DIVERSIFICATION AND STABILITY IN ILLINOIS LOCAL GOVERNMENT REVENUES

WESLEY JANSON, UNIVERSITY OF CHICAGO
JUSTIN MARLOWE, UNIVERSITY OF CHICAGO

We propose and test a new measure of local government revenue diversification. Conventional wisdom suggests that local governments with more diversified revenue portfolios will have more stable revenues over time. However, traditional measures of revenue diversification do not account for co-movements across revenue sources that can lead to unexpected windfalls and shortfalls. To address this drawback, we directly measure the volatility of local government revenue portfolios. We then test this new measure on all counties, cities, and villages in Illinois from 2000-2021, and find it explains revenue windfalls and shortfalls much better than traditional diversification measures. We also find that revenue volatility is especially strong among local governments that depend on state intergovernmental revenues.

INTRODUCTION

A local government's revenue system should be "adequate." That is, it should produce enough revenue each year to fund essential services (Maxwell, 1972; CMAP, 2010; GFOA, 2022a). Today, several demographic, economic, and political trends threaten local revenue adequacy in Illinois and beyond. Consumers have shifted large portions of their spending away from goods that are subject to local sales taxes, and toward services that are not (Mikesell, 2018; Walczak, 2022). Property tax collections are expected to wane due to declining commercial property values (Chernick, Copeland, and Merriman, 2021), and ineffective use of property tax exemptions for economic development and other targeted tax relief (Augustine and Lincoln Institute of Land Policy, 2009; Civic Federation, 2010). Charges for services, once the fastest-growing local revenue source, have been widely criticized for falling disproportionately on the poor (Singla, Kirschner, and Stone, 2020). Local policymakers have responded to these threats by expanding local sales tax bases to include more services (CMAP, 2019), "clawing back" tax incentives that fail to generate their promised economic benefits (Jensen and Malesky, 2018), and "segmenting" local fines and fees by the payees' income (GFOA, 2022b), among many other strategies.

In this paper we focus on a different and often misunderstood dimension of revenue adequacy: stability. Illinois local governments are required by state law to pass a balanced budget. Balanced budgeting is far more difficult in a revenue system that's prone to unpredictable shortfalls. It follows that local elected officials, if given the choice between a system that produces predictable but modest revenues over time, and a system that produces strong revenue growth over time but with large annual windfalls and shortfalls, will choose the former.

If stability is such a desirable characteristic of local revenue systems, then what can state and local policymakers do to promote it? For decades, the primary answer to that question has been revenue diversification. Diversification follows from the proverbial advice of "don't put all your eggs in one basket." A local government that relies on multiple revenue sources, the logic suggests, is less likely to experience simultaneous declines across all those sources. Advocates for new local income taxes and local sales taxes (see, for instance, (Lincoln Institute of Land Policy, 2020; Civic Federation, 2019)) and for easing state restrictions on property tax collections (see, for instance, Pew Charitable Trusts (2021)) often point to diversification's stabilizing effect on overall revenues. Decades of academic research, including several papers focused on Illinois local governments (Carroll, Eger, and Marlowe, 2003; Carroll, 2009; Shoag, Tuttle, and Veuger, 2019), has shown that, in fact, more diversification associates with more revenue stability in some circumstances (Carroll, 2009; Shoag, Tuttle, and Veuger, 2019), but less stability in others (Afonso, 2013, 2017). This mixed relationship begs additional attention.

In this paper we show that our understanding of revenue diversification's effects is incomplete. In response, we devise and test a new measure of diversification that better captures how local revenues behave in space and time.

Most research to date has defined diversification as the distribution of a local government's revenue burden across all its available revenue sources. For example, a jurisdiction that has access to three revenue sources — property tax, local sales tax and state intergovernmental revenues — and relies on each for one-third of its total revenues is "perfectly" diversified and would earn a high score on the traditional diversification measures. Shifting more of its revenue burden to any single source would result in a less diversified portfolio and a lower diversification score (Suyderhoud, 1994; Carroll, 2009; Afonso, 2022).

The problem with these "diversification as distribution" measures is that they do not capture the co-movements across sources. A local government can

distribute its revenue burden equally across three sources, but if all three increase or decrease in tandem, then the portfolio is still subject to large windfalls and shortfalls. Adding a fourth revenue source that follows the same pattern of annual increases and decreases will only further destabilize the portfolio. By contrast, shifting the revenue burden toward sources that move in opposite directions, or at least do not move together to the same extent, will produce more reliable revenue collections. Our current diversification measures do not account for these co-movements.

We offer a new measure that addresses this problem. Our measure treats local government revenues as analogous to investment portfolios (Markowitz, 1952). We observe how revenue sources increase or decrease over time, and more importantly, the correlations across those increases and decreases. This approach produces a measure of the tendency for a local government's overall revenues to deviate from its long-run trend. A less volatile portfolio enjoys the main benefit of diversification — more stable revenues over time — given the specific mix of sources it employs. We calculated this volatility measure for all Illinois counties, cities, and villages from 2000 through 2021.

We report three main findings. First, Illinois local revenues became less volatile throughout the past two decades, even though overall distribution of the revenue burden across sources remained largely unchanged. Second, in a simple multivariate analysis, we find that our volatility measure accounts for revenue windfalls and shortfalls much more effectively than the traditional diversification as distribution measures. And third, local governments that depend more on state intergovernmental revenues tend to have higher revenue volatility, while those that depend more on property taxes and charges for service tend to have lower volatility. In particular, local governments that depend the least on state intergovernmental revenues have revenue volatility that is nearly one half that of local governments that depend the most on state intergovernmental revenues. A diversified revenue portfolio is important, but how that portfolio is diversified is even more important.

The remainder of this paper proceeds in three parts. In the next section we explain how we measure revenue diversification and revenue volatility. Following that, we present our main findings focused on trends in the diversification measures, the relationship between revenue volatility and revenue stability, and the factors that associate with revenue volatility. In the final section we explain the implications of our findings for state fiscal policy surrounding intergovernmental revenues.

MEASUREMENT AND DATA

DIVERSIFICATION AS DISTRIBUTION

Most research to date on local revenue diversification has employed some version of a Herfindahl-Hirschmann index (HHI). HHI is perhaps best known from its applications in anti-trust proceedings, where it is an often-cited indicator of competition among firms in the same industry (see, for example, Miller (1982)).

An HHI compares the distribution of activity across categories to a hypothetical scenario where that activity is distributed equally across categories. For local revenues, it measures the share of total local revenue derived from each potential revenue source, relative to those shares if its revenues were distributed equally across all sources. In concept, more diversification means less reliance on any particular revenue source(s), and that results in more stable revenue collections.

Following previous work (see, among others, Suyderhoud (1994); Carroll, Eger, and Marlowe (2003); Jordan and Wagner (2008); Carroll (2009); Carroll and Johnson (2010); Afonso (2022); Jimenez and Afonso (2022)), we employ the following HHI formulation of local revenue distribution:

$$Distribution = \frac{1-\sum_{i-1}^{'} \omega_i^2}{1-\frac{100\%}{i}} \quad (1)$$

where k is the number of revenue sources and ω_i is the share of total revenue derived from a given source. A higher *Distribution* denotes more diversification, i.e., more equal shares of total revenue derived across categories.

DIVERSIFICATION AS PORTFOLIO VOLATILITY

As an alternative to the traditional HHI-type measures, here we propose a new measure based on the key ideas from portfolio management (Markowitz, 1952; Sharpe, 2000; Lo and Foerster, 2021). These concepts are the foundation for much of the professional investment management industry.

Most investors look to generate the highest investment gains (i.e., returns) given their investment time frame. Someone saving for retirement, for instance, will prefer an investment portfolio that generates smooth and predictable returns to a volatile portfolio that's subject to large annual gains and losses, even if both

portfolios produce the same average returns over the long run. Like investors in search of predictable annual returns, local governments prefer that their revenue portfolios generate predictable annual revenues.

Diversification can help to reduce volatility and smooth returns. A diversified portfolio includes investments whose prices tend to not move together (i.e., uncorrelated assets). To illustrate, consider a portfolio invested in equal parts Allstate, State Farm, and Progressive stock. When the insurance industry performs well, that portfolio will generate some of the strongest investment returns in the stock market. But it is also susceptible to large losses if, say, a major hurricane devastates Florida. By contrast, a portfolio comprised of equal parts Apple stock, U.S. Treasury bonds and real estate — three largely uncorrelated assets — will not perform as well when the insurance industry is booming but is also not exposed to major losses in the wake of that same hurricane. This later portfolio is more diversified and, in turn, less volatile. Note also that both portfolios would score the same on an HHI-style diversification measure.

Here we apply that same concept to local government revenues. A local revenue portfolio is more volatile if multiple revenue streams within it move in tandem. Or, as a recent Government Finance Officers Association analysis put it, "Does the revenue source contribute to a system wherein the productivity of the revenue sources that make up the system are not correlated with each other? This is the essence of diversification" (GFOA, 2022a, p.7).

To illustrate this intuition, imagine that for all cities in a region, the average annual change in local property tax collections throughout the past decade was ± 3%, the average change in local sales tax collections was ± 6%, and the average change in utility tax collections was ± 1%. Given those trends, a local government that depends on property tax for half its revenues and sales tax for the other half will likely have a much higher revenue portfolio volatility than a government that relies on property tax for half and utility taxes for half. The half property tax-half sales tax portfolio has the potential for much higher annual increases, but also for much greater annual decreases. The measure proposed here directly captures these co-movements across revenues.

We construct that measure as follows. First, we measure the volatility of individual revenue sources. For each year t, we define a time window of $[t - k, t - 1]$ spanning the k years preceding year t. Let $REV^{r}_{t,k}$ denote the annual collections of that revenue across that window. The volatility of that revenue source is defined as its standard deviation, or:

$$\sigma(REV)^{i}_{t,k} = \sigma\left(REV^{i}_{t,k}\right) \quad (2)$$

We estimate these volatilities over five-year rolling windows. Next consider a local government with *N* revenue sources. That government's revenue portfolio volatility is defined as:

$$Volatility = \sigma(REV)_{t,k} = \sqrt{\sum_{i=1}^{N}\sum_{j=1}^{N}\omega_i\omega_j\sigma(REV)^{i}_{t,k}\sigma(REV)^{j}_{t,k}\rho_{i,j}} \quad (3)$$

where $\sigma(REV)^{i}_{t,k}$ and $\sigma\left(REV^{i}_{t,k}\right)$ are the volatilities for revenue streams *i* and *j*, respectively, ω_i and ω_j are the proportion of the jurisdiction's total revenue from revenue streams *i* and *j*, respectively, and $\rho_{i,j}$ is the correlation between revenue streams.

A key drawback of this approach is that it assumes variance is normally distributed. In practice, certain local revenue sources or certain jurisdictions can experience prolonged periods of abnormally large revenue increases or decreases. This can happen for structural reasons, like in jurisdictions experiencing large population growth, and for policy reasons like the large infusions of federal and state support during the recent pandemic. But despite this drawback, this approach does help illuminate key trends in portfolio variance across the population of Illinois counties, cities, and villages.

REVENUE STABILITY

We employ a measure of revenue stability used in many previous studies (see Marlowe (2005); Carroll (2009); Wang and Hou (2012). That measure is based on the idea that government revenue collections follow a linear trend over time (see Davis, Dempster, and Wildavsky (1966); Poterba (1994); Hou and Moynihan (2006)). That linear trend reveals expected revenues, and deviations from that trend in turn represent unexpected revenue windfalls or shortfalls. Revenue stability is the frequency and intensity of those windfalls and shortfalls.

To measure revenue stability, we first identify a linear trend using the following specification, and we fit that specification using least squares regression:

$$\Delta\widehat{TotRev}_{it} = \alpha + \beta_1\Delta TotRev_{i,t-1} + \cdots + \beta_k\Delta TotRev_{i,t-k} + \epsilon \quad (4)$$

where $\Delta\widehat{TotRev}_{it}$ is the predicted annual change in total revenue for jurisdiction *i* in year *t*, and *k* is the number of years preceding *t*.

We then compute revenue stability, or *Stability* as the absolute value of the residuals from that regression, or:

$$Stability = \left|\Delta TotRev_{it} - \Delta\widehat{TotRev}_{it}\right| \quad (5)$$

Smaller values for *Stability* suggest less frequent and smaller revenue windfalls and shortfalls. Consistent with previous work in this area (Carroll, 2009), we expect that higher levels of *Distribution* will associate with more *Stability*. We also expect that more *Volatility* will associate with less *Stability*.

DATA

We compute *Distribution*, *Volatility,* and *Stability* for every county, city, and village in Illinois. Our analysis relies on data from the Annual Financial Reports (AFR) submitted to the Illinois Comptroller's Local Government Division. AFRs are self-reported summaries of revenues, expenditures, assets, and liabilities. Most are based on local governments audited Annual Comprehensive Financial Reports (ACFR). AFRs also include other relevant information like population and equalized assessed property value. Our analysis covers 2000-2021, the years the Illinois Comptroller currently makes all local AFRs available.

We limit our analysis to the general fund. This excludes revenues in capital projects, special revenue, enterprise, and other funds that are typically earmarked for specific projects and purposes. Volatility in those revenues is important, but less relevant than general fund revenues for balanced budgeting.

We focus on eight core general fund revenue categories. Those categories and their corresponding AFR codes are reported in Table 1. "Property Tax" and "Local Sales Tax" include only those specific revenues. "Utility Tax" includes all taxes on electric, water, and communications utilities. "Other Taxes" includes taxes on other utilities such as natural gas utilities and electric cooperatives. "State Intergovernmental Revenues" are distributions to local government of the state income tax, state sales tax, state motor fuel tax, state replacement tax, state gaming revenues, and other miscellaneous state revenues. "Federal Intergovernmental Revenues" is federal support for purposes other than

specific programmatic areas like health and transit. "Other Revenues" typically includes intergovernmental grants, shared inter-local revenues, and payments in lieu of taxes from otherwise tax-exempt entities like universities and hospitals. "Licenses, Fees and Charges for Service" include all locally-imposed fees on business licenses; non-business licenses like pet registration; fines and fees in response to violations of local statutes like parking violations and municipal speeding ordinances; and user charges in non-enterprise services like arts, culture, and recreation. "Other Revenues" covers all other non-tax revenues and for most local governments includes franchise fees, charges for services to other local governments, and facility rental fees, among many others.

TABLE 1

CONSTRUCTION OF LOCAL REVENUE CATEGORIES FROM IL COMPTROLLER LOCAL REVENUE CODES

REVENUE SOURCE	IL COMPTROLLER CODE(S)
Property Tax	201t
Local Sales Tax	202t
Utility Tax	203t
Other Taxes	204t
State Intergovernmental Revenues	211t+212t+213t+214t+215t
Federal Intergovernmental Revenues	225t
Licenses, Fees and Charges for Service	231t+233t+234t
Other Revenues	236t

Source: Authors' analysis of Illinois Comptroller data. Note that this analysis is limited to general fund revenues.

We segment our analysis into three types of jurisdictions: counties, home rule municipalities, and non-home rule municipalities. Prior work has shown home rule associates with smaller revenue drops and stronger credit ratings (Shoag, Tuttle, and Veuger, 2019), more diversified revenue portfolios (Hendrick, 2002), and greater autonomy to shift tax burdens, particularly from residents to non-residents (Banovetz, 2002). All those factors might affect revenue diversification and stability. Cities and villages with a population greater than 25,000 are automatically granted home rule status. Jurisdictions with a population of 25,000 or less can become home rule if local voters pass a referendum.

To limit the influence of large annual changes in individual revenue sources on our revenue portfolio variance measure, we truncate the annual changes in revenue at -1 (i.e., a revenue source disappears in a single year) and +1 (i.e., revenues from a source double in a single year). This change affects all observations roughly below the 3rd percentile, and roughly above the 98th percentile. Truncating the data this way allows large annual changes to influence the overall portfolio variance but does not increase that variance so much that the final measure is unreasonably high. Note that most of the truncated observations were on less common revenue sources like Other Taxes and Other Revenues.

After removing any observations with missing data our final dataset includes 102 counties, 213 home rule municipalities, and 1,065 non-home rule municipalities from 2000-2021, for a total of 30,689 annual observations. Of the home rule municipalities, 87 are cities and 126 are villages. Of the non-home rule municipalities, 215 are cities and 823 are villages. Cook County is the only home rule county in Illinois and is included with counties. Table 2 includes descriptive statistics for the revenue portfolio volatility and distribution measures; jurisdiction-level characteristics like population, equalized assessed property value, and total revenue (across all funds); revenue distributions across sources; and trends in the annual changes for individual revenues.

Table 2 shows that the average revenue portfolio volatility is 0.52. This suggests that a typical local government can expect a year-over-year change in its total general fund revenues of ± 52%. This is consistent with the mean revenue stability of 0.36, which suggests that a typical local governments' total general fund revenues deviate from their linear/expected trend by ± 36% each year. We also see in Table 2 that the three most common revenue sources are state intergovernmental revenues, property taxes and licenses/fees/charges for service, and that other revenues and other taxes had the highest average annual changes at +8% and +5% respectively. Federal intergovernmental revenues had the highest standard deviation at 86%, due in large part to the large infusions of federal support during the recent pandemic.

TABLE 2
DESCRIPTIVE STATISTICS

	MEAN	STANDARD DEVIATION	MIN	MAX
Revenue Portfolio Measures				
Revenue Portfolio Volatility	0.52	0.23	0.02	1.63
Revenue Portfolio Distribution	0.61	0.16	0.07	0.91
Revenue Stability	0.079	2.36	0.00	375.22
Jurisdiction Characteristics				
Population	15,129	131,514	126	5,376,741
Equalized Assessed Value ($ millions)	$337.33	$3,346.53	$1.00	$173,853.47
Total Revenue	$8.92	$96.66	$0.23	$4,573.44
Individual Revenue/Total Revenues				
Property Tax	0.18	0.10	0.02	0.40
Local Sales Tax	0.01	0.02	0.00	0.09
Utilities Tax	0.05	0.07	0.00	0.21
Other Taxes	0.01	0.03	0.00	0.10
State Intergovernmental	0.56	0.18	0.24	0.86
Federal Intergovernmental	0.00	0.01	0.00	0.05
Licenses, Fees and Charges for Service	0.10	0.09	0.00	0.30
Other Revenues	0.05	0.06	0.00	0.22
Annual Change in Individual Revenues				
Δ Property Tax	0.03	0.28	-1.00	1.00
Δ Local Sales Tax	0.04	0.59	-1.00	1.00
Δ Utilities Tax	0.01	0.45	-1.00	1.00
Δ Other Taxes	0.05	0.60	-1.00	1.00
Δ State Intergovernmental	0.03	0.28	-1.00	1.00
Δ Federal Intergovernmental	0.03	0.86	-1.00	1.00
Δ Licenses, Fees and Charges for Service	0.04	0.46	-1.00	1.00
Δ Other Revenues	0.08	0.66	-1.00	1.00

Source: Authors' analysis based on Illinois Comptroller data for 2000-2021. All figures are for general fund revenues only. N = 30,689.

RESULTS

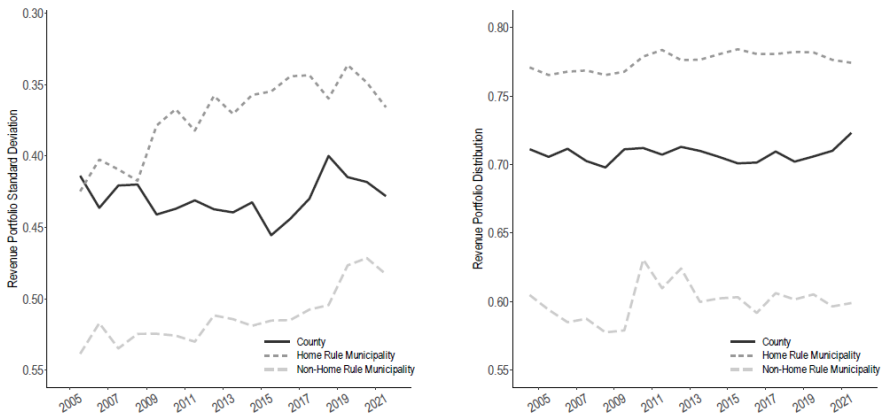
TRENDS IN REVENUE DIVERSIFICATION

Figure 1 shows the annual medians for both revenue diversification measures by type of jurisdiction. Panel A shows those medians for portfolio volatility, and Panel B shows those medians for portfolio distribution. This presentation begins in 2005, as that was the first year that portfolio volatility was available given that it is computed over a five-year rolling window. Note also that the y-axis of Panel A is reversed — in effect, showing that less volatility means more diversification — to improve comparability with portfolio distribution.

Two main trends emerge from Figure 1. First, according to both measures, home rule municipalities have by far the most diversified revenue portfolios. This is consistent with earlier work (Banovetz, 2002; Hendrick, 2002) showing that home rule municipalities have employed their additional autonomy to expand and diversify their revenues broadly, and their local tax revenues in particular. Counties are the second most diversified, particularly since the Great Recession. Non-home rule municipalities are a clear third. This is not surprising, given that they have access to far fewer revenue sources and tend to rely more on state intergovernmental revenues.

FIGURE 1

REVENUE DIVERSIFICATION BY TYPE OF JURISDICTION AND YEAR, 2005-2021



(a) Portfolio Volatility (b) Portfolio Distribution

Source: Authors' analysis based on IL Comptroller data. All figures presented are annual medians based on general fund revenues.

A second trend is that portfolio volatility has generally improved over the past two decades, while portfolio distribution has been constant. Home rule municipalities saw their volatility decline from 0.40 (i.e., an expected annual fluctuation of ± 40%) prior to the Great Recession to 0.32 just prior to the pandemic. Non-home rule municipalities saw a similar relative improvement over that time, and counties saw a similar improvement in the roughly five years preceding the pandemic. By contrast, the median portfolio distributions of all three types of jurisdictions in 2021 were virtually the same as in 2005. Non-home rule municipalities saw a slight improvement in distribution following the Great Recession but returned to their prior levels by 2015.

Note also that all local governments saw declines in both measures in 2020 and 2021. Federal and state revenues supplanted local sales tax and other local revenues, producing noticeably less overall diversification. That trend away from diversification will likely continue well into 2024 and 2025, given that the portfolio standard deviation is computed on a five-year window.

REVENUE DIVERSIFICATION AND REVENUE STABILITY

A new measure of revenue diversification is most useful to fiscal policymaking if it improves our understanding of the factors that drive revenue stability. Here we explore this by examining if both measures can explain variation in revenue stability. To do so we employ a simple multivariate regression model. That model includes the natural log of revenue stability as the dependent variable, and five independent variables: revenue portfolio variance, revenue portfolio distribution, population, total revenue, and equalized assessed value. Population and total revenue are included as their natural logs and are intended to control for management capacity and other factors that might affect forecast accuracy and increase with population. The regression model was estimated using ordinary least squares, with two-way fixed effects on both jurisdiction and year. We also clustered the standard errors by jurisdiction and year to account for any other non-random correlation across space and time. To account for potential endogeneity between volatility on revenue stability, we present three model specifications. Model 1 includes volatility in the same fiscal year as our measure of revenue stability. Model 2 includes a one-year lag in volatility, and Model 3 includes one and two-year lags in volatility as regressors.

Those regression estimates are reported in Table 3. The model has good explanatory power, accounting for 24% of the variation in revenue stability across all three specifications. The coefficients show that, all else equal, revenue

portfolio variance has a strong and statistically significant relationship with revenue stability. The coefficient of 0.294 in Model 1 suggests that a 10% increase in revenue portfolio volatility associates with a 2.94% increase in the gap between expected and actual revenues. That coefficient is also statistically significant at $p < 0.001$, meaning this is most likely not due to random chance. The revenue portfolio distribution's relationship with revenue stability, by contrast, is not statistically significant. The estimates in Models 2 and 3 show that volatility's effect on stability diminishes over time. In the one-year lag the coefficient is smaller at 0.096 but is still statistically significant at $p < 0.1$. By the second year the lag effect is no longer distinguishable. Taken together, these results suggest that revenue portfolio volatility accounts for the variation in revenue stability much more effectively than revenue portfolio distribution accounts for that same variation.

TABLE 3
REGRESSION ESTIMATES OF REVENUE STABILITY FOR ILLINOIS LOCAL GOVERNMENTS, 2005-2021

	MODEL 1	MODEL 2	MODEL 3
Revenue Portfolio Volatility	0.294***	-	-
	(0.055)		
One-Year Lag Portfolio Volatility	-	0.096*	0.057
		(0.056)	(0.067)
Two-Year Lag Portfolio Volatility	-	-	0.022
			(0.065)
Revenue Portfolio Distribution	-0.149	-0.196	-0.197
	(0.136)	(0.141)	(0.144)
Population (ln)	-0.046	-0.040	-0.029
	(0.045)	(0.043)	(0.044)
Total Revenue (ln)	-0.218***	-0.163***	-0.157***
	(0.049)	(0.052)	(0.056)
Equalized Assessed Value (ln)	0.044*	0.029	0.030
	(0.024)	(0.026)	(0.026)
N	24,935	23,553	22,161
Adjusted R2	0.240	0.239	0.242
Residual Std. Error	1.098	1.097	1.094
	(df=23,520)	(df=22,138)	(df=20,747)

*Notes: Data are from the Illinois Comptroller's Local Government Annual Financial Reports. All estimates are based on general fund revenues only. Clustered standard errors are in parentheses. *p < 0.1; **p < 0.05; ***p < 0.01*

WHICH REVENUES AFFECT REVENUE VARIANCE?

The findings presented so far reveal that revenue portfolio volatility has improved throughout the past two decades and is a key driver of local revenue windfalls and shortfalls. With respect to state fiscal policy, a natural next question is: What factors improve volatility? One simple and intuitive response is that volatility is closely linked to the specific revenues that a local government employs. "Pro-cyclical" revenues that tend to increase when the economy is improving — such as local sales taxes and licenses/charges/fees — will likely increase volatility. By contrast, "counter-cyclical" revenues that are less tied to economic trends — such as property taxes and utilities taxes — might reduce volatility.

To explore this claim we examine the distributions of revenue portfolio variance across groups of local governments determined by their dependence on the three most widely used revenues: state intergovernmental revenues, property taxes, and licenses/fees/charges. Consistent with all the analysis so far, we further group by type of jurisdiction.

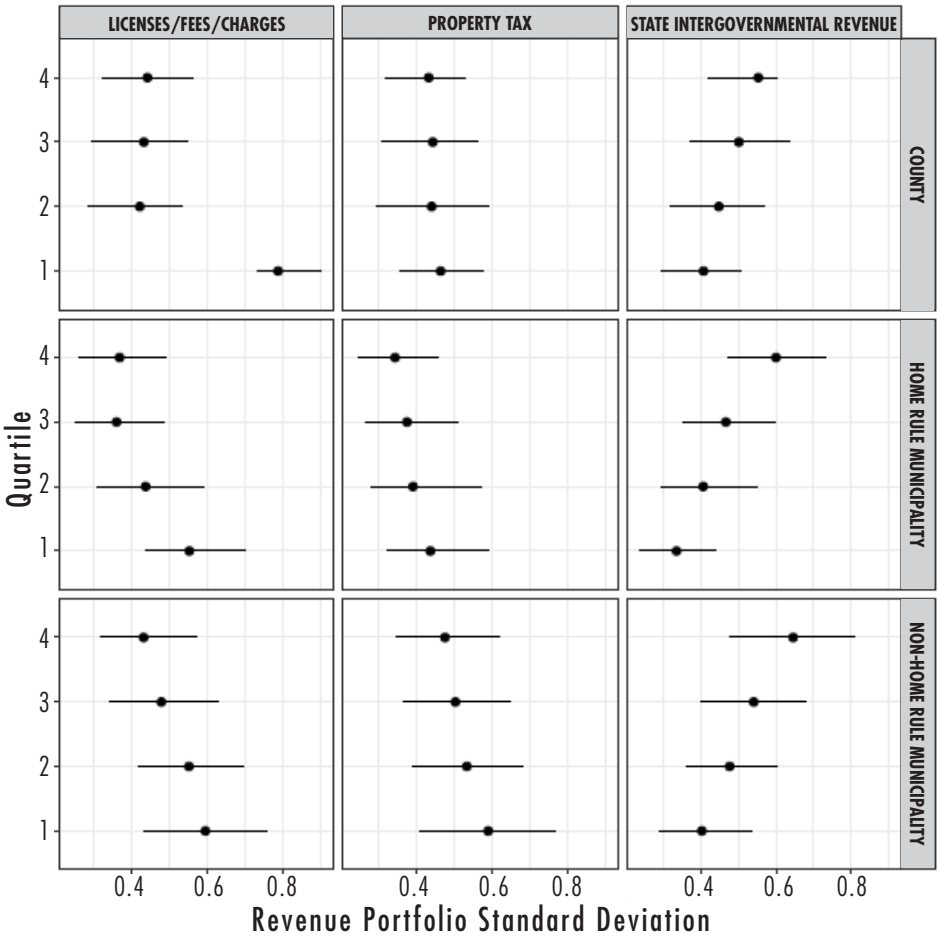
The results of that analysis are shown in Figure 2. Each box includes the distributions of revenue portfolio volatility for different types of jurisdictions defined by quartiles of the revenue source in question as a share of total revenues. Dots represent the median of that distribution, and the lines identify the interquartile range (i.e., the 25th and 75th percentiles). So, for instance, in the center box we see the median portfolio volatility for home rule municipalities in the first quartile of property taxes as percent of total revenue was 0.43. In other words, revenue portfolio volatility is 0.43 among home rule counties that are comparatively the least dependent on property taxes. For the second, third, and fourth quartiles those medians decrease from 0.39 to 0.38 to 0.35, respectively. In short, home rule municipalities that depend more on property taxes tend to have lower revenue volatility.

In Figure 2 we see two broad trends. One is that more dependence on licenses/fees/charges and property taxes associates with lower revenue portfolio volatility. With the exception of the county-licenses/fees/charges combination, in every case we see lower median volatility in the second through fourth quartiles. A second and especially important finding is higher volatility among jurisdictions that depend on intergovernmental revenues. Among home rule municipalities, the median revenue volatility for jurisdictions in the first quartile of intergovernmental revenue dependence was 0.37. Among

jurisdictions in the top quartile, it was 0.61. We note similar differences for counties and for non-home rule municipalities. These increases in volatility are much greater than the reductions in volatility we see with higher dependence on licenses/fees/charges and property taxes.

FIGURE 2

DISTRIBUTIONS OF PORTFOLIO VOLATILITY BY DEPENDENCE ON KEY REVENUE SOURCES, 2005-2021



Source: Authors' analysis based on Illinois Comptroller data. All figures presented are annual medians.

This relationship between state intergovernmental revenues and revenue volatility is not surprising. Most state intergovernmental revenue distributions are based on a share of total state income taxes, general sales taxes, and motor fuel taxes. These revenues are particularly pro-cyclical. As a result, local governments receive larger distributions when state tax collections are up, and vice versa. At the same time, the broader economic forces that lead to higher state tax collections also lead to higher collections of pro-cyclical local revenues like local sales taxes and charges for service. These revenue co-movements are precisely the reason for this new revenue portfolio volatility measure.

DISCUSSION AND POLICY IMPLICATIONS

In this paper we developed and tested a new measure of local revenue diversification. That measure is based on the volatility in a local government's total general fund revenue portfolio. A portfolio comprised of sources that do not move in tandem, the logic suggests, is more diversified and generates more reliable revenue collections. Reliability is, of course, a central factor in effective local government budgeting.

We find this new measure accounts for revenue windfalls and shortfalls more effectively than traditional diversification measures based on a local government's relative dependence on individual sources. We also find local governments that depend on state intergovernmental revenues experience higher revenue volatility. All this suggests a central takeaway: A diversified revenue portfolio is important, but how that portfolio is diversified is even more important.

These findings have near-term and long-term policy implications. In the near-term, they suggest that advocates for expanded state intergovernmental revenues should carefully consider the effect of those expansions on local revenue volatility and, by implication, local revenue windfalls and shortfalls. As one example, HB 1116, which has been under consideration in the General Assembly, would restore the state contribution to the Local Government Distributive Fund (LGDF) from its current rate of 6.47% of state income tax revenues to 10%. That expansion would presumably increase state intergovernmental revenues as a share of local revenues, increase revenue volatility and, as the results presented here suggest, lead to larger local revenue windfalls and shortfalls. This is not an argument against such expansions, but rather an invitation to consider this potentially overlooked trade-off.

In the longer term, these findings underscore the importance of timely state budgeting and effective budget execution. Delayed passage of state budgets introduces uncertainty to the levels of and potential restrictions on state intergovernmental revenues. That additional uncertainty can make a fraught intergovernmental revenue landscape even more volatile, particularly for smaller, rural, non-home rule jurisdictions. Regarding budget execution, these results reinforce the need for timely and predictable distributions of intergovernmental revenue to localities, as delayed distributions can only exacerbate potential revenue windfalls and shortfalls. Legislation to ensure regular and timely distribution of those funds could help mitigate some of that uncertainty. Public Act 98-1052, for example, requires the State Comptroller to transfer funds from LGDF to local governments no later than 60 days after the State Treasurer has certified those funds. Similar legislation applied to redistributions of state sales taxes, motor fuel taxes, and other taxes could address some of the concerns suggested by these results.

Future academic work should more carefully examine two lingering technical concerns surrounding quantitative analysis in this space. One is the revenue volatility measure developed and presented here does not directly account for the asymmetric "upside" and "downside" risk of revenue diversification. That is, if a local government's revenue portfolio outperforms, policymakers allocate the one-time windfall and move on. But if that revenue portfolio underperforms and forces budget cuts, policymakers must answer difficult questions about the financial and human toll of a poorly constructed revenue system. Future work should extend the portfolio concepts employed here by calculating the Sharpe Ratio (Sharpe, 1966) or the Sortino Ratio (Sortino and Price, 1994) to quantify these risk-return trade-offs, and to better understand the implications of potential alternative revenue portfolio scenarios.

A second concern is how we measure revenue stability. Future work should extend beyond the deviation from linear trend approach used throughout this literature and employ other approaches to better account for the cycle and seasonal components of those deviations (see, for instance, Christiano and Fitzgerald (2003)). This is particularly important if business cycles and other predictable revenue increases and decreases account for what the literature in this space has until now treated as unpredictable variations that might be mitigated by more diversified revenues.

Wesley Janson is a Data Scientist with the Research, Advanced Analytics and Statistics division at the Internal Revenue Service. He received his Master of Science in Computational Analysis and Public Policy from the University of Chicago. Previously, he worked at the Federal Reserve Bank of Cleveland assisting with monetary policy preparation and developing original research, some of which is featured in the Journal of Money, Credit & Banking. *His professional focus centers on the intersection of economic policy and data science through the use of machine learning and computational statistics.*

Justin Marlowe is a Research Professor and Director of the Center for Municipal Finance at the Harris School of Public Policy at the University of Chicago. His research and teaching are focused on public budgeting and finance, with emphasis on the municipal bond market, local fiscal policy, and financial reporting. He has written or edited five books, he is an admitted expert witness, and he has served on advisory boards for the State of Illinois, the Chicago Metropolitan Agency for Planning, the National Academies of Science, and many other government, non-profit and private sector organizations.

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