The Effect of Public Lands Ownership & Management on Economic Growth

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Federal Land Ownership

AZ	42.3%
20	36.2%
D	61.7%
MT	28.9%
NM	34.7%
NV	81.1%
UT	66.5%
WY	48.2%



State Public Lands

- All unappropriated land reverted to federal ownership at statehood
- Federal government gave each state two or four sections per township (State Trust Lands)

 - R Possibility of trade





The States Claim...

- Poor management of federal lands cause economic damage to states and counties
- States can be better land stewards and managers than federal agencies
- Research Question: Is the states' story true?



Hypothesis

State ownership, and hence management, is more effective at fostering economic growth than is federal ownership and management



Public Lands & Economic Growth

✓ Use "regional adjustment model" to examine the effect of public land ownership and management on countylevel measures of economic health:

- Reputation Growth
- Reployment Growth



Regional Adjustment Models

Solution Solution And Migration/Population Growth are endogenous

CS	Muth	SEJ	1971
CS	Greenwood and Hunt	AER	1984
CS	Carlino and Mills	JRS	1987

Real Public lands policy affect employment, income (wages) and net migration

R	Lewis, Hunt, & Plantinga	<i>G & C</i>	2003
63	Eichman <i>et al</i> .	JARE	2010
63	Wu and Mishra	RFF	2008
R	Carruthers and Vias	JRS	2005



General Model

- - \bigcirc Y₁ = Population Density Growth
 - \bigcirc Y₂ = Employment Density Growth
 - \bigcirc Y₃ = Income Density Growth

$$\begin{split} Y_1 &= f(Y_2, Y_3, Public \ Lands, X_1) + \ \varepsilon_1 \\ Y_2 &= g(Y_1, Y_3, Public \ Lands, X_2) + \ \varepsilon_2 \\ Y_3 &= h(Y_1, Y_2, Public \ Lands, X_3) + \ \varepsilon_3 \end{split}$$



Econometric Modeling

- Reconometric Concerns (Kelejian & Prucha, 2004):

 - Reteroscedasticity
- GS2SLS: *Spivreg* command (Drukker, et al. *Stata J*. 2013) controls for first three issues
- GS3SLS (SUR) model to controls for spatial lags and cross-equation correlation



Spatial autocorrelation

- $y_1 = \alpha_1 + \beta_{12} y_2 + \beta_{13} y_3 + \gamma_1 PL + \delta_1 X_1 + \lambda_1 W y_1 + \mu_1$
- $y_2 = \alpha_2 + \beta_{21} y_1 + \beta_{23} y_3 + \gamma_2 PL + \delta_2 X_2 + \lambda_2 W y_2 + \mu_2$
- $y_3 = \alpha_3 + \beta_{31} y_1 + \beta_{32} y_2 + \gamma_2 PL + \delta_3 X_3 + \lambda_3 W y_3 + \mu_3$
- \bowtie where *W* is an *n* × *n* the spatial weights matrix
- $\propto y_1, y_2$, and y_3 represent the values of the dependent variables;
- \bowtie and λ_1, λ_2 , and λ_3 are spatial parameters



Public Land Data

GIS data from multiple layers

- Cassifies all public land (and some private land) by ownership and management—*GAP Status*
- Gap Status (various years, 2005 for Utah)
 - Gap 1 or 2: a management plan prevents land cover disturbance ("Protected land")
 - Gap 3 or 4: a management plan allows for land cover disturbance, or management plan does not exist ("Multiple use land")



Duchesne County, UT - Land ownership & GAP Status



Federal (USFS) Wilderness Area

Federal (USFS) Multiple Use

Tribal/Private Land

State Wildlife Management Area

Federal (BLM) Multiple Use & State Multiple Use



Data Sources (276 counties)

- **BEA**: Employment, total personal income
- **Census**: Population, other demographics
 - CR Commuting zones, as defined by USDA from Journeyto-Work (used to create spatial weight matrix, W)
- **FAA**: Primary airports
- GIS: Land classification, distance to nearest primary airport, road density

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County-level Land Ownership & Management (%)

	Mean	Min	Max
Private	43.8%	1.4%	98.3%
Federal Multiple Use	32.3%	0.0%	90.5%
State Multiple Use	6.4%	0.0%	34.6%
Protected	7.5%	0.0%	56.7%
National Park Service	1.2%	0.0%	44.1%
Other Land	8.8%	0.1%	81.0%
(DoD, DoE, Tribal, Misc.			
Water)			



Model Parameters (p-value)

	Population	Employment	Income
λ (spatial auto)	0.23 (0.07)	0.38 (0.01)	0.46 (0. 01)
1npopdens07		0.08 (0.05)	0.16 (0.01)
lnempdens07	-0.04 (0.15)		-0.03 (0.30)
1nincdens07	0.02 (0.55)	0.02 (0.72)	
1npopdens00	0.03 (0.27)		
lnempdens00		-0.11 (0.10)	
1nincdens00			-0.12 (0.01)

Other Exogenous Variables (p < 0.05)

	Population	Employment	Income
Farming	—		
Mining		+	+
Recreation	+	+	+
Minutes to Airport	—	—	
Road Density		—	
Cooling Degree Days	+		+
College		+	+

Land Ownership and Management parameters

	Population	Employment	Income
National	-2.8×10 ⁻⁴	-14.4×10 ⁻⁴	2.4×10 ⁻³
Park (%)	(0.70)	(0.27)	(0.17)
Protected	-9.1×10 ⁻⁴	-2.8×10 ⁻⁴	-1.6×10 ⁻³
land (%)	(0.10)	(0.27)	(0.01)
Other land	-3.2×10 ⁻⁴	-3.1×10 ⁻⁴	-8.6×10 ⁻⁴
(%)	(0.28)	(0.53)	(0.01)



Land Ownership and Management parameters

	Population	Employment	Income
Federal MU (%)	1.7×10-3	7.7×10 ⁻⁴	2.2×10-3
	(0.03)	(0.49)	(0.05)
Federal MU	-2.0×10 ⁻⁵	-9×10 ⁻⁶	-3.5×10 ⁻⁵
Squared (%)	(0.06)	(0.53)	(0.02)
State MU (%)	-8.3×10 ⁻³	-9.5 ×10 ⁻³	-9.0 ×10 ⁻³
	(0.01)	(0.01)	(0.01)
State MU	2.8×10-3	3.1×10-4	2.9×10 ⁻⁴
Squared (%)	(0.03)	(0.01)	(0.01)

Quadratic specification provided best fit.





Turning point at :

- Pop = 43.6% Fed MU
- Emp = 43.5%
- Inc = 32.0%

Turning point at :

- Pop = 14.8% State MU
- Emp = 15.6%
- Inc = 15.3%



Marginal Effect Of 25% Land Transfer



				Growth Measure		
County		% Federal MU	% State MU	POP Density	EMP Density	INC Density
Carbon						
	Current	38.2%	11.7%			
	Post Transfer	28.7%	21.2%			
	Net Gain/Loss	-9.5%	+9.5%			
Emery						
	Current	60.2%	10.8%			
	Post Transfer	45.2%	25.8%			
	Net Gain/Loss	-15.0%	+15.0%			



- Pop = 43.6%
- Emp = 43.5%
- Inc = 32.0%

- Pop = 14.8%
- Emp = 15.6%
- Inc = 15.3%



Marginal Effect Of 25% Land Transfer



			Growth Measure			
		% Federal	% State	POP	EMP	INC
County		MU	MU	Density	Density	Density
Carbon						
	Current	38.2%	11.7%	-0.06%	0.58%	2.21%
	Post Transfer	28.7%	21.2%	0.15%	0.81%	2.76%
	Net Gain/Loss	-9.5%	+9.5%	0.21%	0.23%	0.55%
Emery						
	Current	60.2%	10.8%	-0.38%	1.10%	1.30%
	Post Transfer	45.2%	25.8%	0.16%	1.58%	2.25%
	Net Gain/Loss	-15.0%	+15.0%	0.56%	0.48%	0.95%

Marginal Effect Of 25% Land Transfer





Growth Measure

				Pop	EMP	INC
Area name		FED_MU	ST_MU	Density	Density	Density
Grand						
	current	52.7%	14.2%	0.66%	2.20%	3.84%
	post Transfer	39.6%	27.3%	1.24%	2.68%	4.59%
	Net Gain/ Lost	-13.1%	+13.1%	0.58%	0.48%	0.75%
San Juan						
	current	36.3%	4.8%	-0.31%	2.34%	2.63%
	post Transfer	27.2%	13.9%	-0.63%	2.00%	2.52%
	Net Gain/ Lost	-9.1%	+9.1%	-0.32%	-0.34%	-0.11%

Summary

- Support for state's claim that "too much" federal land is a drag on economic growth
- - Rew counties meet this



Unanswered Questions

- Real Endogeneity of land ownership
- Measure of land fragmentation
- County economic structure interacted with land ownership
- CR Land measures do not capture resource potential (e.g., energy)



THANK YOU



					EMP	
Area name		FED_MU	ST_MU	Pop Density	Density	INC Density
Garfield	current	58.7%	4.4%	0.31%	2.12%	2.06%
	post Transfer	44.1%	19.0%	0.15%	178%	1.71%
	Net Gain/ Lost	-14.6%	+ 14.6%	-0.16%	-0.34%	0.35%
Piute						
	current	71.6%	11.8%	-0.17%	5.83%	3.11%
	post Transferred	53.8%	28.8%	1.26%	6.69%	4.79%
	Net Gain/ Lost	-17.8%	+17.8%	1.09%	0.86%	1.68%
Sevier						
	current	75.9%	4.0%	0.93%	1.62%	2.92%
	post Transferred	56.9%	23.0%	1.09%	1.47%	3.72%
	Net Gain/ Lost	-19.0%	+19.0%	0.16%	-0.15%	0.80%
Wayne						
	current	53.1%	10.0%	0.63%	0.24%	2.20%
	post Transferred	39.8%	23.3%	0.94%	0.43%	2.97%
	Net Gain/ Lost	-13.3%	+13.3%	0.31%	0.18%	0.77%