*** (0.0340)	0.506*** (0.0479)	1.072*** (0.0408)	0.817*** (0.0315)	0.718*** (0.0914)
2012	0.740*** (0.0368)	0.518*** (0.0518)	1.075*** (0.0440)	0.839*** (0.0344)	0.765*** (0.0984)
ln(Median Income)	0.0826*** (0.0302)	0.0976** (0.0422)	0.0503 (0.0336)	0.0249 (0.0253)	0.161** (0.0783)
ln(Top Ten Income)	0.0209** (0.0106)	0.0264* (0.0157)	-0.00181 (0.0144)	0.0116 (0.0102)	0.185*** (0.0349)
Poverty Rate	-0.398*** (0.0984)	-0.986*** (0.138)	0.308** (0.126)	-0.329*** (0.0922)	-1.787*** (0.275)
Pct BA Degree	0.360*** (0.0724)	0.614*** (0.0962)	-0.125 (0.100)	0.302*** (0.0665)	0.488** (0.195)
Mobile Home Rate	0.304*** (0.0664)	0.570*** (0.0956)	0.0862 (0.0793)	0.194*** (0.0592)	0.432** (0.185)
ln(Population)	0.965*** (0.0128)	1.095*** (0.0175)	0.756*** (0.0154)	0.947*** (0.0124)	1.008*** (0.0305)
Female HH Rate	0.0992 (0.139)	0.00957 (0.114)	0.201 (0.167)	0.141 (0.164)	-0.752 (0.530)
Pct Over 65	0.306* (0.175)	0.328 (0.238)	0.324 (0.208)	0.600*** (0.166)	-0.784* (0.420)
Pct Under 18	0.842*** (0.168)	-0.216 (0.241)	2.027*** (0.190)	1.058*** (0.160)	0.213 (0.402)
Pct White	0.0496 (0.0583)	0.307*** (0.0810)	-0.191** (0.0768)	6.67e-05 (0.0561)	-0.0740 (0.176)
Right to Work	-0.0687*** (0.0118)	-0.0683*** (0.0172)	-0.0760*** (0.0131)	-0.0542*** (0.0109)	-0.214*** (0.0340)
Tax & Expenditures Limits	-0.00131** (0.000646)	-0.00324*** (0.000915)	0.000124 (0.000807)	-0.00145** (0.000580)	0.000191 (0.00201)
School Finance Reform	0.00971*** (0.00230)	-0.0154*** (0.00338)	0.0326*** (0.00302)	0.00621*** (0.00208)	-0.0244*** (0.00621)
Public Health Cost Index	0.000264*** (7.87e-05)	0.000678*** (0.000116)	-0.000161* (8.30e-05)	0.000274*** (7.03e-05)	0.000467** (0.000213)
Obesity Rate	0.746*** (0.140)	1.111*** (0.212)	0.282 (0.180)	0.748*** (0.128)	-0.782** (0.379)
Constant	-0.684** (0.343)	-2.639*** (0.485)	0.853** (0.409)	-0.115 (0.309)	-5.092*** (0.888)
Observations	27,961	27,961	27,960	27,961	27,948
R-squared	0.892	0.816	0.836	0.913	0.357
Number of Units	3,107	3,107	3,107	3,107	3,107

Dependent variables in log form. Cluster-robust standard errors in parentheses. Time fixed effects included. ***p<0.01, **p<0.05, *p<0.1

Table 4: Local Government Expenditure Category Regressions

All Units	Total Expenditures	Education	Public Safety	Utilities & Waste	All Others
1977	0.145*** (0.00661)	0.0955*** (0.00796)	0.309*** (0.0105)	0.467*** (0.0263)	0.152*** (0.0106)
1982	0.237*** (0.0105)	0.136*** (0.0114)	0.628*** (0.0163)	0.765*** (0.0354)	0.231*** (0.0170)
1987	0.397*** (0.0133)	0.314*** (0.0147)	0.837*** (0.0210)	0.956*** (0.0433)	0.372*** (0.0219)
1992	0.485*** (0.0179)	0.416*** (0.0195)	0.945*** (0.0279)	1.063*** (0.0555)	0.436*** (0.0301)
1997	0.581*** (0.0219)	0.505*** (0.0239)	1.055*** (0.0336)	1.200*** (0.0671)	0.557*** (0.0373)
2002	0.666*** (0.0284)	0.542*** (0.0306)	1.163*** (0.0437)	1.375*** (0.0834)	0.683*** (0.0489)
2007	0.742*** (0.0338)	0.557*** (0.0361)	1.272*** (0.0518)	1.652*** (0.0977)	0.787*** (0.0583)
2012	0.761*** (0.0366)	0.508*** (0.0389)	1.356*** (0.0561)	1.846*** (0.106)	0.844*** (0.0629)
ln(Median Income)	0.0538* (0.0295)	-0.0115 (0.0256)	0.0398 (0.0422)	0.285*** (0.0713)	0.0198 (0.0464)
ln(Top Ten Income)	0.0377*** (0.0110)	-0.00423 (0.0105)	0.0710*** (0.0221)	-0.0190 (0.0326)	0.0956*** (0.0188)
Poverty Rate	-0.539*** (0.101)	-0.568*** (0.106)	-0.952*** (0.177)	-3.068*** (0.306)	-0.408** (0.180)
Pct BA Degree	0.379*** (0.0726)	0.343*** (0.0859)	-0.298*** (0.115)	-0.714*** (0.211)	0.558*** (0.118)
Mobile Home Rate	0.302*** (0.0665)	0.607*** (0.0682)	0.547*** (0.105)	0.101 (0.206)	-0.0845 (0.119)
ln(Population)	0.953*** (0.0133)	0.951*** (0.0146)	1.132*** (0.0199)	0.872*** (0.0392)	0.973*** (0.0215)
Female HH Rate	0.132 (0.137)	0.320 (0.266)	0.531* (0.277)	-1.377* (0.764)	-0.0629 (0.111)
Pct Over 65	0.279 (0.176)	-0.422** (0.184)	-0.204 (0.289)	1.952*** (0.518)	1.133*** (0.293)
Pct Under 18	0.994*** (0.173)	2.173*** (0.169)	-0.703** (0.311)	-0.785 (0.514)	0.246 (0.271)
Pct White	0.0676 (0.0586)	-0.145** (0.0679)	0.520*** (0.115)	0.794*** (0.214)	0.296*** (0.105)
Right to Work	-0.0792*** (0.0119)	-0.0857*** (0.00926)	-0.114*** (0.0225)	0.0498 (0.0409)	-0.101*** (0.0233)
Tax & Expenditures Limits	-0.00134** (0.000668)	-0.00348*** (0.000709)	-0.00114 (0.00102)	-0.000696 (0.00227)	0.00213* (0.00109)
School Finance Reform	0.00696*** (0.00240)	0.0244*** (0.00273)	0.0143*** (0.00378)	-0.0229*** (0.00650)	-0.0176*** (0.00433)
Public Health Cost Index	0.000275*** (8.12e-05)	-6.54e-05 (7.24e-05)	0.000643*** (0.000118)	0.000672*** (0.000214)	0.000892*** (0.000145)
Obesity Rate	0.660*** (0.142)	1.739*** (0.146)	0.944*** (0.224)	-0.592 (0.375)	-0.462* (0.246)
Constant	-0.492 (0.340)	-0.225 (0.315)	-5.852*** (0.547)	-4.121*** (0.923)	-2.038*** (0.549)
Observations	27,961	27,908	27,954	27,626	27,961
R-squared	0.879	0.842	0.874	0.578	0.693
Number of Units	3,107	3,106	3,107	3,107	3,107

Dependent variables in log form. Cluster-robust standard errors in parentheses. Time fixed effects included. ***p<0.01, **p<0.05, *p<0.1

Figure 1: Trends in Local Government Spending, Income and Obesity

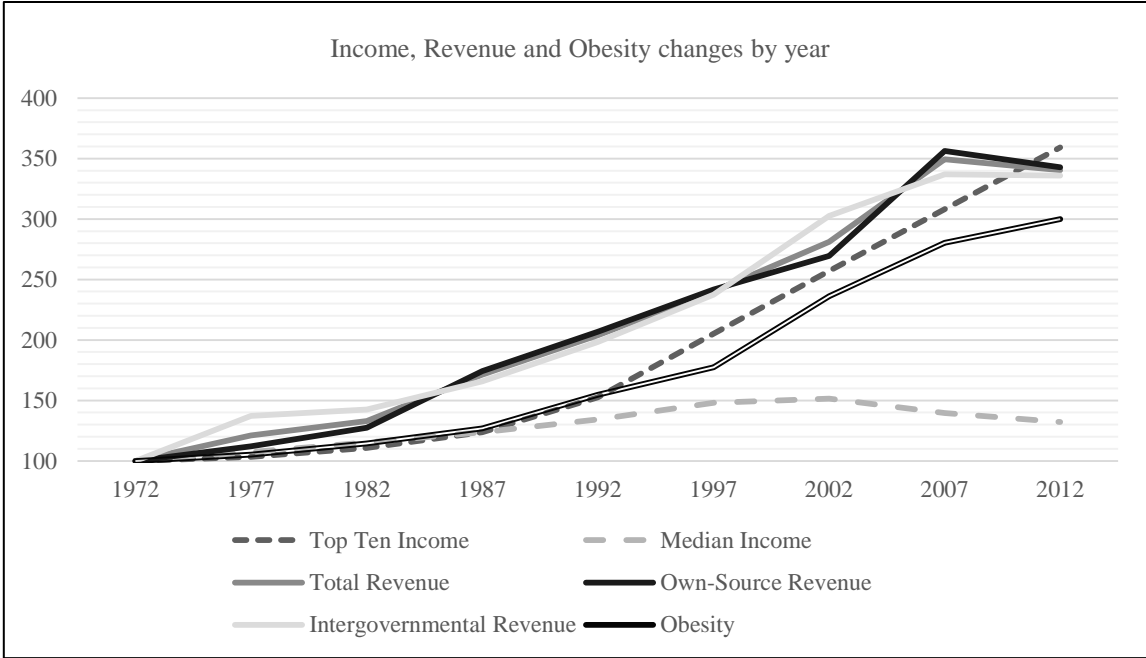


Figure 2: Percent Change in Per Capital Local Government Spending from 1972 to 2012

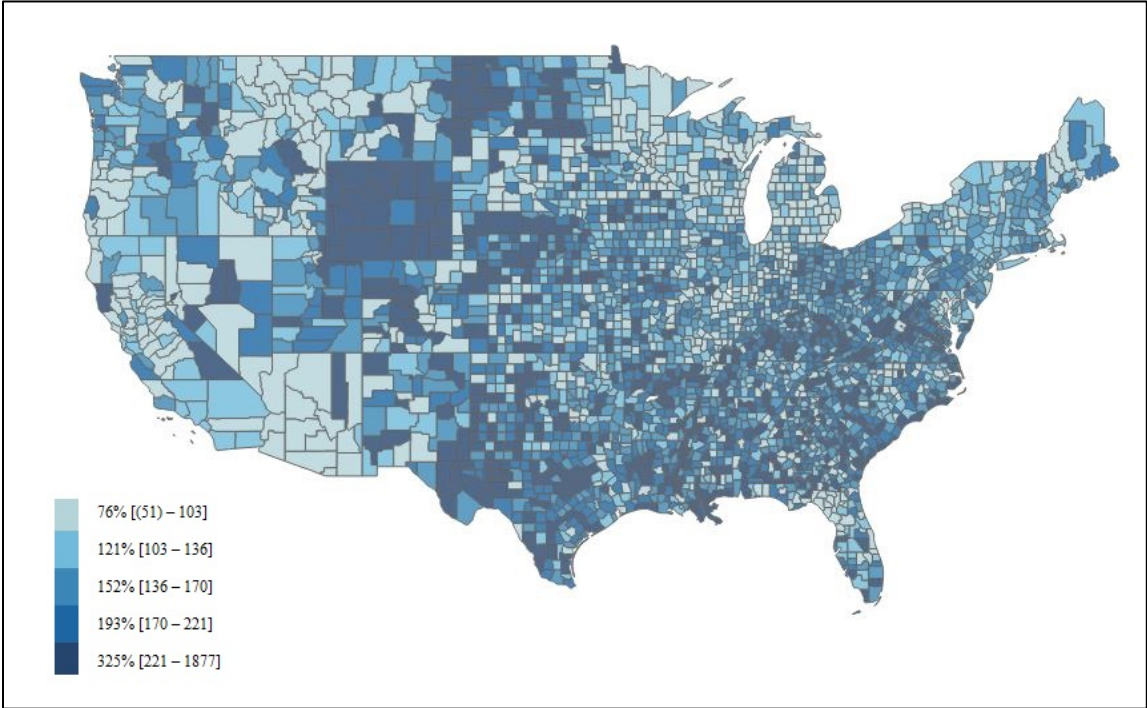


Figure 3: Percent Change in Obesity Rate from 1972 to 2012

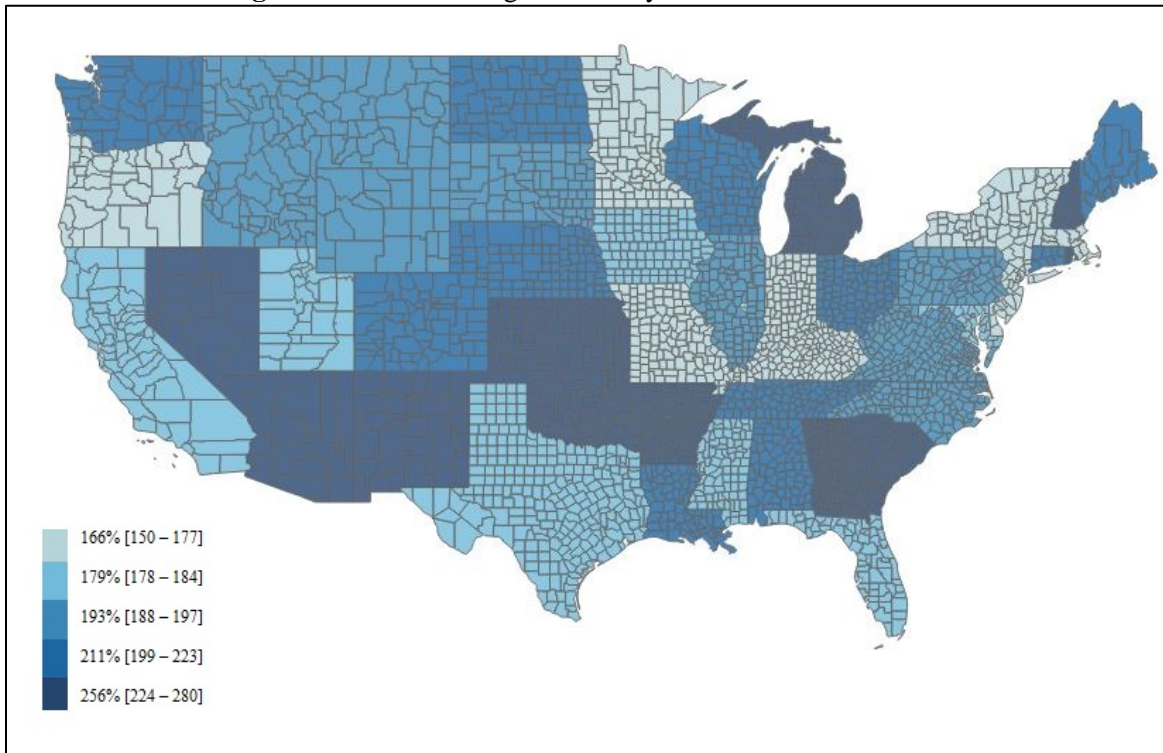


Figure 4: Percent Change in Mobile Home Rate from 1972 to 2012

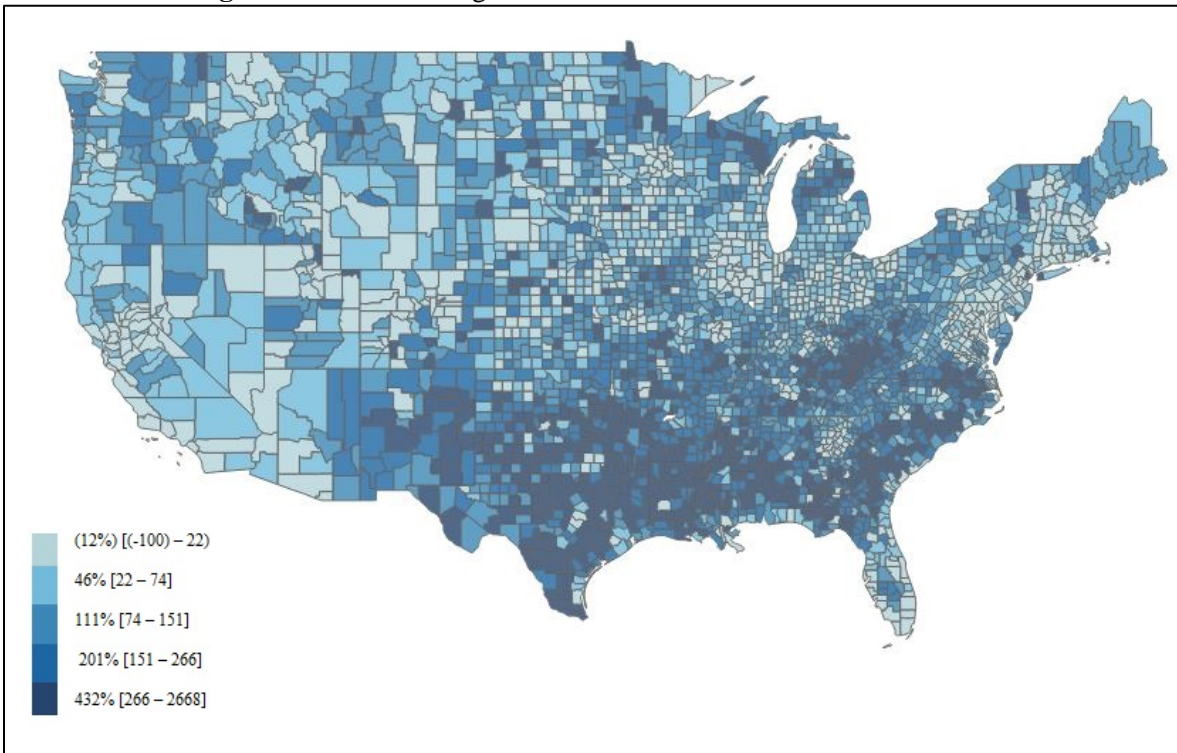
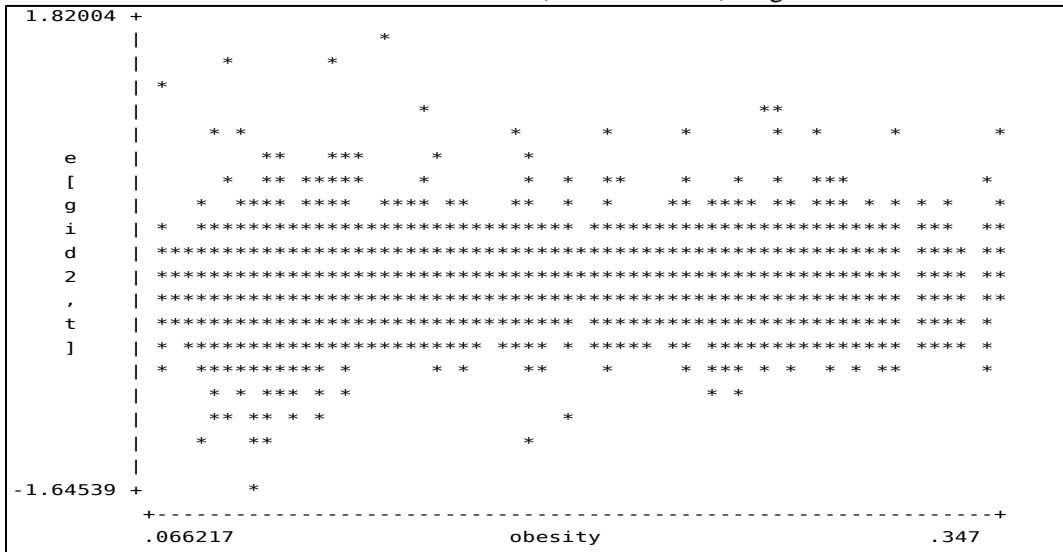
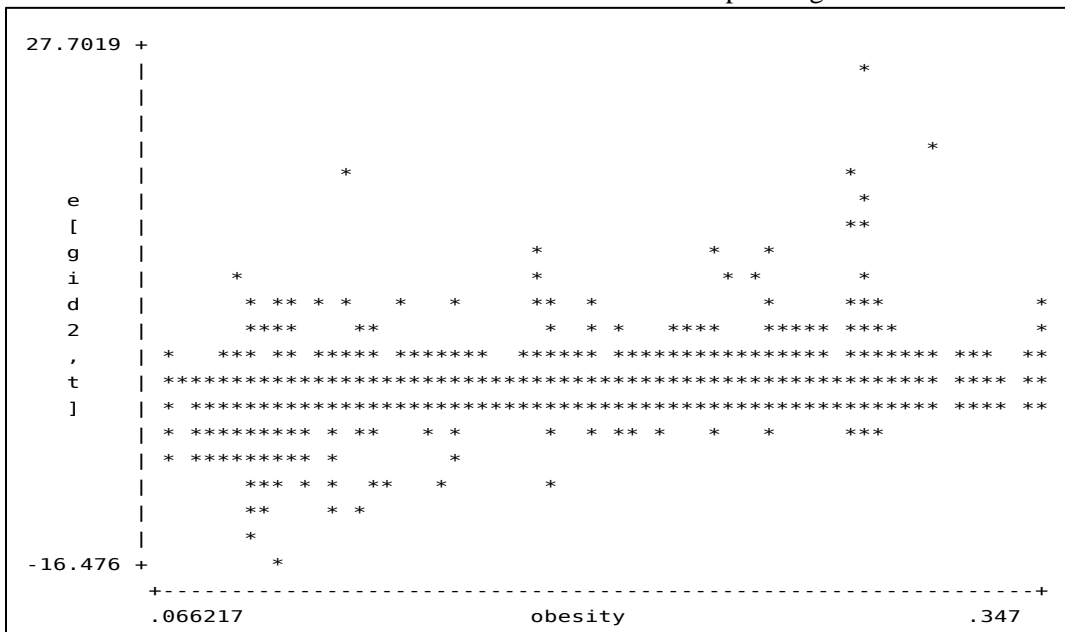


Figure 5: Local Government Revenue Residual-Obesity Rate Plots and Simple Regressions

Panel A: Residuals from Ln(Total Revenue) Regression



Panel B: Residuals from Total Revenue Per Capita Regression



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Appendix A: Data Variables, Definitions, Sources and Methods

Variable	Definition
¹ Total Revenue	Total measure of revenue received by a governmental unit.
¹ Own-Source Revenue	Revenue raised directly by a governmental unit.
¹ Intergovernmental Revenue	Revenue received from other governmental units.
¹ Total Expenditures	Total measure of expenditures by a government unit
¹ Operational Expenditures	Expenditures used by a governmental unit to operate its normal operations.
¹ Capital Expenditures	Expenditures used by a governmental unit to acquire or upgrade capital assets.
¹ Education	Total K-12 education spending by a governmental unit.
¹ Public Safety	Total aggregated expenditures of police, judicial and corrections by unit.
¹ Health	Total health expenditures by a government unit.
¹ Welfare	Total public welfare expenditures by a governmental unit.
¹ Natural Resources	Total natural resource expenditures by a government unit.
² Population	Total number of persons inhabiting a governmental unit.
² Median Income	Income level that divides the income distribution into two equal groups.
² Top Ten Income	Income level that defines the lower bound of the top ten percent income bracket.
² Female HH Rate	Percentage of households that are female-headed.
² Poverty Rate	Percentage of households with income below the poverty line.
² Pct Over 65	Percentage of the population aged 65 years or older.
² Pct Under 18	Percentage of the population aged 18 years or younger.
² Pct BA Degree	Percentage of the population that have earned a bachelor's degree.
² Pct White	Percentage of the population of the White race.
² Mobile Home Rate	Percentage of households that occupy a mobile home.
³ Right to Work	Statute that prohibits union security agreements.
^{4,5} Tax and Expenditure Limits	Statute that restrict the level of growth, or spending of a governmental unit.
⁶ School Finance Reform	Judicial or legislative acts that reform school funding rules.
⁷ Health Cost Index	Index variable of state level health spending, including Medicare and Medicaid
⁸ Obesity Rate	Percentage of the population aged 18 years or older considered to be obese.

¹ United States Census Bureau. "State and Local Government Finance Data" from Census of Government Finances and Annual Survey of Local Government Finances.

² Minnesota Population Center. National Historical Geographic Information System (NHGIS): Version 2.0. Minneapolis, MN: University of Minnesota 2011.

³ United States Department of Labor. "State Right-to-work Laws and Constitutional Amendments in Effect as of January 1, 2009 With Year of Passage".

⁴ Advisory Commission on Intergovernmental Relations. "Tax and Expenditure Limits on Local Governments". Publication M-195: 1995.

⁵ Amiel, Lindsay, Deller, S.C., and Stallman, J.I. "The Construction of a Tax and Expenditure Limitation Index for the US." University of Wisconsin-Madison, Staff Paper Series No. 536: 2009.

⁶ Jackson, C. Kirabo, Johnson, R., Persico, C. "The Effect of School Finance Reforms on the Distribution of Spending, Academic Achievement, and Adult Outcomes." National Bureau of Economic Research Working Paper No. 20118: 2014.

⁷ United States Census Bureau. "State and Local Government Finance Data" and Center for Medicare and Medicaid Services "National Health Expenditure Data."

⁸ National Center for Disease Control and Prevention. "Behavioral Risk Factor Surveillance System."

Appendix A (continued)

Variable	Description and Method
Top Ten Income	<p>Top ten income is defined as a top ten % (or 90th percentile) income level of U.S. households. As U.S. Census does not provide the full income distribution at the local level, we restore an (approximate) income distribution using the reported number of households in each of 10 income categories. First, the upper limits of income distribution for each sample periods are estimated using the historical national-level household income trends. Assuming households are distributed uniformly within each income category, we get households distribution function across income levels and using this function we calculate the top ten % income by targeting the income level where the area under the households income distribution function above that income level is equal to 0.10*total households in a county.</p>
Right To Work	<p>Right to work statutes are defined to be a dummy variable: 1 if a state has enacted a statute or constitutional amendment, and 0 if the state has not. The dummy variable applies to all types of local government units within a state.</p>
Tax and Expenditure Limits	<p>TEs are defined as a count variable that captures the number of statutory limitation changes that affect a certain type of governmental unit over the period. The type of TEL or specific limits are not considered. Data is available for counties, municipalities, and school districts; therefore, a TEL placed on municipalities is assumed to also impact townships and special districts. TEL data for the aggregate of all types of government units (the "All Units" category) are the total number of TELs affecting all the government unit types; if a TEL affects two government unit types, it is counted twice in this category to account for the total impact on the category.</p>
School Finance Reform	<p>The School Finance Reform variable is defined as a count variable that captures the number of legislative or judicial reforms within a given state. It applies to all types of local government units within a state because of the impact of SFR on schools and other governmental units.</p>
Health Cost Index	<p>Index variable of state level health spending, including Medicare and Medicaid. This captures the increasing costs of providing medical services, given an absence of available data for the creation of a public employee health cost index.</p>
Obesity Rate	<p>State obesity rate data prior to 1985 is not available. Therefore, the data for the missing years was extrapolated by state using the national average percent change over the years.</p>