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Does State and Local Government Employment Promote Tax Revenue Stability? A Look at Kentucky Cities

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Abstract

Research shows that public sector jobs are more stable than private sector jobs. This study examines whether tax revenue volatility is affected by the concentration of a city's economic base in state and local government employment. The relationship between public employment and revenue volatility has not been studied but is relevant as state and local governments have reduced their workforces in the post-Great Recession period. Using panel data on Kentucky cities, I find that the coefficient on state and local government employment concentration is inversely related to tax volatility but is not statistically significant in a fixed effects estimation.

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Executive Summary

In the years following the Great Recession, state and local governments across the country reduced their workforces in response to fiscal stress. State and local government employment recovery has been slow, with fewer public employees in 2018 compared to 2008.[1] Despite job losses, research shows public jobs are more stable than private jobs.[2] Post-Great Recession losses in public employment represent the reduction of a relatively stable industry. Because governments are major employers in many cities, this study seeks to answer the following question: Does the concentration of a city's economic base in state and local government employment impact that city's tax revenue volatility?

Previous research has not explored government employment's impact on tax revenue volatility. I theorize that job security declines as an economic base substitutes away from public sector employment towards private sector employment. In turn, lower job security makes income and spending more susceptible to economic conditions, increasing the volatility of income and sales tax revenues. I also discuss how reduced government employment can impact tax volatility through property tax collections.

I utilize panel data on Kentucky cities over the period 2007 to 2018 to estimate pooled OLS, random effects, and fixed effects models. The coefficient on the total county employment from state and local government is inversely related to tax volatility but is only statistically significant in a pooled OLS estimation. The coefficient is not statistically significant in a random or fixed effects estimation. Future research should observe other geographies and more extended time series. Such research has important implications on long-term financial planning in cities that have economies with high concentrations in public employment

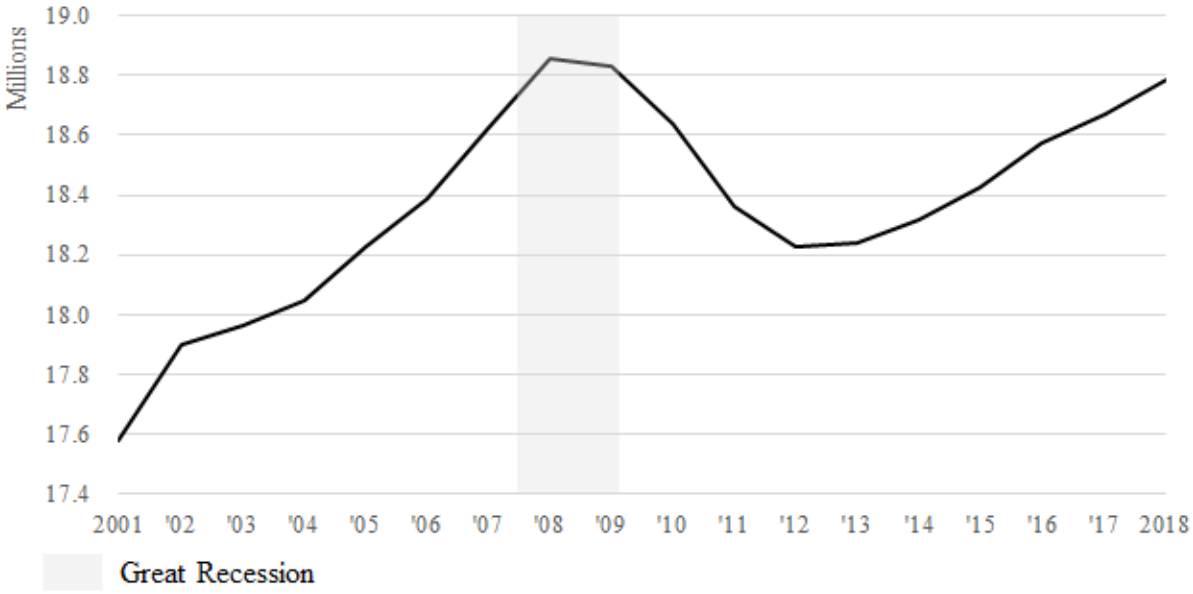
Introduction

June 2019 marked ten years since the end of the Great Recession,[*] a period for which the Pew Charitable Trust presents evidence of a financial "lost decade" for state governments.[3] A reduced government workforce is among the continuing impacts from the Great Recession cited by the Pew Charitable Trust.[4] Researchers note the Great Recession's unique effect on public sector employment compared to previous downturns. Lewin describes this impact through the political environment.[5] More so than previous recessions, politicians pursued cuts to public sector employment and bargaining rights following the Great Recession.[6] In 2012, the Brookings Institute noted that the Great Recession is unique due to sustained reductions in state and local government employment.[7]

Figure 1 shows U.S. average annual employment in state and local government from 2001 to 2018. State and local government jobs did not fall immediately during the Great Recession. However, fiscal pressures and the end of stimulus funding resulted in significant losses in the years following the official end of the Recession.[8] Surveys of city financial officers in the years 2009 to 2011 found that the most common spending cuts were personnel-related, with such cuts reported by over 70 percent of respondents in 2010 and 2011.[9] Analysis from the U.S. Census Bureau shows government job losses were more prolonged, though not as immediate or severe as private sector job losses.[10] Further, Census data show fewer state and local government employees in 2018 compared to 2008.[11] The Bureau of Labor Statistics data presented in Figure 1 also show that in 2018, average annual employment in state and local government was still slightly below 2008 levels.

[*] The National Bureau of Economic Research defines the Great Recession as starting December 2007 and ending June 2009.

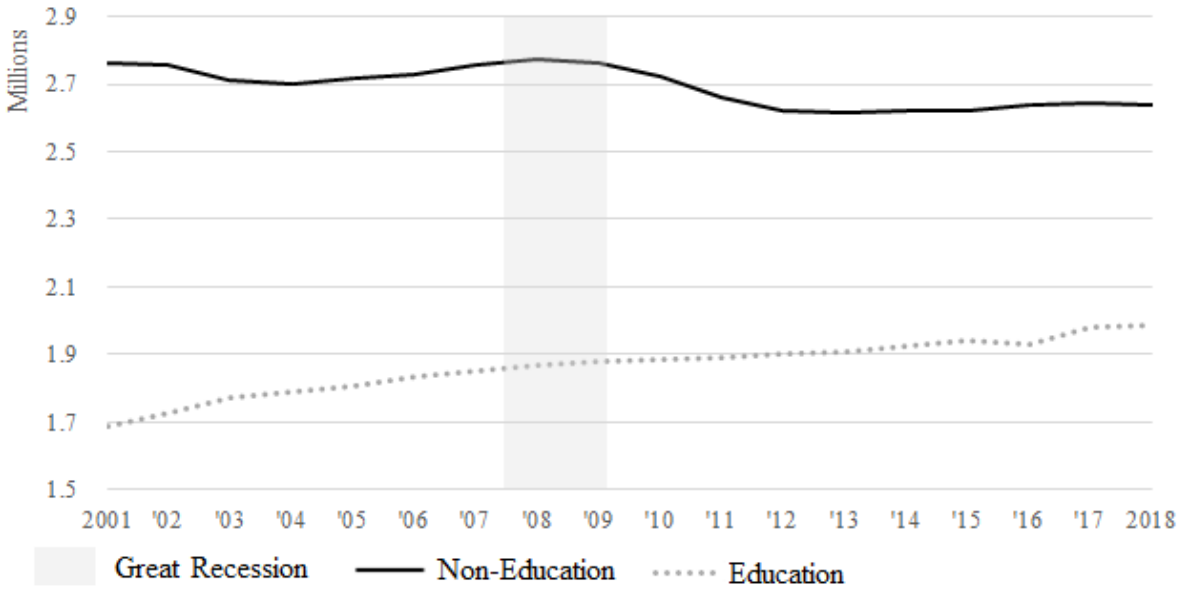
Figure 1 | State and Local Government
Average Annual Employment Level



Source: Bureau of Labor Statistics. Quarterly Census of Employment and Wages, 2001-2018. https://www.bls.gov/cew/data.htm

Recovery in state and local government employment has not been consistent across occupations or geographies. Elementary, secondary, and higher education show the strongest recovery according to Census information.[12] State government employment shows little improvement when excluding educational service jobs. Figure 2 compares state employment in education and non-education jobs from 2001 to 2018. Non-education state employment in 2018 was almost 5 percent lower than in 2008. State and local government job recovery is also uneven across states. Appendix A compares state and local government employment changes by state. In 2018, 28 states reported fewer state and local government employees than in 2008.

Figure 2 | State Government
Average Annual Employment Level



Source: Bureau of Labor Statistics. Quarterly Census of Employment and Wages, 2001-2018. https://www.bls.gov/cew/data.htm

Research shows that state and local government employment is stable relative to private sector employment during both recession and expansion periods.[13] This evidence of stability combined with post-Great Recession trends in state and local government employment presents a stable industry that is smaller than its historical levels. Further, reduced personnel in the post-Great Recession period is a characteristic of the "new normal" for local governments according to some scholars.[14] Given these trends and the importance of the industry to tax revenue generation, this study seeks to answer the following question: Does the concentration of a city's economic base in state and local government employment affect that city's tax revenue volatility?

Prior research has not explored the impact of government employment on local government revenue volatility. However, this relationship may have essential planning implications for cities with high concentrations of public sector employment in their local economies. State capital cities stand out as one example. If declining or stagnating numbers of public sector workers increase a

city's reliance on private sector employment, will that city experience higher levels of tax volatility? If so, cities that have historically experienced stabilizing effects from public sector employment may be unprepared for increased volatility during future recessionary periods.

I expect that higher concentrations of a city's economic base in state and local government employment will lower tax volatility given the relative stability of state and local government employment. This study tests the following null and alternative hypotheses:

H_O: Tax revenue volatility is not affected by the concentration of a city's economic base in state and local government employment.

H_A: Tax revenue volatility is affected by the concentration of a city's economic base in state and local government employment.

I test the hypotheses above utilizing panel data on Kentucky cities over the years 2007 to 2018. The panel data set contains tax revenue information submitted through state-mandated reports as well as federal data on employment and economic conditions. Regression with city and year fixed effects serves as the primary method of analysis, with random effects and pooled OLS models included for comparison. The coefficient on the variable measuring the concentration of a city's economic base in state and local government employment results in the expected sign, but I fail to reject the null hypothesis.

The next two sections of this paper review relevant literature and theorize channels through which government employment can impact tax volatility. A discussion of Kentucky cities follows and includes details on the selection of cities. After a description of variables and methods, I present results across three regression methods. The paper closes with a discussion of limitations and conclusions.

Literature Review

Before Charles Levin's work in the 1970's, most approaches to public management assumed constant revenue growth.[15] However, economic slowdown and anti-tax sentiments inspired Levin's development of cutback management.[16] Levin describes cutback management as "…managing organizational change toward lower levels of resource consumption and organizational activity."[17] Since Levin's original work, periods of fiscal stress have forced public managers to confront challenges of resource scarcity. For example, Scorsone and Plerhoples describe how public financial management changed in the early 2000s.[18] State and local government reaction to economic downturn moved away from tax increases and toward spending cuts and the use of reserves.[19]

The Great Recession of 2009 represents potential[†] punctuation in the timeline of events that have shaped public management. Martin, Levey, and Cawley suggest that the Great Recession created a "new normal" for local governments marked by lower levels of revenues and expenditures, including less personnel.[20] Two main reasons support the idea of a permanent shift in local government management.[21] Firstly, increased globalization has limited local governments' control over their economic success.[22] Secondly, government leaders pursued changes to public employment following the Great Recession by limiting employee benefits and bargaining rights.[23] Regarding this second point, cuts to public sector employment make the Great Recession stand out from prior recessions.

Surveys conducted by the National League of Cities from 2009 to 2011 showed the most common expenditure cuts were personnel-related, with 67 percent to 79 percent of cities reporting

[†] Ammons, Smith, and Stenberg challenged the idea that the Great Recession would lead to a new normal across local governments. They argue that economic stressors alone have not caused permanent change across local governments. Instead, Ammons *et al.* suggest that change in local government happens more gradually and is the result of numerous factors.

cuts to personnel.[24] Such cuts led to a reduction in the size of state and local government workforces. Additionally, Brookings Institute analysis shows more prolonged state and local government job losses from the Great Recession compared to prior recessions.[25] State and local governments lost more than 500,000 jobs between 2008 and 2013, and the Census Bureau finds that state and local government employment has been slow to recover.[26] By 2018, growth in state and local government employment had not offset losses experienced between 2008 and 2013.[27]

Further, post-Great Recession cuts to public sector compensation may have long-term impacts on governments' ability to fill positions. Levin and Scorsone suggested in 2011 that changes to public employee benefits following the Great Recession may impact individuals' willingness to seek jobs in public service.[28] More recent research and news articles appear to support this prediction. Gorina and Hoang find that reductions to state employee benefits increase turnover by 4 percent.[29] Additionally, recent headlines such as "Public-sector employees are losing their foothold in the middle class" and "State governments say 'Help Wanted.' But people aren't applying like they used to" provide anecdotal evidence.[30]

Post-Great Recession declines in public employment conflict with the historical view of government jobs as stable and secure. However, government workforce reductions are often achieved more through attrition than layoffs.[31] Surveys of city financial officers from 2010 to 2013 show that hiring freezes were the most common type of personnel cut.[32] Hiring freezes were reported by 74 percent and 68 percent of cities in 2010 and 2011, respectively.[33] Layoffs were lower, with 35 percent to 31 percent of cities reporting such actions.[34] Kopelman and Rosen find that state and local government employees experience greater job security compared to private sector employees after controlling for worker charactersitcs.[35] These benefits even appear to increase during recessionary periods.[36] During the Great Recession, state and local employees

were 5 percent to 6 percent less likely to lose their jobs compared to private-sector workers.[37] This advantage was lower at 3 percent to 4 percent during non-recession periods.[38]

Researchers note the importance of a local government's economic base on its revenue stability.[39] Wasylenko and Erickson state that "Regions specializing in education and public administration are typically among the most stable of regional economies…."[40] Given that government employment represents a relatively stable industry and contributes to the economic base, a shrinking government workforce may impact a city's revenue volatility.

Revenue stability is an essential consideration for local governments. Revenues that become more susceptible to business cycles threaten a government's ability to provide stable services.[41] The demand for certain government services may even increase during an economic decline just when more volatile revenue sources fall.[42] Local governments' inability to balance budgets through borrowing also makes revenue volatility a vital topic.[43]

Revenue volatility has been one of the major issues in public finance research. One area of focus is the importance of a government's source and diversity of revenues.[44] Local governments utilize various revenue streams that exhibit different levels of volatility. Property taxes represent a prominent and stable source of revenue for local governments.[45] Carroll explains that local governments may increase their dependence on more volatile revenue sources when they take action to diversify their revenue portfolios.[46] Afonso examines the increased use of sales taxes among local governments.[47] She finds increased sales tax collections per capita is a significant and meaningful determinant of increased revenue volatility.[48]

Yan extends the revenue volatility research by finding that the interaction of a local government's tax portfolio and economic base impact revenue volatility.[49] The combination of industries within a city's economic base contributes to the city's tax revenues.[50] Yan measures a

local government's economic base by analyzing the stability of county employment levels and does not address specific industries.[51] Overton and Bland's study of economic base and revenue volatility includes industry-level variables but does not explicitly address government employment.[52]

Theorized Channels: Government Employment's Impact on Tax Volatility

I theorize three channels through which government employment can impact revenue stability. First, government employment can promote stable income and spending. Government employees earn and spend money in the local economy. If government employees are laid off or there are fewer job opportunities in government, workers may move to less secure positions in the private sector. Spending can become more susceptible to economic conditions when workers have reduced job security. Substitution towards private sector employment over time may also increase the number of layoffs in the local economy, causing wider swings in income and consumption. Thus, these changes in job security and spending will directly impact the volatility of income and sales tax revenues. For specific demographics, public sector employment represents a source of upward mobility.[53] Research shows that governments are a major employer of African Americans and that such positions lead to higher wages and greater wage equality.[54] Increased opportunities for upward mobility and income security may also have positive effects on income and sales tax stability.

The second theorized channel involves the impact of government employment changes on property tax collections, which are a significant revenue source for local governments. Eom discusses the importance of available resources in measuring property tax assessment quality, including staff resources.[55] Eom uses operating budgets per parcel to capture available resources.[56] He finds a significant positive relationship between budget amounts and assessment quality.[57] Eom

also finds that a higher frequency of reassessments improves quality because reassessment brings assessed values closer to market values.[58] In this regard, reductions in government employment can limit the capacity to conduct reassessments. Carrol and Goodman attempt to understand the relationship between assessment quality and revenue volatility.[59] They find evidence that lower quality assessments increase the volatility of non-property tax revenues.[60] To the extent to which government job losses decrease the quality of assessments in an area, total revenue volatility may go up.

As a third channel, I expect that exemptions for government-owned properties can impact revenue volatility. Local governments own less property compared to higher levels of government.[61] Therefore, Bowman predicts that local governments can gain from taxing the properties of state and federal governments.[62] Consider a state capital city that forgoes large amounts of property tax revenue due to state-owned properties. Reduced dependence on stable property taxes can increase a city's reliance on more volatile revenue sources. It is possible that steady income and spending created by government employment mitigates the loss of relatively stable property taxes. However, if the state government cuts the size of its workforce and the stabilizing impacts of this sector decrease, the loss of property tax revenue may no longer be mitigated. In 2015, it was estimated that Kentucky's capital city, Frankfort, missed out on $1.5 million in revenues due to state-owned properties, a significant amount considering total city property tax revenue collections of $3.5 million.[63]

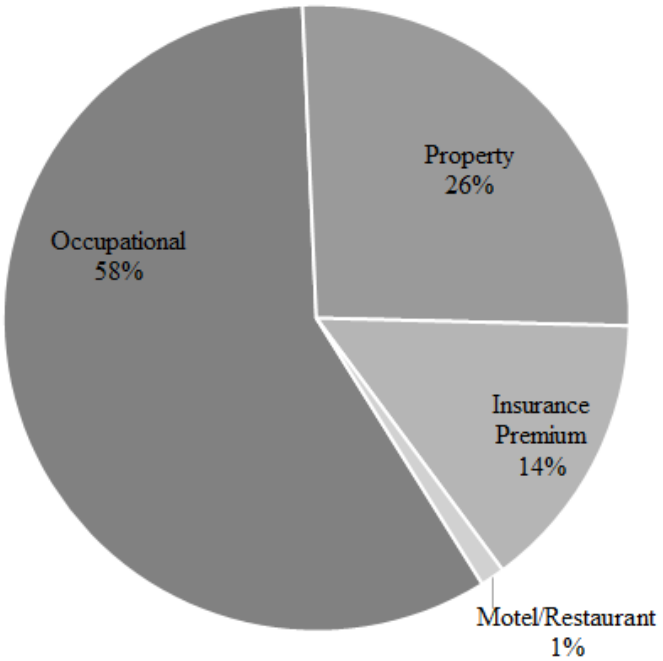
Background on Kentucky Cities

This study seeks to answer the following question: Does the concentration of a city's economic base in state and local government employment affect that city's tax revenue volatility? I choose Kentucky cities to answer this question for two reasons. First, comparisons across U.S.

cities are difficult due to wide disparities in services provided and taxing power.[64] By observing cities within a single state, I expect that this heterogeneity is minimized as cities exist under similar state statutes and limitations. Second, data maintained by the Kentucky League of Cities (KLC) allows for detailed tax revenue information across most Kentucky cities. KLC gathers this data from Uniformed Financial Information Reports (UFIR), which cities must submit annually by state law.[65] These reports include detailed information on revenues by source. Cities that fail to provide these reports risk losing state road funds.[66]

Kentucky cities are less reliant on property taxes compared to local governments nationally.[67] Occupational taxes represent the largest tax source for Kentucky cities and are levied on payroll or business profits.[68] Figure 3 shows the composition of Kentucky city revenues over the period of this study, 2007 to 2018. Taxes on insurance companies represent a significant source of revenue at 14 percent of total tax revenues. Certain cities with tourism commissions can impose

Figure 3 | Kentucky City Tax Revenue by Source 2007 to 2018



Source: Kentucky League of Cities. Uniformed Financial Information Report Data, 2007-2018.

taxes on motels and restaurants.[69] However, such taxes represent only 1 percent of total tax revenues over the period analyzed.

I limit the study to one city from each of Kentucky's 120 counties, because I rely on county-level employment data to measure each city's economic base.[‡] I selected county seats when data was available. If data on the county seat was unavailable or if a county had multiple county seats, the city with the largest population[§] was selected. The analysis revealed potential outliers in the smallest cities from the selection. For this reason, the smallest cities from the selection are omitted using the following method. Before changes in 2014, the Kentucky legislature grouped cities in one of six population classes.[70] The smallest, Class six, included cities with populations below 1,000.[71] I use this threshold to omit cities from the original selection, excluding those with populations averaging less than 1,000 individuals over the period analyzed. The final selection includes 100 cities across the Commonwealth of Kentucky. Appendix B provides a list of sample cities and those omitted based on population.

Design

Prior research has not covered the impact of government employment on tax revenue stability. I rely on research that has examined links between economic base and revenue volatility to build a model. I use the following equation to test the impact of a city's concentration in state and local government employment on that city's tax revenue volatility:

VOL = f (STATELOC, FED, PVOL, PROP, POP, PCPI, GDP, RES, NRES)

Where VOL = tax revenue volatility; STATELOC = share of total employment from state and local government employment; FED = share of total

[‡] No cities from McCreary County were represented in the KLC data.
[§] Based on 2010 population from Census mid-year population estimate

employment from federal government employment; PVOL = volatility of private-sector employment; PROP = share of total tax revenues from property taxes; POP = population; PCPI = per capita personal income; GDP = county-level gross domestic product; RES = reserved cash balances; NRES = Non-reserved cash balances

Variables

Variable descriptions are provided in Table 1.

Table 1 | Variable Descriptions

Variable	Description	Source
Dependent Variable		
VOL	Tax revenue volatility measured as the absolute difference between logged predicted and actual revenues (Revenue amounts were converted to 2007 constant dollars before the calculation)	Kentucky League of Cities, UFIR Data
Economic Base		
STATELOC	State and local government employment as a percentage of total county employment	Bureau Labor Statistics, QCEW
FED	Federal government employment as a percentage of total county employment	Bureau Labor Statistics, QCEW
PVOL	Private sector employment volatility measured as the absolute difference between logged predicted and actual annual employment	Bureau Labor Statistics, QCEW
Revenue Portfolio		
PROP	Percentage of total tax revenues from property taxes	Kentucky League of Cities, UFIR Data
Economic Conditions		
POP	Log of the city population	Census Bureau Mid-Year Population Estimates
PCPI	Log of the county per capita personal income (2006 constant dollars)	Bureau of Economic Analysis

Variable	Description	Source
GDP	Log of the county GDP (2012 chained dollars)	Bureau of Economic Analysis
Fiscal Slack		
RES	Log of reserved cash balances (2007 constant dollars)	Kentucky League of Cities, UFIR Data
NRES	Log of non-reserved cash balances (2007 constant dollars)	Kentucky League of Cities, UFIR Data

Tax Revenue Volatility

Researchers utilize several measures of revenue volatility. This study follows an approach used by Carroll.[72] To calculate tax volatility, a growth trend is first calculated for each city in the sample using the following equation:

$$Tax_{it} = \beta_0 + \beta_1 time_t + \beta_2 city_i + \beta_1 time_t \times \beta_2 city_i + \varepsilon_{it}$$

The natural log of real tax revenue (Tax) for the city i in year t is regressed on variables for the year, dummy variables for each city, and the interaction of these two variables. This equation allows a unique intercept and slope for each city. From this equation, I calculate predicted values for each city in each year. Volatility is then calculated by taking the absolute value of the difference between actual and predicted revenues for the city i in year t. Values approaching zero represent lower volatility.

I use the tax revenue data supplied by the Kentucky League of Cities for the volatility calculation, and this data covers the years 2007 to 2018. Kentucky cities report revenue information on a fiscal year ending June 30. A ranking of the sample cities by their average volatility over the period can be found in Appendix C.1.

Economic Base Variables

I use county-level employment data from the Bureau of Labor Statistics' Quarterly Census of Employment and Wages (QCEW) to measure a city's economic base. Comprehensive employment data is not available at the city level for Kentucky cities. However, I assume that county employment provides a good proxy for a city's local economy. Ross, Yan, and Johnson also utilize county employment to analyze city fiscal measures, citing the likelihood that "…the home county of the city remains home to a significant share of the actors who spend and/or earn taxable income in the city's local economy."[73] Variables using the QCEW data are calculated as annual averages based on the fiscal year ending June 30.

The primary variable of interest in this study is the concentration of a city's economic base in state and local government employment. For this variable, I measure state and local government employment within the city's home county as a percentage of total county employment. I include a similar variable to control for potentially stabilizing effects from federal government employment. I expect an inverse relationship between the concentration of a city's economic base in government employment and tax revenue volatility.

Consistent private sector employment data by industry is not available at the county level due to non-disclosures. While the economic bases of two cities may have similar proportions from private sector employment, the varying mix and concentration of private sector industries within each city can contribute differently to volatility. To account for this, I include a measure to control for the overall volatility of private sector employment in the city's home county. Yan utilizes variation in annual employment to measure the impact of economic base instability on revenue volatility.[74] I calculate private sector employment volatility using the same approach as tax revenue volatility discussed above. I expect that increased private sector employment volatility will increase tax revenue volatility, all else equal.

Revenue Portfolio

I include a variable to measure each city's dependence on property taxes to control for revenue portfolio characteristics of cities. The property tax variable measures property tax revenue as a share of total tax revenues within the cities. The omitted category represents all other tax sources. I include the property tax variable because property taxes represent a relatively stable source of revenue for local governments.[75] Further, cities often use property tax rate adjustments as a budget balancing tool.[76] I expect that a higher share of revenues from property taxes will lower volatility.

Other Variables

I include several variables to control for economic conditions. I use Census Bureau mid-year population estimates to create the log of the population for sample cities. Additionally, for each city's home county, I include variables for the log of real per capita personal income and the log of real GDP. Data for these two variables were collected from datasets published by the Bureau of Economic Analysis. Yan's study of local government revenue volatility finds a positive relationship between population and volatility.[77] Additionally, Yan finds an inverse relationship between per capita personal income and volatility.[78]

Researchers studying revenue volatility also discuss slack resources.[79] Slack resources, such as reserve funds, can help governments handle unexpected shocks to municipal finances.[80] Local governments have several short-term options available when faced with fiscal stress and budget shortfalls, including fee increases or utilizing slack resources.[81] The availability of reserve funds can allow a city to avoid increased fees or other revenue actions that can result in higher volatility. I use reserved and unreserved cash balances to control for fiscal slack and gather these amounts from the Uniformed Financial Information Report data supplied by the Kentucky League

of Cities. For reserved funds, I include the sum of sinking funds, bond proceeds, and other reserved funds.

Methods

Independent variables based on the fiscal year ending June 30 are lagged one year (economic base, revenue portfolio, and fiscal slack). Because the measures of per capita personal income and GDP are on a calendar year, I could not create a one-year lag. Instead, I apply a 6-month lag to these variables. For example, tax volatility for the fiscal year ending June 30, 2018 is compared against GDP for calendar year December 31, 2017. Census Bureau annual population estimates are as of July 1 and are positioned at the start of the fiscal year.

I lag independent variables for two reasons. The first is to address concerns related to simultaneity bias. The theory behind this study implies that government employment represents a stable industry that contributes to stable revenues. However, reverse causality could occur if the level of revenue uncertainty impacts government hiring. Other studies on revenue volatility lag variables to deal with potential issues of endogeneity.[82] I assume that current year volatility cannot impact previous year employment by lagging the state and local government employment variable.

A second reason for lagging the independent variables is that the expected impacts on volatility are not instantaneous. Government employees and agencies create spending that will have lagged multiplier effects in the economy. Additionally, property taxes represent a significant portion of local government revenues. Economic base impacts on property taxes may be delayed through the assessment process.

The primary method of analysis in this study is a regression with city and year fixed effects. While I attempt to limit heterogeneity by selecting cities within a single state, unobserved city characteristics are still a concern. The use of a fixed effects model allows for the observation of

variation within cities over time. This process removes unobserved time-invariant characteristics between cities. Fixed effects regression is also utilized in other revenue volatility studies referenced in this paper.[83]

The use of fixed effects and the observation of within-city variation creates potential challenges in this study. The data for this analysis covers twelve years. However, explanatory variables in the model might experience limited change within a city over just twelve years. A much longer time series may be required to see substantial structural changes in revenue portfolios or a city's economic base. As such, the variation between cities is of interest, but the fixed effects regression eliminates such variation. On the other hand, random effects models make use of both within and between variation of panel data. A key assumption is required for random effects models to produce unbiased estimates. I must assume that any unobserved effects are not correlated with explanatory variables in the model.[84] This is a problematic assumption to support in this study. Still, I provide random effects results as a comparison to fixed effects results and to introduce between-city variation. I also provide pooled OLS estimates for additional comparison. Unlike the random effects model, the pooled OLS model ignores the panel nature of the data. All models are estimated using robust standard errors.

Results

Table 2 contains descriptive statistics. On average, state and local government employment represents 20 percent of total employment in the home counties of cities in this study. Franklin County, which is home to Kentucky's state capital city, shows the highest concentrations in state and local government employment. Over the twelve years analyzed, Franklin County's share of total employment from state and local government averaged 45 percent. A ranking of cities by their share of state and local government employment can be found in Appendix C.2. The highest

concentrations in federal government employment are in Christian and Hardin counties, and both counties are home to military bases. A ranking of each city by the share of federal government employment can be found in Appendix C.3. Cities in this study, on average, collect 28 percent of their tax revenues from property taxes. Property tax dependence varies widely across cities, from as low as 7 percent of total revenues to as high as 97 percent. On average, the volatility of private sector employment at 0.04 is lower than that of tax volatility at 0.05. Tax volatility also exhibits a wider range than private sector employment volatility does. On average non-reserved fund balances were higher and varied less than reserved fund balances.

Table 2 | Descriptive Statistics

Variables	N	Mean	Standard Deviation	Minimum	Maximum
VOL	1,168	0.054	0.055	0.000	0.527
STATELOC	1,176	0.200	0.074	0.059	0.476
FED	1,200	0.016	0.021	0.002	0.164
PVOL	1,200	0.035	0.028	0.000	0.161
PROP	1,073	0.283	0.155	0.066	0.967
POP	1,200	8.618	1.176	6.659	13.337
PCPI	1,200	10.220	0.167	9.781	11.099
GDP	1,200	13.435	1.146	11.257	17.707
RES	1,070	12.054	4.911	0.000	20.315
NRES	1,070	13.267	4.396	0.000	19.852

Results from the fixed effects, random effects, and pooled OLS regressions are given in Table 3. The primary method of focus in this study is the fixed effects regression, though I present random effects and pooled OLS for comparison and to introduce between-city variation. In general, results from the fixed effects model show large standard errors.

Table 3 | Regression Results for Tax Volatility

Variable	Fixed Effects	Random Effects	Pooled OLS
STATELOC	-0.180	-0.068	-0.043*
	(0.120)	(0.048)	(0.025)
FED	-0.503	-0.245***	-0.222***
	(0.311)	(0.068)	(0.043)
PVOL	0.092	0.080	0.030
	(0.086)	(0.079)	(0.063)
PROP	0.010	-0.007	-0.014
	(0.066)	(0.022)	(0.011)
POP	-0.003	-0.017***	-0.018***
	(0.071)	(0.007)	(0.004)
PCPI	-0.014	-0.015	-0.015
	(0.027)	(0.017)	(0.013)
GDP	-0.011	0.009	0.010**
	(0.018)	(0.008)	(0.004)
RES	-0.001**	-0.001	0.000
	(0.000)	(0.000)	(0.000)
NRES	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)
CONSTANT	0.426	0.263	0.247**
	(0.720)	(0.162)	(0.124)
R-Squared	0.033	0.088	0.092
F-Statistic	3.00***		7.36***
Wald Chi2		86.02***	
# of Groups	99	99	
N	1,029	1,029	1,029

Notes:

- Robust standard errors included in parenthesis
- Significant at: *10 percent level, **5 percent level, ***1 percent level
- Within R-Squared reported for fixed effects; Overall R-Squared reported for random effects
- Year dummy variables included across all three models but are not shown above

The only significant coefficient in the fixed effects model is on the reserved cash balances measure. For every 1 percent increase in reserved cash balances, tax volatility falls by 0.1 percent. The reserved cash balance coefficient is not significant in the random effects model but shows a

similar effect size. The coefficient for non-reserved cash balances is not significant in any of the three models.

The coefficient on the concentration of a city's economic base in state and local government employment is negative in all three models. The fixed effects model indicates that for each 1 percentage point increase in county employment from state and local government, tax revenue volatility decreases by 18 percent. However, the variable is not statistically different from zero. In the random effects and pooled OLS models, state and local government employment lowers volatility by 7 percent and 4 percent, respectively. The state and local government employment variable is only significant in the pooled OLS model.

The measure of federal government employment also shows an inverse relationship with tax volatility. This variable is significant in both the random effects and pooled OLS models. Coefficients in those models show that every 1 percentage point increase in county employment from the federal government lowers volatility by 22 percent to 25 percent, all else equal. In the fixed effects model, there is a 50 percent reduction in tax volatility for each 1 percentage point increase in total employment from the federal government, but the coefficient is not statistically significant.

The coefficient for private sector employment volatility is positive but is not statistically significant in any of the models. Coefficients in both the fixed effects and random effects model show similar impacts on tax volatility. Holding other variables constant, every 1 percent increase in private sector employment volatility increases tax volatility by 9 percent in the fixed effects model and 8 percent in the random effects model.

The property tax variable does not present statistical significance in any of the three models. Additionally, the sign on the property tax coefficient is not consistent across the three

models. The property tax coefficient shows a positive sign in the fixed effects regression and a negative sign in both the random effects and pooled OLS regressions.

The coefficient on population exhibits significance in the random effects and pooled OLS models. In each of these two regressions, a 1 percent increase in population lowers volatility by approximately 2 percent. This finding contradicts the positive relationship Yan's finds observing local governments in Georgia.[85] Though not significant, the effect size of per capita personal income was similar across all three models. A one percent increase in per capita personal income is associated with a 1.4 to 1.5 percent decline in tax volatility. The coefficient on the gross domestic product variable is only significant in the pooled OLS model and shows a positive sign.

Limitations and Conclusion

Characteristics of Kentucky cities, including more centralized power at the state level and a local reliance on income taxes,[86] raise questions about the external validity of the results. Findings may differ under varying state structures. Kentucky is a largely rural state, and results may vary in more urban areas. Additionally, this study utilizes employment numbers to measure a location's economic base. However, employment is not a perfect measure in understanding the impacts of government cutbacks on municipal revenue stability. Employment numbers may not account for actions like furloughs[87] or increased reliance on contract employees.

Future research utilizing fixed effects models over a more extended time period can analyze large structural changes in cities' economic bases and revenue portfolios. Increased within-city variation may result in more robust findings and a more precise understanding of public sector employment's importance to tax stability. Further research deserves consideration given the size of public sector employment in many U.S. cities. If the post-Great Recession era truly is a new normal for governments, cities that depend on public sector employment (e.g., state capitals and

university towns) should better understand the consequences of reducing public workforces. Such studies may help guide these cities in their long-term financial planning. The Pew Charitable Trust recommends that governments understand the causes of their revenue volatility and long-term trends in volatility to advise better decisions related to rainy day funds.[88] Cities that have historically relied on stability from government employment but are seeing their economic base shift towards private sector employment may wish to increase reserves or examine their tax portfolios to prepare for future recessions.

This study attempts to measure the impact of state and local government employment on city tax revenue volatility. Revenue volatility is a common topic in public finance research, but little is known about the impact of specific industries on tax volatility. For public sector employment, sustained state and local government job losses following the Great Recession represent the reduction of a relatively stable industry. Such trends raise questions about government employment as an industry and its impact on revenue stability. This study represents a starting point for investigating this relationship. While the government employment coefficients estimated in this study show an inverse relationship with tax volatility, low statistical significance limits confidence in the results. Additional research is needed to better understand the relationship between government employment and tax volatility.

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Appendix A - Changes in State and Local Government Employment by State

Percent Change in State and Local Government Employment 2018 vs. 2008

State	% Change	State	% Change
Louisiana	-12.2%	Alaska	-1.3%
Connecticut	-10.5%	Hawaii	-1.1%
Michigan	-7.5%	Alabama	-1.1%
Pennsylvania	-6.6%	Tennessee	0.0%
Georgia	-6.6%	Vermont	0.1%
Rhode Island	-6.0%	Maryland	0.7%
New Mexico	-5.7%	California	1.1%
Arizona	-5.7%	North Carolina	1.4%
New Jersey	-5.5%	Virginia	2.0%
Maine	-5.3%	Oklahoma	2.2%
Ohio	-5.0%	Iowa	2.4%
Illinois	-4.4%	South Carolina	2.6%
Indiana	-4.4%	Minnesota	3.1%
Missouri	-4.3%	Nebraska	3.3%
West Virginia	-3.3%	Wyoming	3.6%
Mississippi	-3.0%	Montana	3.8%
New Hampshire	-2.8%	Massachusetts	5.1%
Florida	-2.6%	Idaho	5.4%
Kansas	-2.4%	Delaware	5.5%
Nevada	-2.2%	South Dakota	6.5%
Kentucky	-1.9%	Texas	7.8%
Oregon	-1.5%	Washington	8.0%
Wisconsin	-1.4%	North Dakota	12.4%
Arkansas	-1.4%	Colorado	15.9%
New York	-1.3%	Utah	18.9%

Source: Author's calculation using Bureau of Labor Statistics. Quarterly Census of Employment and Wages, 2008 and 2018. https://www.bls.gov/cew/data.htm

Appendix B – Sample of Cities

Cities Included in the Study

City	County	Population	City	County	Population	City	County	Population
Louisville	Jefferson	596,155	Campbellsville	Taylor	10,819	Grayson	Carter	4,115
Lexington	Fayette	296,847	Mayfield	Graves	10,058	Carrollton	Carroll	3,933
Bowling Green	Warren	59,347	Paris	Bourbon	9,815	Williamstown	Grant	3,929
Owensboro	Daviess	57,481	Maysville	Mason	9,016	Prestonsburg	Floyd	3,860
Covington	Kenton	40,498	Versailles	Woodford	8,857	Lancaster	Garrard	3,811
Hopkinsville	Christian	32,124	Franklin	Simpson	8,452	Stanford	Lincoln	3,743
Richmond	Madison	31,690	Harrodsburg	Mercer	8,359	Morganfield	Union	3,513
Florence	Boone	29,671	LaGrange	Oldham	8,096	West Liberty	Morgan	3,297
Georgetown	Scott	29,202	London	Laurel	7,988	Hodgenville	Larue	3,231
Henderson	Henderson	28,949	Pikeville	Pike	7,033	Barbourville	Knox	3,173
Elizabethtown	Hardin	28,419	Russellville	Logan	6,970	Marion	Crittenden	3,031
Nicholasville	Jessamine	28,104	Mount Sterling	Montgomery	6,902	Flemingsburg	Fleming	2,848
Frankfort	Franklin	27,327	Morehead	Rowan	6,877	Springfield	Washington	2,808
Paducah	Mccracken	25,002	Leitchfield	Grayson	6,662	Stanton	Powell	2,744
Madisonville	Hopkins	19,837	Cynthiana	Harrison	6,430	Brandenburg	Meade	2,696
Winchester	Clark	18,355	Princeton	Caldwell	6,341	Hartford	Ohio	2,672
Murray	Calloway	17,845	Monticello	Wayne	6,191	Cadiz	Trigg	2,606
Danville	Boyle	16,266	Lebanon	Marion	5,553	Eddyville	Lyon	2,557
Newport	Campbell	15,464	Hazard	Perry	5,499	Mount Vernon	Rockcastle	2,514
Shelbyville	Shelby	14,134	Williamsburg	Whitley	5,148	Irvine	Estill	2,478
Glasgow	Barren	14,025	Columbia	Adair	4,571	Louisa	Lawrence	2,455
Bardstown	Nelson	12,578	Benton	Marshall	4,532	Morgantown	Butler	2,451
Shepherdsville	Bullitt	11,373	Greenville	Muhlenberg	4,485	Hickman	Fulton	2,392
Somerset	Pulaski	11,228	Scottsville	Allen	4,239	Tompkinsville	Monroe	2,349
Lawrenceburg	Anderson	11,022	Paintsville	Johnson	4,231	Hardinsburg	Breckinridge	2,336

Cities Included in the Study - Continued

City	County	Population	City	County	Population	City	County	Population
Falmouth	Pendleton	2,213	Salyersville	Magoffin	1,870	Owingsville	Bath	1,515
Jackson	Breathitt	2,187	Catlettsburg	Boyd	1,864	Vanceburg	Lewis	1,459
Liberty	Casey	2,171	Jamestown	Russell	1,796	Manchester	Clay	1,443
Greensburg	Green	2,159	Harlan	Harlan	1,739	Clinton	Hickman	1,377
Elkton	Todd	2,146	Warsaw	Gallatin	1,685	Beattyville	Lee	1,303
Whitesburg	Letcher	2,131	Munfordville	Hart	1,611	Greenup	Greenup	1,189
Albany	Clinton	2,027	Edmonton	Metcalfe	1,598	Taylorsville	Spencer	1,189
Carlisle	Nicholas	2,000	Burkesville	Cumberland	1,539			
Pineville	Bell	1,934	Owenton	Owen	1,527			

Smallest Cities Omitted Due to Outlier Concerns

City	County	Population	City	County	Population	City	County	Population
Hawesville	Hancock	982	Bardwell	Carlisle	721	Campton	Wolfe	436
Dixon	Webster	918	Inez	Martin	715	Hyden	Leslie	369
New Castle	Henry	909	Wickliffe	Ballard	689	Mount Olivet	Robertson	367
Brownsville	Edmonson	837	Brooksville	Bracken	650	Smithland	Livingston	301
McKee	Jackson	807	Sandy Hook	Elliott	643	Booneville	Owsley	135
Hindman	Knott	774	Bedford	Trimble	610			
Calhoun	Mclean	761	Frenchburg	Menifee	533			

Source: 2010 population based on Census Bureau mid-year population estimates, 2010-2018. https://www.census.gov/data/datasets/time-series/demo/popest/2010s-total-cities-and-towns.html

Appendix C – Rankings

Table C.1 – Tax Volatility

Sample Cities Ranked by Average Tax Volatility Score (Low to High)
2007 to 2018

Rank	City	County	Volatility	Rank	City	County	Volatility
1	Morehead	Rowan	0.012	34	Shepherdsville	Bullitt	0.036
2	Henderson	Henderson	0.016	35	Morganfield	Union	0.036
3	Richmond	Madison	0.018	36	Mount Sterling	Montgomery	0.036
4	Hopkinsville	Christian	0.019	37	Franklin	Simpson	0.036
5	Frankfort	Franklin	0.019	38	Madisonville	Hopkins	0.037
6	Mayfield	Graves	0.019	39	Manchester	Clay	0.037
7	Flemingsburg	Fleming	0.020	40	Paris	Bourbon	0.037
8	Paducah	Mccracken	0.022	41	Covington	Kenton	0.037
9	Owensboro	Daviess	0.023	42	Prestonsburg	Floyd	0.038
10	Campbellsville	Taylor	0.025	43	Louisa	Lawrence	0.039
11	Clinton	Hickman	0.025	44	Lebanon	Marion	0.041
12	Harrodsburg	Mercer	0.025	45	Williamsburg	Whitley	0.041
13	Nicholasville	Jessamine	0.027	46	Owingsville	Bath	0.042
14	Marion	Crittenden	0.028	47	Maysville	Mason	0.043
15	Paintsville	Johnson	0.028	48	Florence	Boone	0.043
16	Carrollton	Carroll	0.028	49	Owenton	Owen	0.044
17	Russellville	Logan	0.029	50	Bowling Green	Warren	0.044
18	Barbourville	Knox	0.029	51	Murray	Calloway	0.045
19	Elizabethtown	Hardin	0.030	52	Lawrenceburg	Anderson	0.046
20	Lexington	Fayette	0.031	53	Springfield	Washington	0.046
21	Beattyville	Lee	0.031	54	Elkton	Todd	0.046
22	Glasgow	Barren	0.031	55	Winchester	Clark	0.046
23	Hardinsburg	Breckinridge	0.031	56	Jamestown	Russell	0.047
24	Carlisle	Nicholas	0.032	57	Munfordville	Hart	0.048
25	Tompkinsville	Monroe	0.032	58	Greenville	Muhlenberg	0.048
26	Hazard	Perry	0.032	59	Monticello	Wayne	0.049
27	Williamstown	Grant	0.034	60	Newport	Campbell	0.049
28	Stanford	Lincoln	0.035	61	Brandenburg	Meade	0.049
29	Pikeville	Pike	0.035	62	Shelbyville	Shelby	0.049
30	Louisville	Jefferson	0.035	63	Versailles	Woodford	0.050
31	Eddyville	Lyon	0.035	64	Harlan	Harlan	0.051
32	Princeton	Caldwell	0.035	65	Pineville	Bell	0.054
33	Cynthiana	Harrison	0.036	66	West Liberty	Morgan	0.055

Sample Cities Ranked by Average Tax Volatility Score (Low to High) - Continued
2007 to 2018

Rank	City	County	Volatility	Rank	City	County	Volatility
67	Cadiz	Trigg	0.055	84	Liberty	Casey	0.087
68	Benton	Marshall	0.057	85	Hartford	Ohio	0.090
69	Salyersville	Magoffin	0.058	86	Edmonton	Metcalfe	0.091
70	Falmouth	Pendleton	0.061	87	Vanceburg	Lewis	0.094
71	Leitchfield	Grayson	0.061	88	Mount Vernon	Rockcastle	0.096
72	Morgantown	Butler	0.062	89	Columbia	Adair	0.097
73	Scottsville	Allen	0.064	90	Stanton	Powell	0.098
74	Greensburg	Green	0.065	91	Georgetown	Scott	0.101
75	Warsaw	Gallatin	0.067	92	Burkesville	Cumberland	0.101
76	Danville	Boyle	0.071	93	Grayson	Carter	0.102
77	LaGrange	Oldham	0.071	94	Jackson	Breathitt	0.104
78	Taylorsville	Spencer	0.075	95	Hickman	Fulton	0.105
79	Hodgenville	Larue	0.075	96	London	Laurel	0.119
80	Lancaster	Garrard	0.078	97	Whitesburg	Letcher	0.146
81	Somerset	Pulaski	0.078	98	Catlettsburg	Boyd	0.163
82	Bardstown	Nelson	0.078	99	Greenup	Greenup	0.179
83	Irvine	Estill	0.084	100	Albany	Clinton	0.180

Source: Author’s calculation using Kentucky League of Cities UFIR data

Table C.2 – State and Local Government Employment

Sample Cities Ranked by Share of Total County Employment from State and Local Government Employment (High to Low)
2006 to 2017

Rank	City	County	% State Local Gov Emp	Rank	City	County	% State Local Gov Emp
1	Frankfort	Franklin	44.8%	33	Hickman	Fulton	21.8%
2	Eddyville	Lyon	38.8%	34	Grayson	Carter	21.7%
3	West Liberty	Morgan	34.9%	35	Hodgenville	Larue	21.6%
4	Carlisle	Nicholas	34.7%	36	Whitesburg	Letcher	21.3%
5	Taylorsville	Spencer	33.0%	37	Lawrenceburg	Anderson	21.3%
6	Vanceburg	Lewis	31.8%	38	Leitchfield	Grayson	21.1%
7	Greensburg	Green	31.7%	39	Burkesville	Cumberland	21.1%
8	Salyersville	Magoffin	31.5%	40	Louisa	Lawrence	20.7%
9	Lancaster	Garrard	31.1%	41	Marion	Crittenden	20.4%
10	Stanton	Powell	30.9%	42	Richmond	Madison	20.3%
11	Jackson	Breathitt	30.5%	43	Prestonsburg	Floyd	20.2%
12	Manchester	Clay	29.6%	44	Columbia	Adair	19.9%
13	Flemingsburg	Fleming	29.5%	45	Liberty	Casey	19.6%
14	Irvine	Estill	29.4%	46	Pineville	Bell	19.6%
15	Owingsville	Bath	28.4%	47	Greenville	Muhlenberg	19.3%
16	Morehead	Rowan	28.1%	48	Greenup	Greenup	18.9%
17	Falmouth	Pendleton	27.3%	49	Hazard	Perry	18.9%
18	Owenton	Owen	27.3%	50	Williamsburg	Whitley	18.8%
19	Elkton	Todd	27.3%	51	Hartford	Ohio	18.8%
20	Edmonton	Metcalfe	26.5%	52	Cadiz	Trigg	18.7%
21	Brandenburg	Meade	25.9%	53	Newport	Campbell	18.5%
22	Beattyville	Lee	25.9%	54	Monticello	Wayne	18.4%
23	Paintsville	Johnson	24.8%	55	Warsaw	Gallatin	18.3%
24	Hardinsburg	Breckinridge	24.7%	56	Barbourville	Knox	18.1%
25	Stanford	Lincoln	24.6%	57	Scottsville	Allen	18.0%
26	LaGrange	Oldham	24.5%	58	Princeton	Caldwell	18.0%
27	Clinton	Hickman	23.5%	59	Madisonville	Hopkins	17.8%
28	Williamstown	Grant	23.4%	60	Munfordville	Hart	17.8%
29	Harlan	Harlan	23.2%	61	Lexington	Fayette	17.6%
30	Morgantown	Butler	22.5%	62	Cynthiana	Harrison	17.0%
31	Mount Vernon	Rockcastle	22.2%	63	Owensboro	Daviess	16.9%
32	Tompkinsville	Monroe	22.1%	64	Jamestown	Russell	16.7%

Sample Cities Ranked by Share of Total County Employment from State and Local Government Employment (High to Low) - Continued
2006 to 2017

Rank	City	County	% State Local Gov Emp	Rank	City	County	% State Local Gov Emp
65	Versailles	Woodford	16.6%	83	Morganfield	Union	13.1%
66	Mayfield	Graves	16.3%	84	Henderson	Henderson	13.1%
67	Campbellsville	Taylor	15.6%	85	Danville	Boyle	13.0%
68	Springfield	Washington	15.6%	86	Bardstown	Nelson	12.2%
69	Benton	Marshall	15.6%	87	Lebanon	Marion	11.6%
70	Albany	Clinton	15.6%	88	Catlettsburg	Boyd	11.4%
71	Nicholasville	Jessamine	15.3%	89	Winchester	Clark	11.4%
72	Maysville	Mason	15.1%	90	Hopkinsville	Christian	11.4%
73	Shepherdsville	Bullitt	15.0%	91	Carrollton	Carroll	11.0%
74	Elizabethtown	Hardin	15.0%	92	London	Laurel	11.0%
75	Russellville	Logan	15.0%	93	Covington	Kenton	10.9%
76	Somerset	Pulaski	14.8%	94	Mount Sterling	Montgomery	10.8%
77	Shelbyville	Shelby	14.7%	95	Paducah	Mccracken	9.5%
78	Paris	Bourbon	14.7%	96	Franklin	Simpson	9.5%
79	Bowling Green	Warren	14.5%	97	Louisville	Jefferson	9.0%
80	Harrodsburg	Mercer	14.3%	98	Georgetown	Scott	8.8%
81	Pikeville	Pike	13.4%	99	Florence	Boone	6.6%
82	Glasgow	Barren	13.2%		Murray	Calloway	N/A

Source: Author's calculation using Bureau of Labor Statistics. Quarterly Census of Employment and Wages, 2006 to 2017. https://www.bls.gov/cew/data.htm

Table C.3 – Federal Government Employment

Sample Cities Ranked by Share of Total County Employment from Federal Government Employment (High to Low)
2006 to 2017

Rank	City	County	% Fed Gov Emp	Rank	City	County	% Fed Gov Emp
1	Hopkinsville	Christian	14.0%	34	Hartford	Ohio	1.3%
2	Elizabethtown	Hardin	12.9%	35	Marion	Crittenden	1.3%
3	Manchester	Clay	9.0%	36	London	Laurel	1.3%
4	Covington	Kenton	6.8%	37	Edmonton	Metcalfe	1.2%
5	Greenville	Muhlenberg	6.1%	38	Lancaster	Garrard	1.2%
6	Richmond	Madison	3.4%	39	Jamestown	Russell	1.2%
7	Cadiz	Trigg	2.8%	40	Pikeville	Pike	1.2%
8	Lexington	Fayette	2.3%	41	West Liberty	Morgan	1.2%
9	Clinton	Hickman	2.3%	42	Harlan	Harlan	1.2%
10	Hardinsburg	Breckinridge	2.1%	43	Vanceburg	Lewis	1.2%
11	Barbourville	Knox	2.0%	44	Newport	Campbell	1.2%
12	Jackson	Breathitt	1.9%	45	Prestonsburg	Floyd	1.2%
13	Mayfield	Graves	1.9%	46	Hickman	Fulton	1.2%
14	Catlettsburg	Boyd	1.7%	47	Hazard	Perry	1.1%
15	Paducah	Mccracken	1.7%	48	Morgantown	Butler	1.1%
16	Frankfort	Franklin	1.7%	49	Columbia	Adair	1.1%
17	Flemingsburg	Fleming	1.7%	50	Whitesburg	Letcher	1.1%
18	Florence	Boone	1.6%	51	Springfield	Washington	1.1%
19	Pineville	Bell	1.6%	52	Grayson	Carter	1.1%
20	Hodgenville	Larue	1.6%	53	Louisa	Lawrence	1.1%
21	Carlisle	Nicholas	1.6%	54	Leitchfield	Grayson	1.1%
22	Owingsville	Bath	1.6%	55	Scottsville	Allen	1.0%
23	Elkton	Todd	1.6%	56	Princeton	Caldwell	1.0%
24	Louisville	Jefferson	1.6%	57	Mount Vernon	Rockcastle	1.0%
25	Taylorsville	Spencer	1.5%	58	Tompkinsville	Monroe	1.0%
26	Eddyville	Lyon	1.5%	59	Williamstown	Grant	1.0%
27	Warsaw	Gallatin	1.4%	60	Irvine	Estill	0.9%
28	Greensburg	Green	1.4%	61	Cynthiana	Harrison	0.9%
29	Owenton	Owen	1.4%	62	Beattyville	Lee	0.9%
30	Stanton	Powell	1.4%	63	Madisonville	Hopkins	0.9%
31	Stanford	Lincoln	1.4%	64	Morganfield	Union	0.9%
32	Albany	Clinton	1.3%	65	Brandenburg	Meade	0.9%
33	Falmouth	Pendleton	1.3%	66	Lawrenceburg	Anderson	0.9%

Sample Cities Ranked by Share of Total County Employment from Federal Government Employment (High to Low) - Continued
2006 to 2017

Rank	City	County	% Fed Gov Emp	Rank	City	County	% Fed Gov Emp
67	Morehead	Rowan	0.9%	84	Glasgow	Barren	0.7%
68	Benton	Marshall	0.8%	85	Mount Sterling	Montgomery	0.7%
69	Munfordville	Hart	0.8%	86	Henderson	Henderson	0.6%
70	Liberty	Casey	0.8%	87	Paris	Bourbon	0.6%
71	Campbellsville	Taylor	0.8%	88	Owensboro	Daviess	0.6%
72	Russellville	Logan	0.8%	89	Maysville	Mason	0.6%
73	Greenup	Greenup	0.8%	90	Bardstown	Nelson	0.6%
74	Williamsburg	Whitley	0.8%	91	Shelbyville	Shelby	0.6%
75	Winchester	Clark	0.8%	92	Carrollton	Carroll	0.5%
76	Paintsville	Johnson	0.8%	93	LaGrange	Oldham	0.5%
77	Burkesville	Cumberland	0.8%	94	Nicholasville	Jessamine	0.5%
78	Somerset	Pulaski	0.7%	95	Murray	Calloway	0.5%
79	Bowling Green	Warren	0.7%	96	Danville	Boyle	0.5%
80	Monticello	Wayne	0.7%	97	Versailles	Woodford	0.5%
81	Salyersville	Magoffin	0.7%	98	Franklin	Simpson	0.4%
82	Harrodsburg	Mercer	0.7%	99	Shepherdsville	Bullitt	0.4%
83	Lebanon	Marion	0.7%	100	Georgetown	Scott	0.3%

Source: Author's calculation using Bureau of Labor Statistics. Quarterly Census of Employment and Wages, 2006 to 2017. https://www.bls.gov/cew/data.htm