

On the Measurement of Revenue Diversity

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What is the proper method of operationalizing “revenue diversity”?



- TELs and the guidance of the ACIR have helped to move local governments away from the property tax
- While the theoretical definition of revenue diversity has been debated, less attention has been paid to how to operationalize the definition



- **Revenue diversity:** relying on a number of revenue sources and having some balance among them
- Questions
 - How many revenue sources should a local government(s) utilize?
 - What are the relative proportions of each revenue source to all the others
- We seek a measure that combines the answers to these two questions



- Richness (R): Number of discrete revenue sources in a dataset
- Evenness (E): Equability of the proportional use of revenue sources

$$\text{Diversity} = \text{Richness} \times \text{Evenness}$$

$$\text{Evenness} = \frac{\text{Diversity}}{\text{Richness}}$$



$$HHI = \sum_j r_j^2$$

- From Wagner (1976), Breeden and Hunter (1985), Misiolek and Elder (1988), Suyderhoud (1994), Heyndels and Smolders (1994)
 - Meant to be a measure of revenue complexity in fiscal illusion analyses
 - Gives more weight to the most abundant revenue source
 - Imposes a restriction on the value of the differences between the revenue sources that may be unnecessary
 - Provides no information on evenness



$$HHI = \frac{1 - \sum_j r_j^2}{1 - 1/j}$$

- From Hendrick (2002), Carroll, Eger, and Marlowe (2003), Carroll (2005), Carroll (2009), Carroll and Jones-Stater (2009), Carroll and Johnson (2010)
- The current method of measuring RD only gives us information on evenness
 - The influence of the number of revenue sources is not present in this operationalization
 - Each revenue category is treated equally
 - Academics and practitioners tend to put value on the largest source of local revenue, the property tax
 - Complete balance may not be a virtue in this instance



$${}^q D = 1/{}^q \bar{p}_i = 1 / \sqrt[q-1]{\sum_{i=1}^R (p_i p_i^{q-1})} = \left(\sum_{i=1}^R p_i^q \right)^{1/(1-q)}$$

Where,

- p_i is the proportion of revenue from the i th source
- ${}^q \bar{p}_i$ is the weighted generalized mean
- q defines the type of mean utilized



- Units: Effective revenue sources
 - Hypothetical equally abundant revenue sources
- As qD increases, the number of effective revenue sources increase indicating greater diversity
- Evenness (or balance) can be backed out by dividing by the number of revenue sources

$${}^qE = {}^qD/R$$



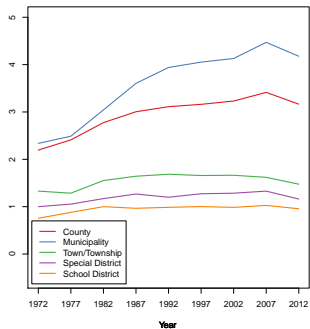
- This operationalization is not sensitive to the categories chosen
 - No need to create categories with a non-zero percentage of revenue
- Measuring RD is dependent on the dataset
- Understanding the underlying forces leading to what we observe is a secondary analysis



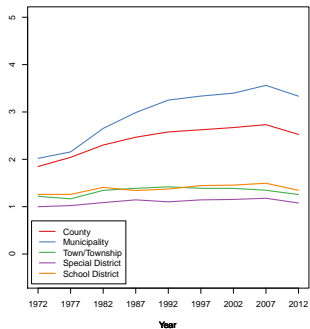
- Census of Governments Individual Finance File
 - 1972 to 2012 in 5 year increments
- Allows for uniform revenue categories (51) for many local governments
- Examine diversity across types of local governments, values of q , and time
- Address validity concerns



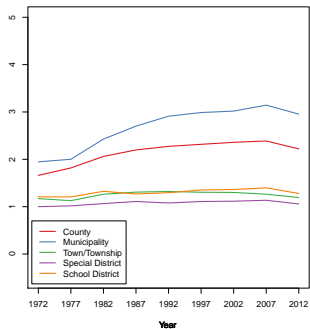
	<i>q</i>				
	0	1.1	2	3	4
Counties	51 (0.00)	3.1651 (1.29)	2.5262 (0.99)	2.2196 (0.88)	2.0846 (0.80)
Municipalities	51 (0.00)	4.1767 (1.80)	3.3329 (1.45)	2.9545 (1.28)	2.7680 (1.19)
Towns/Townships	51 (0.00)	1.4752 (1.04)	1.2560 (0.77)	1.1930 (0.66)	1.1700 (0.61)
School Districts	51 (0.00)	0.9563 (0.46)	1.3469 (0.38)	1.2789 (0.36)	1.2474 (0.34)
Special Districts	51 (0.00)	1.1612 (0.49)	1.0771 (0.42)	1.0582 (0.39)	1.0516 (0.37)



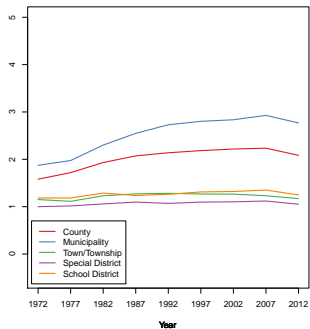
(a) $q = 1.1$



(b) $q = 2$



(c) $q = 3$



(d) $q = 4$

		<i>q</i>			
		1.1	2	3	4
Counties	Δ Property tax reliance	-0.0115** (27.90)	-0.0112** (30.84)	-0.0103** (31.35)	-0.0097** (31.37)
	<i>Constant</i>	2.4789** (176.41)	2.0963** (179.63)	1.8942** (182.35)	1.8026** (186.09)
	<i>n</i>	24,295	24,295	24,295	24,295
	Within-R ²	0.2270	0.1917	0.1763	0.1690
Municipalities	Δ Property tax reliance	-0.0081** (57.19)	-0.0072** (57.41)	-0.0066** (56.81)	-0.0062** (56.31)
	<i>Constant</i>	2.7847** (366.86)	2.4031** (360.05)	2.2173** (361.71)	2.1201** (366.23)
	<i>n</i>	149,685	149,685	149,685	149,685
	Within-R ²	0.2773	0.2059	0.1753	0.1610

		<i>q</i>			
		1.1	2	3	4
Towns/Townships	Δ Property tax reliance	-0.0077** (76.14)	-0.0070** (78.74)	-0.0064** (78.90)	-0.0060** (78.70)
	<i>Constant</i>	1.5574** (360.97)	1.4380** (412.26)	1.3811** (443.62)	1.3519** (463.63)
	<i>n</i>	128,369	128,369	128,369	128,369
	Within-R ²	0.1785	0.1587	0.1520	0.1487
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Special Districts	Δ Property tax reliance	-0.0021** (40.41)	-0.0020** (43.19)	-0.0019** (43.76)	-0.0018** (43.84)
	<i>Constant</i>	1.2972** (306.77)	1.2279** (329.68)	1.1990** (346.41)	1.1845** (358.22)
	<i>n</i>	162,200	162,200	162,200	162,200
	Within-R ²	0.0458	0.0411	0.0392	0.0383
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School Districts	Δ Property tax reliance	-0.0021** (16.06)	-0.0079** (52.78)	-0.0079** (56.17)	-0.0076** (56.89)
	<i>Constant</i>	0.8264** (380.08)	1.3642** (594.21)	1.3168** (609.98)	1.2891** (633.95)
	<i>n</i>	111,282	111,282	111,282	111,282
	Within-R ²	0.0508	0.1992	0.2052	0.2052



- Benefits
 - Interpretable units
 - Revenue categories are dataset dependent
 - Provides a lens to interpret past research
- Concerns
 - Datamining q

