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MUNICIPAL FINANCE IN TIMES OF CHANGE

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Acknowledgements

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Overview

- Measuring and Evaluating Acute Fiscal Stress—Based on:
  - Skidmore, Mark, Scorsone, Eric A. 2011. Causes and Consequences of Fiscal Stress in Michigan Cities. *Regional Science and Urban Economics* 12. 10.1016/j.regsciurbeco.2011.02.007.
- Measuring and Evaluation Chronic Fiscal Stress—Based on:
  - Das, Biswa, and Skidmore, Mark. 2017. Asymmetry in Municipal Spending over the Long-run. Working paper.

Definitions

- Acute
  - sharp or severe in effect; intense: acute sorrow; an acute pain.
  - extremely great or serious; crucial; critical: an acute shortage of oil.
  - (of disease) brief and severe (opposed to chronic).
- Chronic
  - constant; habitual; inveterate: a chronic liar.
  - continuing a long time or recurring frequently: a chronic state of civil war.
  - having long had a disease, habit, weakness, or the like: a chronic invalid.

Measuring and Evaluating Acute Fiscal Stress

Skidmore, Mark, Scorsone, Eric A. 2011. Causes and Consequences of Fiscal Stress in Michigan Cities. *Regional Science and Urban Economics* 12. 10.1016/j.regsciurbeco.2011.02.007.

- Outline
  - Literature Review
  - Framework for Analysis
  - Data & Methods
  - Results and Conclusions

Literature Review

- Measuring "Fiscal Stress" or "Fiscal Capacity"
  - ACIR (1972)—six indicators of fiscal stress
    - Imbalance in operating fund
    - Pattern of expenditures exceeding revenues
    - Excess of current operating liabilities over current assets
    - Short-term operating loans at fiscal year end or borrowing of cash from restricted funds
    - <u>High and rising rate of property tax delinquency</u>
    - <u>Substantial decrease in assessed values</u>
  - Variations on This General Theme: Nathan (1978), CBO (1978), U.S. Dept. of Treasury (1978), MFGOA (1978), Groves and Valente (1994) Brown (1993, 1996), Kloha, Weissert, and Kliene (2005)
  - Hendrick (2004)—"slack", "<u>balance</u>", "<u>environmental</u>"
    - We Focus on External Forces

Literature Review: External Forces

- Ladd and Yinger (1989)— "need-capacity gap"
  - Expenditure needs vs. revenue raising capacity
- Reschovsky (1993), Sjoquist (1996), Reschovsky (2004), Chernick and Reschovsky (2007)
- Our Work:
  - Create a measure of fiscal stress (cost index of service provision vs. revenue index)
  - Determine which functional spending categories are most responsive to fiscal stress

Fiscal Stress Framework

- **Fiscal Stress (FS_{it}) = Gov't Services Cost Index (GCI_{it}) – Gov't Revenues Index (GRI_{it})**

  where

  GCI_{it} = GECI*a + CCI*b

  and

  $GECI_t$ = Government Employee Cost Index
  CCI_t = Capital Cost Index

  for municipality i in period t.

  a and b are the shares of expenditures devoted to employee costs where a + b = 1 and are determined by statewide averages.

- **GECI and CCI are taken from**
  -Bureau of Labor Statistics (http://data.bls.gov/cgi-bin/surveymost?ci)
  -Turner Building Cost Index
  (http://www.turnerconstruction.com/corporate/files_corporate/CI4q2007.pdf)

- **GRI is generated by taking the sum of all revenue sources (property tax, income tax, state and federal revenue sharing, and other revenues) and generating the percent change from the 2005 base year.**

- **2005 is the base year and GCI and GRI = 100 in the 2005 base year**

Evaluating Impacts on Budgets

- We examine the impact of the fiscal stress measure (FS_{it}) by regressing FS_{it} on various per capita expenditure (EXP_{jit}) categories:

  $$EXP_{jit} = f(FS_{it}, X_{it})$$

  $$Ln(Exp_{jit}) = \alpha FS_{it} + \beta`(ln(X_{it}))+ t_t + \varepsilon_{it}$$

  where EXP_{jit} represents a vector of j expenditure categories. X_{it}, includes municipal assessed value and population

  EXP_{jit} are the following expenditure categories:

  -General Government
  -Public Safety
  -Public Works
  -Health and Welfare
  -Community Economic Development
  -Recreation and Culture
  Other Expenditures

- We also examine the impact of FS_{it} on <u>Capital</u> and <u>Non-capital Expenditures</u>.

Data

- Years: 2005-2009
- Municipalities: Most Municipalities in Michigan
- Source: State of Michigan Department of Treasury
  - Web-based local government fiscal data management system

Methods

- Panel Data Methods
  - Unbalanced Panel (using a balanced panel yields similar findings)
  - Random Effects
    - Time indicator variables
    - Address non-independence of observations from the same municipality through clustering (Arello (1987); Bertrand, et al (2004))
    - Some categories are truncated at zero (Random Effects Tobit with bootstrapping to obtain robust standard errors)
  - Fixed Effects
    - Municipal indicator variables
    - Time indicator variables
    - Address non-independence of observations from the same municipality through clustering (Arello (1987); Bertrand, et al (2004))

Summary Statistics

Statewide Average Municipal Fiscal Variables

(standard deviation in parentheses)

Year	**2005**	**2006**	**2007**	**2008**	**2009**	**%Δ '05-'09**
Number of Cities	241	211	189	217	230	
Population						
Population	15,662.50	15,869.67	16,355.65	16,264.68	15,944.64	2%
	(26,041.67)	(26,247.75)	(27,400.6)	(26,281.32)	(25,974.02)	
Fiscal Data in Per Capita Terms						
Property Value Data						
Taxable Value	$28,542.47	$30,093.36	$31,192.19	$30,637.24	$29,564.42	4%
	(23,323.71)	(25,346.49)	(23,426.28)	(25,243.77)	(24,040.04)	
State Equalized Value	$40,129.55	$41,773.43	$42,739.26	$40,059.78	$35,125.59	-12%
	(33,690.2)	(36,474.36)	(33,864.38)	(33,951.72)	(30,142.39)	
Revenues						
Property Tax	$499.68	$514.75	$543.02	$536.02	$535.16	7%
	(274.27)	(283.1)	(296.48)	(296.73)	(293.11)	
Income Tax [a]	$194.06	$190.08	$192.90	$196.95	$182.96	-6%
	(63.3)	(52.64)	(61.58)	(63.01)	(58.02)	
Revenue Sharing from State	$117.08	$112.35	$107.12	$102.46	$101.67	-13%
Government	(41.41)	(38.7)	(35.55)	(33.87)	(35.03)	
Other Intergovernmental	$89.68	$43.17	$92.97	$93.16	$86.55	-3%
Rev. from State Gov't	(60.07)	(63.01)	(70.16)	(95.95)	(60.99)	
Intergovernmental Rev. from	$65.14	$54.67	$51.24	$45.57	$34.09	-48%
Federal Gov't	(223.61)	(138.33)	(179.36)	(94.53)	(58.59)	
Total Revenues	$1,721.42	$1,686.59	$1,747.26	$1,749.45	$1,698.67	-1%
	(878.91)	(912.12)	(898.76)	(918.89)	(909.98)	
Expenditures						
General Government	$179.07	$179.64	$179.45	$171.60	$181.26	1%
	(99.36)	(93.57)	(88.88)	(86.75)	(97.25)	
Public Safety	$268.35	$276.44	$282.60	$282.10	$283.38	6%
	(144.82)	(149.57)	(150.25)	(153.33)	(157.39)	
Public Works	$571.48	$608.65	$601.79	$614.02	$631.38	10%
	(442.63)	(532.75)	(458.03)	(503.95)	(504.99)	
Health and Welfare	$32.95	$35.25	$39.20	$33.83	$32.44	-2%
	(281.02)	(284.27)	(307.75)	(278.03)	(271.22)	
Community & Economic	$56.81	$54.52	$50.80	$51.57	$56.11	-1%
Development	(121.46)	(89.02)	(72.24)	(77.44)	(82.28)	
Recreation & Culture	$85.98	$83.50	$85.45	$87.31	$82.74	-4%
	(93.3)	(80.64)	(88.14)	(85.34)	(79.5)	
All Other Expenditures	$481.22	$487.25	$459.25	$455.80	$456.54	-5%
	(373.24)	(503.98)	(377.98)	(363.)	(379.59)	
Total Expenditures	$1,675.87	$1,725.09	$1,697.56	$1,696.23	$1,723.85	3%
	(837.33)	(1,019.69)	(864.39)	(899.89)	(929.47)	

[a] Only 22 cities have an income tax—of these only 15, 13, 11, 14 and 14 reported fiscal data in 2005, 2006, 2007, 2008 and 2009 respectively.

Summary Statistics
Capital and Non-Capital Expenditures
(standard deviation in parentheses)

Year	2005	2006	2007	2008	2009
Total Capital Outlay	$2,987,604.14 (7,028,667.28)	$3,610,337.16 (8,796,314.9)	$3,480,235.63 (8,817,272.63)	$2,739,351.71 (7,404,993.78)	$2,772,408.49 (7,126,404.64)
Per Capita Capital Outlay	$194.59 (261.36)	$233.82 (291.02)	$206.64 (287.88)	$183.46 (260.82)	$180.37 (246.02)
Total Non-Capital	$24,213,540.56 (46,826,456.5)	$22,640,785.19 (36,897,445.73)	$25,686,049.96 (50,198,104.74)	$25,163,136.55 (46,760,904.53)	$24,862,766.12 (46,078,423.61)
Per Capita Non-Capital	$1,489.34 (745.00)	$1,450.55 (755.82)	$1,494.85 (745.57)	$1,501.41 (780.85)	$1,543.48 (793.27)

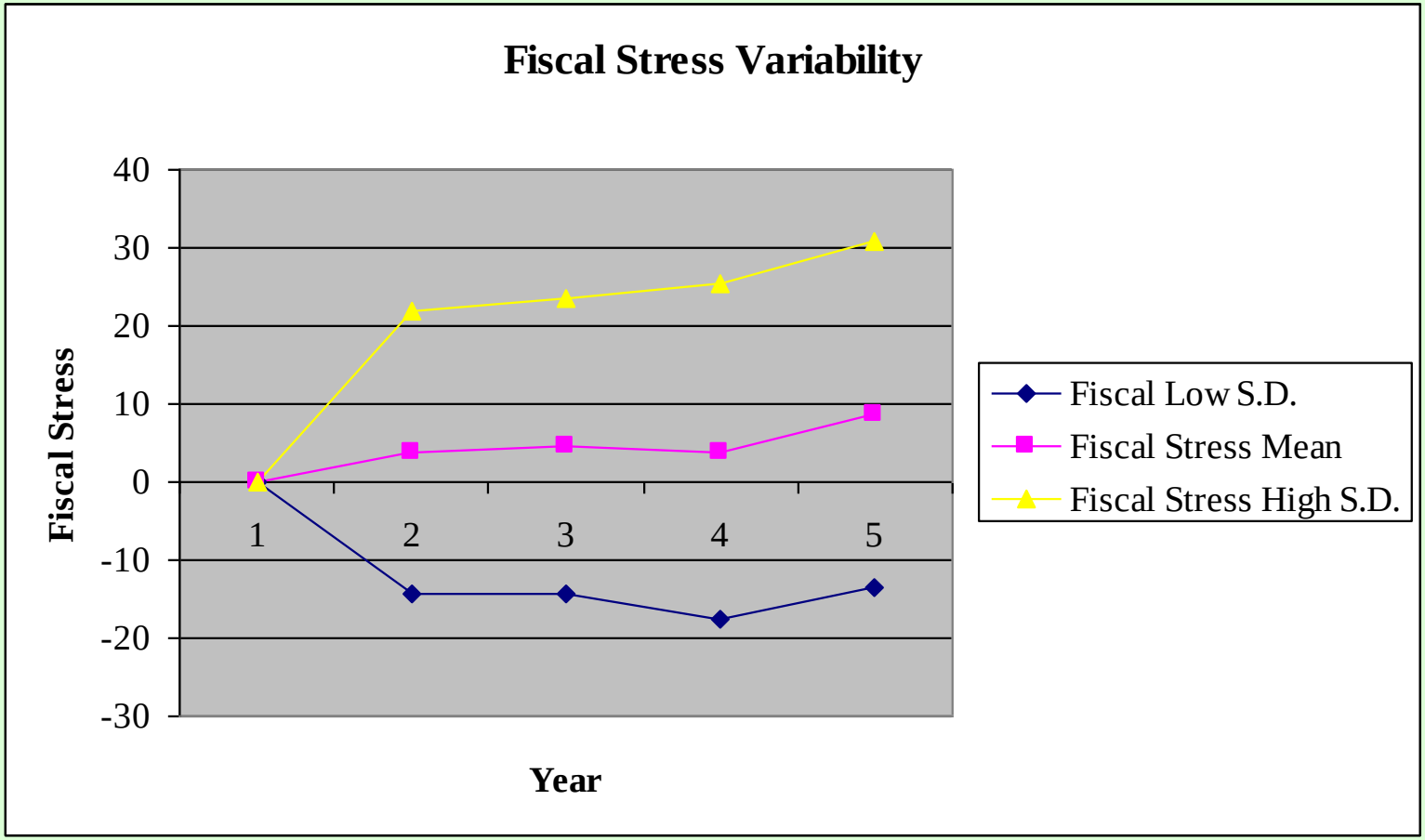
Summary Statistics

Municipal Service Cost and Revenue Growth Indices

(standard deviation in parentheses)

Variable	2005	2006	2007	2008	2009
Share of expenditures from employees costs (a)	0.901	0.882	0.895	0.903	0.905
	(0.096)	(0.104)	(0.108)	(0.095)	(0.094)
Share of expenditures from capital costs (b)	0.099	0.118	0.104	0.097	0.095
	(0.096)	(0.104)	(0.108)	(0.095)	(0.094)
Gov't service cost index (GCI)	100.00	104.59	109.60	113.65	115.39
	-	-	-	-	-
Gov't employee cost index (GECI)	100.00	103.97	108.40	111.60	115.33
	-	-	-	-	
Capital cost index (CCI)	100.00	110.60	119.11	126.60	116.00
	-	-	-	-	
Government Revenue Index (GRI)	100.00	100.87	104.99	109.81	106.77
	-	(18.02)	(18.80)	(21.492)	(22.09)
Fiscal stress (FS)	0.00	3.72	4.61	3.84	8.62
	-	(18.022)	(18.80)	(21.49)	(22.09)

Fiscal Stress



Fixed Effects Regression Results

(t-statistics in parentheses)

	Dependent Variable:								
	General Gov't	Public Safety	Public Works	Health & Welfare	Economic Development	Parks and Recreation	Other	Capital	Non-Capital
Independent Variable									
Fiscal stress	**-0.0013** (-1.977)**	**-0.0005** (-1.577)**	**-0.0016** (-2.137)**	**-0.0063** (-0.909)**	**-0.0052** (-1.106)**	**-0.0075** (-2.571)**	**-0.017*** (-7.062)**	**-0.022*** (-3.221)**	**-0.0039*** (-8.938)**
Ln(Population)	-0.00643 (-0.628)	0.0799*** (6.252)	-0.0168** (-2.233)	2.3746*** (12.53)	0.0083 (0.0805)	-0.1568** (-2.214)	1.5052*** (50.46)	-1.5629*** (-11.27)	0.0171*** (3.406)
Ln(Taxable value)	0.029 (1.194)	-0.003 (-0.150)	0.028 (1.019)	-0.082 (-0.328)	0.218 (1.315)	0.131 (1.105)	0.016 (0.228)	-0.138 (-0.434)	0.024 (1.259)
Adjusted R^2 (within)	0.019	0.014	0.030	0.018	0.011	0.014	0.119	0.024	0.201
Number of Observations	1103	1103	1103	1103	1103	1103	1095	1103	1095

Notes: All regressions include time effects.

* Indicates significance at the 90 percent confidence level for a two-tailed test.
** Indicates significance at the 95 percent confidence level for a two-tailed test.
*** Indicates significance at the 99 percent confidence level for a two-tailed test.

Magnitudes

Spending Category	Fiscal Stress=9 (mean)	Fiscal Stress=30 (one std. dev. above mean)
General Gov't	-1.1%	-3.6%
Public Works	-1.5%	-5.1%
Parks and Rec.	**-6.3%**	**-22%**
Other	**-11%**	**-39%**
Capital	**-16%**	**-54%**
Non-capital	-3.5%	-11.4%

Summary on Acute Stress

- Expenditure Categories Responsive to Fiscal Stress:
- General Government
- Public Works
- **Parks and Recreation (3)**
- **Other (2)**
- **Capital (1)** vs. Non-capital Spending

- Public Safety Not Responsive to Fiscal Stress

Measuring and Evaluating Chronic Fiscal Stress (preliminary)

Das, Biswa, and Skidmore, Mark. 2017. Asymmetry in Municipal Spending over the Long-run. Working paper.

- Outline
  - Literature Review
  - Framework for Analysis
  - Data & Methods
  - Results and Conclusions

Literature Review

- Briefly Highlight Literature on Determinants of Local Government Spending in General as well as Capital Spending
  - Spending Overall
    - Borcherding, Deacon (1972), and many others, Median Voter model is useful for explaining demand for local public services
    - Brennan and Buchanan (1980), government as leviathan…institutional factors/constraints are important
    - Berry & Berry (2012), local government tend to grow even in the face of declining population
    - Skidmore (2017), asymmetry in education spending in growing and shrinking places

Literature Review

- Capital Spending
  - ASCE (2017), $3.6 trillion required
  - Mikesell (2012), 90% of capital expenditure at state & local levels
  - ICMA (2013), capital spending dependent on economic cycles
  - Fisher & Wassmer (2015), capital spending pre- and post-recession

Data & Empirical Approach

- Data
  - Forty years of municipal fiscal data on revenues and expenditures are aggregated to the county level and are collected every five-years (1972, 1977, 1982, 1987, 1992, 1997, 2002, 2007, and 2012).
  - Two indicator variables:
    - Decline identifies counties with declining population over the 1972-2012 period (about 25% of counties); and
    - Grow identifies counties with positive population growth (75% of counties).

Empirical Approach

- Empirical Approach

$$\Delta \mathrm{Re}\, v_{ij} = Grow * \Delta Econ_{it}\alpha_1 + Shrink * \Delta Econ_{it}\alpha_2 +$$
$$Grow * \Delta Pop_{it}\alpha_3 + Shrink * \Delta Pop_{it}\alpha_4 +$$
$$Grow * \Delta Inst_{it}\alpha_5 + Shrink * \Delta Inst_{it}\alpha_6 + Grow * t_t + Shrink * t_t + c_i + e_{it}$$

where

Δ***Rev*** represents the change in the natural logarithm of municipal revenue (or expenditure) for county i between periods t and t-1 for revenue (expenditure) category j

Δ***Econ*** represents a vector of economic variables

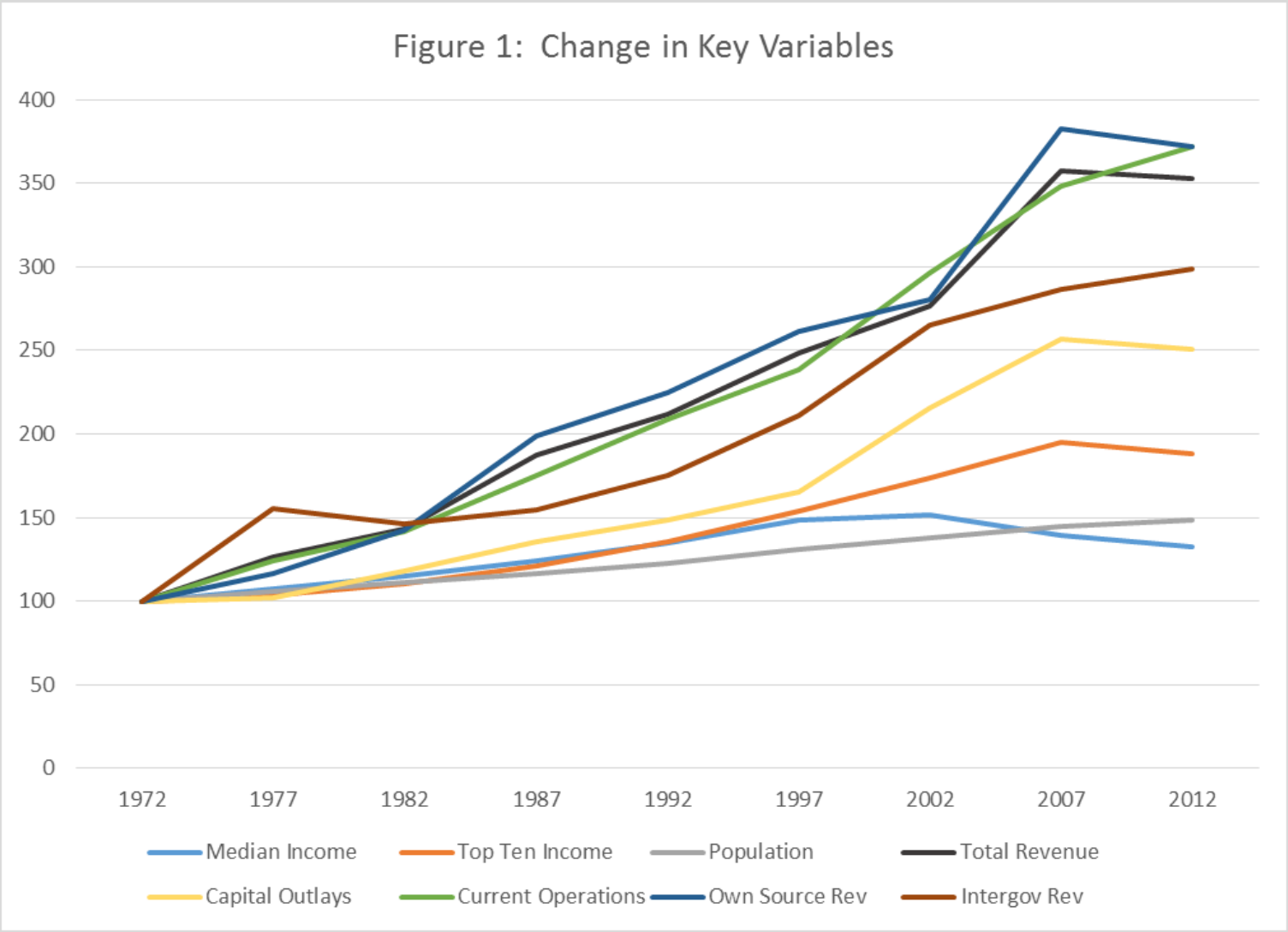
Δ***Pop*** represents a vector of demographic characteristics

Δ***Inst*** is a vector of institutional variables

Independent Variables

- Δ***Econ*** : Median Income, Top Ten Income, Poverty Rate, Mobile Home
- Δ***Pop*** : <u>Population</u>, Female HH, % over 65, % under 18, % White,
- Δ***Inst*** : RTW, TEL, &, SFR

Changes in Key Variables over Time



Growing and Shrinking

Growing Jurisdictions Summary Statistics for Dependent Variables

	1972	1977	1982	1987	1992	1997	2002	2007	2012
Total Revenue	**33,820** **(614,827)**	44,065 (698,326)	50,496 (618,849)	68,391 (858,022)	78,488 (1,021,489)	92,159 (1,105,205)	103,769 (1,070,517)	136,917 (1,618,225)	**135,623** **(1,451,167)**
Total Capital Outlays	8,368 (83,937)	8,602 (56,835)	10,389 (81,699)	12,256 (87,994)	13,389 (123,839)	14,730 (132,207)	19,248 (170,837)	24,001 (207,256)	23,388 (246,438)
Total Current Operations	23,325 (446,438)	29,687 (442,689)	34,594 (413,456)	43,878 (516,229)	53,247 (618,569)	61,064 (655,960)	76,672 (849,470)	91,886 (916,032)	98,548 (1,011,805)

Declining Jurisdictions Summary Statistics for Dependent Variables

	1972	1977	1982	1987	1992	1997	2002	2007	2012
Total Revenue	**25,369** **(208,899)**	29,835 (235,832)	32,925 (261,701)	37,244 (291,116)	39,385 (326,452)	45,939 (384,372)	48,084 (384,570)	55,629 (472,087)	**53,464** **(431,623)**
Total Capital Outlays	5,496 (39,268)	5,487 (37,313)	5,511 (40,038)	5,552 (46,407)	6,148 (51,641)	7,045 (64,255)	9,469 (93,306)	8,357 (81,754)	8,111 (67,093)
Total Current Operations	17,726 (148,121)	20,489 (159,722)	22,509 (173,980)	24,871 (190,824)	27,208 (211,292)	30,803 (239,200)	36,753 (302,397)	38,577 (306,954)	39,886 (309,551)

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

Growing and Shrinking

Growing Jurisdictions: Summary Statistics for Control Variables

	1972	2012
Economic		
Median Inc	33,043	44,277
	(8,450)	(11,503)
Demographic		
Population	65,186	110,383
	(203,921)	(328,984)

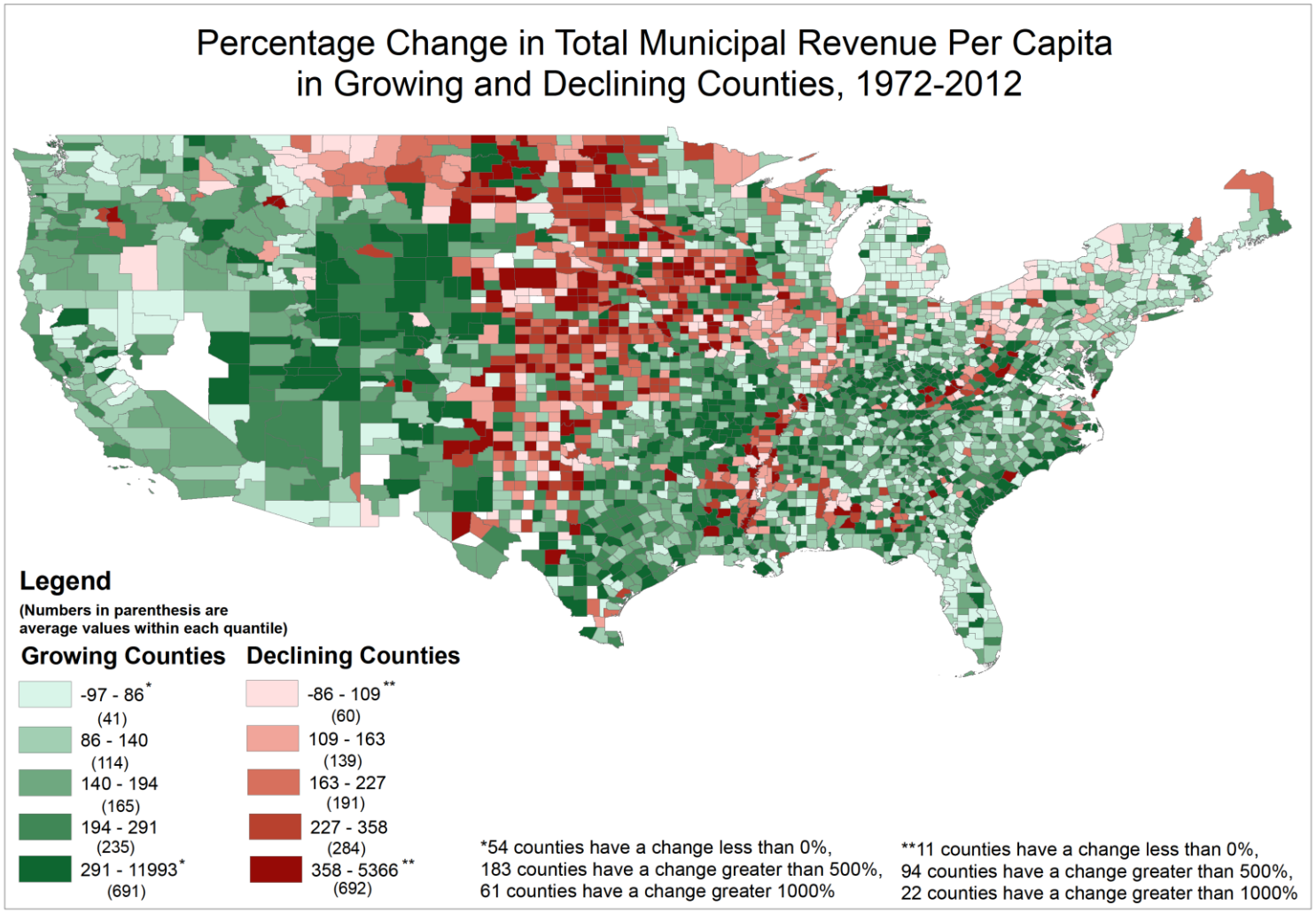
Standard deviation in parentheses. Adjusted to 2009 dollars.

Declining Jurisdictions: Summary Statistics for Control Variables

	1972	2012
Economic		
Median Inc	30,740	39,230
	(7,211)	(7,246)
Demographic		
Population	48,575	42,595
	(246,942)	(222,006)

Standard deviation in parentheses. Adjusted to 2009 dollars.

Map of Changes in Municipal Revenue Per Capita



Regressions—No Distinction between Growing and Shrinking Counties

All Units	Total Revenue	Own-Source Revenue	Intergovernmental Revenue	Capital Outlays	Current Operations
ln(Median Income)					
	0.230**	0.0746	0.354***	0.103	0.237***
	(2.272)	(0.549)	(2.821)	(0.466)	(2.635)
ln(Top Ten Income)	0.151*	0.396***	0.0482	0.354**	0.0641
	(1.853)	(3.228)	(0.569)	(2.072)	(0.828)
ln(Population)	0.829***	0.635***	1.029***	1.559***	0.811***
	(5.803)	(2.941)	(7.375)	(5.772)	(5.587)
TELs	-0.0506***	-0.0774***	-0.0543***	-0.0754**	-0.0436**
	(-2.944)	(-3.475)	(-3.117)	(-2.425)	(-2.531)
Observations	47,122	43,562	46,359	40,129	46,884
R-squared	0.024	0.039	0.019	0.006	0.026
Number of Units	6,063	6,018	6,045	5,889	6,059

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

Asymmetric Regressions

	Total Revenue		Own-Source Revenue		Intergovernmental Revenue	
	Declining	Growing	Declining	Growing	Declining	Growing
ln(Median Income)	**0.589****	**0.219***	**1.219*****	**-0.00423**	**0.540****	**0.364*****
	(2.273)	**(1.951)**	**(3.258)**	**(-0.0305)**	**(2.035)**	**(2.626)**
ln(Population)	**0.491**	**0.763*****	**0.0937**	**0.670*****	**0.402**	**0.925*****
	(1.255)	**(4.797)**	**(0.152)**	**(2.823)**	**(0.990)**	**(6.022)**
TELs	**-0.00903**	**-0.0732*****	**-0.132*****	**-0.0692*****	**-0.0180**	**-0.0750*****
	(-0.221)	**(-3.931)**	**(-2.673)**	**(-2.808)**	**(-0.422)**	**(-3.980)**
Observations		47,122		43,562		46,359
R-squared		0.024		0.040		0.019

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

	Capital Outlays		Current Operations	
	Declining	Growing	Declining	Growing
ln(Median Income)	**1.119****	**-0.0295**	**0.469***	**0.180****
	(2.021)	**(-0.144)**	**(1.797)**	**(2.040)**
ln(Population)	**0.951**	**1.441*****	0.670*	0.768***
	(1.097)	**(4.995)**	(1.737)	(4.695)
TELs	**-0.00138**	**-0.111*****	**-0.0223**	**-0.0631*****
	(-0.0174)	**(-3.306)**	**(-0.541)**	**(-3.385)**
Observations		40,129		46,884
R-squared		0.007		0.027

Dependent variables in log form. Cluster-robust standard errors. T-score in parentheses. Time and county fixed effects

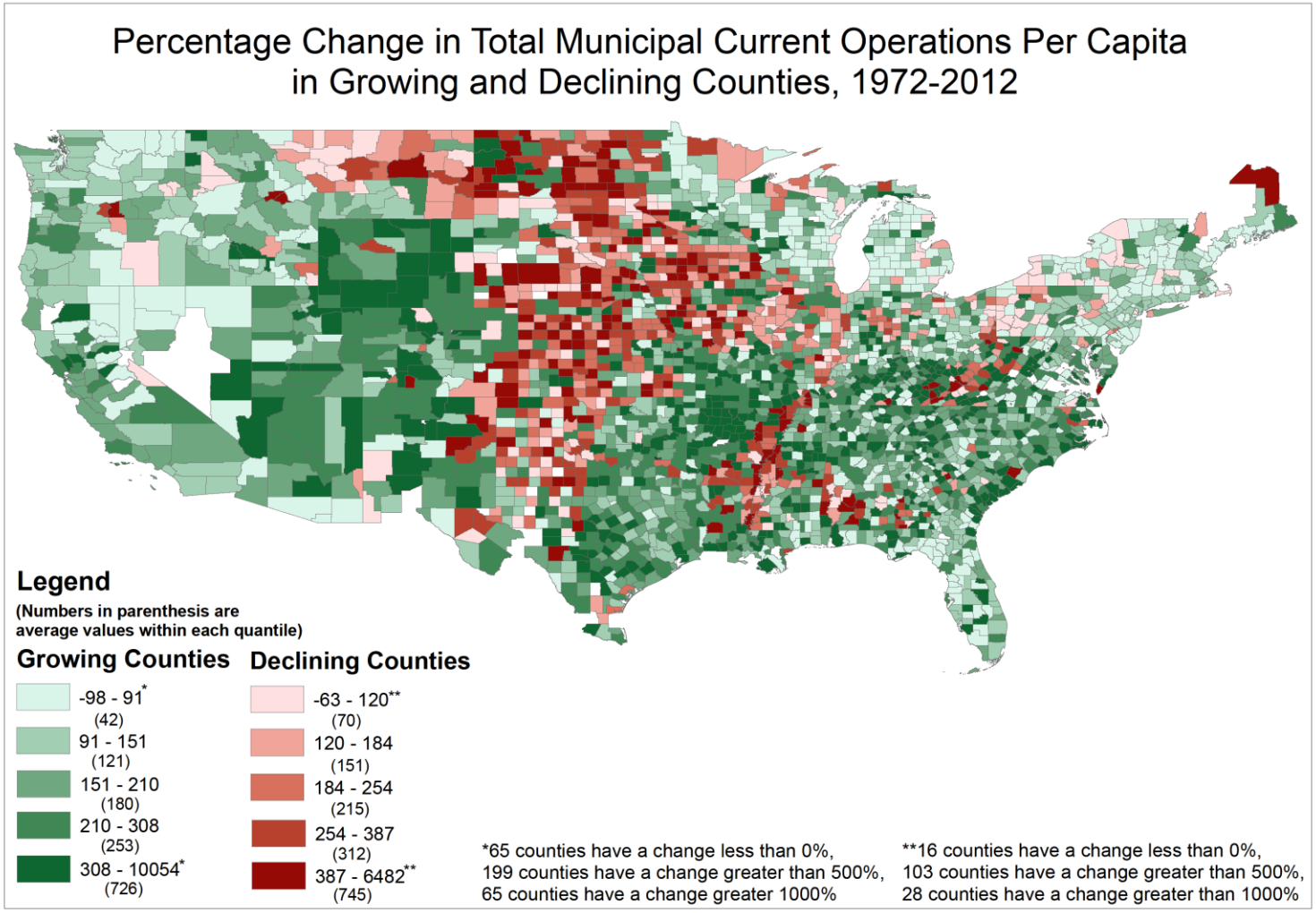
Conclusions/Thoughts

- Short-run: Municipal governments in Michigan tend to cut capital, parks and recreation, and other non-core spending in acute crisis.
- Long-run: Municipalities nationwide increase spending during periods of population growth but tend not to cut spending in the face of long-run chronic population decline (asymmetry).
- How do we help communities distinguish between temporary downturns and long-run structural decline in order to avoid fiscal crises and at the same time provide important local public services?
  - Rules-based decision-making?
  - Other guideline/strategies?

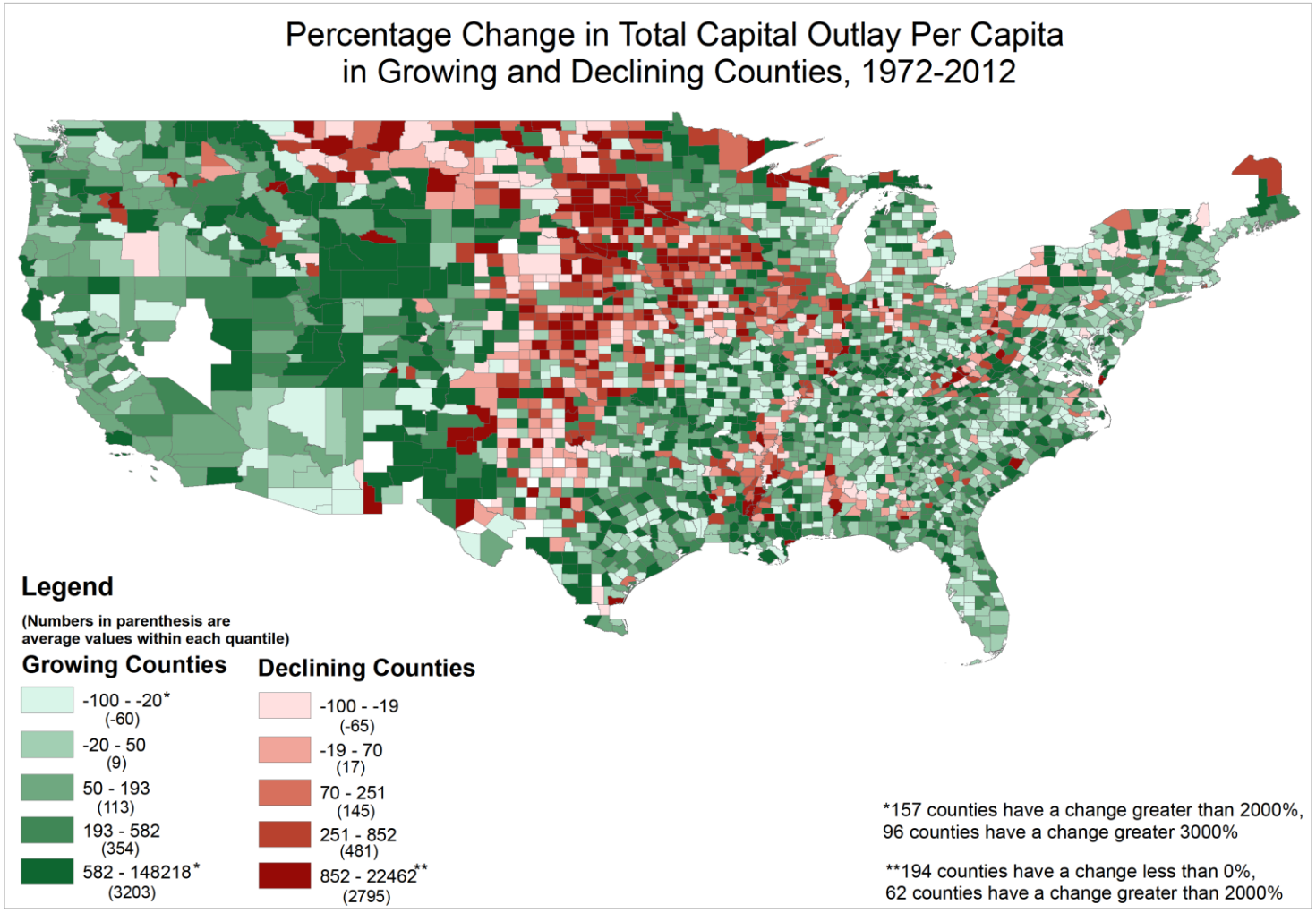
Supplemental Slides

- Map of Operating Expenditures
- Map of Capital Expenditures

Maps


Percentage Change in Total Municipal Current Operations Per Capita
in Growing and Declining Counties, 1972-2012
Legend
(Numbers in parenthesis are
average values within each quantile)
Growing Counties
-98 - 91*
(42)
91 - 151
(121)
151 - 210
(180)
210 - 308
(253)
308 - 10054*
(726)
Declining Counties
-63 - 120**
(70)
120 - 184
(151)
184 - 254
(215)
254 - 387
(312)
387 - 6482**
(745)
*65 counties have a change less than 0%,
199 counties have a change greater than 500%,
65 counties have a change greater 1000%
**16 counties have a change less than 0%,
103 counties have a change greater than 500%,
28 counties have a change greater than 1000%

Maps


Percentage Change in Total Capital Outlay Per Capita
in Growing and Declining Counties, 1972-2012
Legend
(Numbers in parenthesis are
average values within each quantile)
Growing Counties
-100 - -20*
(-60)
-20 - 50
(9)
50 - 193
(113)
193 - 582
(354)
582 - 148218*
(3203)
Declining Counties
-100 - -19
(-65)
-19 - 70
(17)
70 - 251
(145)
251 - 852
(481)
852 - 22462**
(2795)
*157 counties have a change greater than 2000%,
96 counties have a change greater 3000%
**194 counties have a change less than 0%,
62 counties have a change greater than 2000%