Natural Amenities, the Energy Boom and Economic Growth in the US Continental Northwest

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by

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Introduction

The role of natural amenities in U.S. regional economic growth and development has long been established through an extensive literature

- much of the early debate centered on whether jobs or natural amenities were more important for U.S. internal migration
- recent literature has examined various dimensions of amenity-growth

There also is an extensive literature on the effect of energy development on regional economic growth and development

- the early literature attempted to assess whether energy rich regions suffered from a "resource curse" in the long run
- the more recent literature has attempted to estimate both short-run and longer-run economic impacts of the shale energy boom

Less is known about the regional economic effects of the energy development in high natural amenity areas

(Introduction continued)

Today, I will first discuss some relevant studies on natural amenities, energy development and regional economic growth

I will then examine the role of natural amenities and energy development for the **nonmetropolitan portions** of several states in the Pacific Northwest Region during the period 1992 to 2016

The region contains fast-growing areas of the nation

- three quarters of a million people moved to one of 442 counties designated as retirement destinations by the Economic Research Service in 2017, representing a population increase of two percent (e.g., Coeur d´Alene, Jackson Hole) (Wall Street Journal, 2018)
- Austin, Glaeser and Summers (2018, *Brookings Papers on Economic Activity*) note the stronger economic growth in the Western Heartland relative to the Eastern Heartland over the past 40 years

(Introduction continued)

I will then assess growth during the periods of 1992 to 2004 and 2004 to 2016

- assess whether areas rich in natural amenities experienced relative shifts in economic growth across the two periods
- assess the 2004-2016 period of energy boom and bust

Present some basic growth statistics

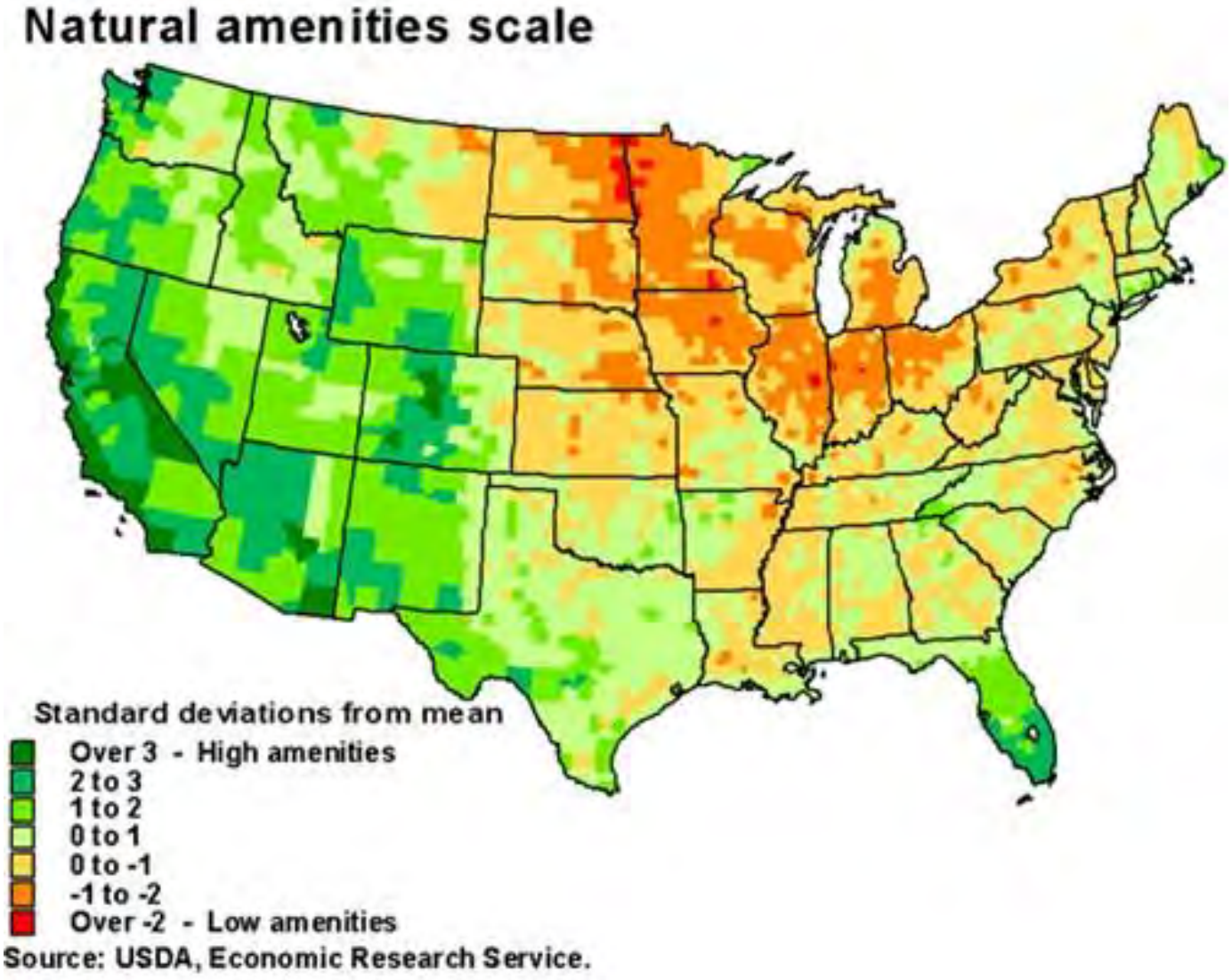
- nonmetropolitan portions of the states
- high amenity counties
- energy boom counties

Synthetic Control Method

- nonmetropolitan portions of the states

Simple regressions of the counties in the nonmetropolitan areas

Natural Amenities and Regional Growth



Natural Amenities and Regional Economic Growth

Graves, Philip E., 1980. "Migration and Climate" *Journal of Regional Science* (20) 2: 227-37.

- favorable climate (natural amenities) acts as a continual interregional migration force
- not from changes in amenities, but in **demand for amenities** with rising U.S. income and wealth, along with life-cycle effects
- **differences in incomes** did not necessarily reflect differences in economic opportunity that induce migration, but reflect **differences in natural amenities** (general negative relationship between pleasant climate and price-adjusted wages across the U.S.)

This and other of Grave's studies became the basis of the **equilibrium** approach to regional growth and internal migration. Regional economies were in continuous equilibrium, only adjusting as the demand for natural amenities increased.

(Natural Amenities and Regional Economic Growth continued)

Michael J. Greenwood, 1969. "Analysis of Determinants of Geographic Labor Mobility in the United States," Review of Economics and Statistics 51(2), 189-194.

- d**ifferences in income** reflected **household utility differentials** that induced internal migration
- regional income differentials were **not** compensating differentials for regional differences in amenity attractiveness
- assumes regional labor markets do not equilibrate quickly and may never do so completely
- primarily the income differentials result from **differential labor demand shocks**

This study and a number of subsequent studies came to represent the **disequilibrium** approach to internal migration and regional growth

(Natural Amenities and Regional Economic Growth continued)

Greenwood, Hunt, Rickman & Treyz, 1991. "Migration, Regional Equilibrium, and the Estimation of Compensating Differentials". *American Economic Review*. *81* (5), 1382-1390.

- tested the assumption of equilibrium for U.S. states using migration data, found that not all states were in equilibrium, but **equilibrium** could only be **rejected** statistically for a **small number of states**

Treyz, Rickman, Hunt & Greenwood, 1993. "The Dynamics of Internal Migration in the U.S.". *The Review of Economics and Statistics*. *75* (2), 209-214.

- estimated migration responses to labor demand shocks for use in a regional forecasting and simulation model (REMI model); controlled for amenity influence with state fixed effects.
- results suggested a 1% increase in jobs from a labor demand shock would produce a 0.84% increase in population after 20 years, suggesting **long-lasting disequilibrium**

Partridge, Rickman, Olfert, Tan, 2015. "When Spatial Equilibrium Fails: Is Place-Based Policy Second Best?" *Regional Studies*. *49* (8), 1303-1325.

- extensive review of the literature, including both cross-section and time-series studies; found evidence favoring the **weak form of the spatial equilibrium** hypothesis, **movement towards spatial equilibrium** following shocks but **little evidence for strong form** of spatial equilibrium in terms of equalized household utility or complete supply responses to demand shocks

Key Points Regarding Amenity Demand and Economic Growth

1) Natural amenities affect other labor market outcomes through population movements

Partridge & Rickman. (1997). "The Dispersion of U.S. State Unemployment Rates: The Role of Market and Non-market Factors". *Regional Studies*. *31* (6), 593-606.

- found that over **one-half of U.S. state unemployment rate differences** were related to state differences in **natural amenities**; would not be expected to then influence migration as they do not reflect household utility differences

Partridge & Rickman. (1999). "Which Comes First, Jobs or People? An Analysis of the Recent Stylized Facts". *Economics Letters*. *64* (1), 117-123.

- supply shocks from amenity-migration would be distinguished from labor demand shocks by **reduced relative wages** and **rising unemployment rates**, though both associated with **increased population and employment**

(Key Points Regarding Amenity Demand and Economic Growth continued)

2) Demand for natural amenities can change

Partridge, Rickman, Olfert & Ali, 2012. "Dwindling U.S. Internal Migration: Evidence of Spatial Equilibrium or Structural Shifts in Local Labor Markets?" *Regional Science and Urban Economics*. *42* (1-2), 375-388.

- **downward shift in migration**, especially post-2000; did not find evidence of a stable spatial equilibrium in which amenity demand ceased to influence migration; **amenity migration continued post-2000 (through 2007)** in line with previous decades; mostly found **reduced migration responses to exogenous employment shocks**

Rickman & Guettabi, 2015. "The Great Recession and Nonmetropolitan America," *Journal of Regional Science*. *55*(1), 93-112.

- during the housing market bubble, **housing prices increased the most** in **high natural amenity areas**; these areas suffered the most during the subsequent Great Recession—**reduced migration** during contraction; only during the **national economic recovery did amenity demand resume**

(Key Points Regarding Amenity Demand and Economic Growth continued)

3) There can be shocks to natural amenity attractiveness of an area, hurricanes, droughts, other change in weather patterns

Partridge and Rickman, 2003. "The Waxing and Waning of State Economies: The Chicken Egg Issue of Jobs vs People," *Journal of Urban Economics*, *53* (1), 76-97.

- used a Structural Vector Autoregression (SVAR) model to assess relative contribution of labor supply shocks to employment growth.
- found it **slightly more likely that people follow jobs than jobs follow people** in terms of responses to shocks

Partridge & Rickman, 2006. "Fluctuations in Aggregate U.S. Migration Flows and Regional Labor Market Flexibility," *Southern Economic Journal*, *72* (4), 958-980.

- used SVAR to assess relative contribution of supply shocks to population growth and assessed regional labor market flexibility
- **labor demand and supply shocks had nearly equal impacts** on interregional migration.

(Key Points Regarding Amenity Demand and Economic Growth continued)

4) Endogeneity of natural amenity attractiveness to growth

Gabriel, Mattey and Wascher (2003, *Regional Science and Urban Economics*)

- "… substantial **deterioration in quality-of-life** rankings in some states that experienced rapid population growth during the decade. Reduced spending on infrastructure, increased traffic congestion, and air pollution account for the bulk of the deterioration in quality-of-life in these states"

Chen, Irwin and Jayaprakash (2009, *Ecological Economics*; 2012, *Journal of Regional Science*)

- (EE) "footloose households do respond to **declining ecological amenities** and rising congestion by relocating, they are much more likely to **relocate within the region** to a different neighborhood rather than leave the region altogether"
- (JORS) "strong preferences for **natural amenities generally foster population dispersion**; such preferences can also lead to **population concentration** when ecological degradation is low and **man-made capital** is a relatively scarce input into natural amenity production"

(Key Points Regarding Amenity Demand and Economic Growth continued)

Rickman and Rickman, 2011. "Population Growth in High Amenity Nonmetropolitan Areas: What's the Prognosis?" *Journal of Regional Science*. *51* (5), 863-879.

- natural amenities increasingly **capitalized into factor prices**, particularly housing prices; **population growth** in high-amenity areas **feeding back negatively** on amenity attractiveness of the area, reducing in-migration; migration moving to next lower tier of amenity-attractive areas

5) The demand for natural amenities can vary spatially

Partridge, Rickman, Ali & Olfert, 2008. "The Geographic Diversity of U.S. Nonmetropolitan Growth Dynamics: A Geographically Weighted Regression Approach," *Land Economics*. *84* (2), 241-266.

- geographic variation in demand for amenities; bodies of freshwater more valued in regions where they are scarce; although ERS amenity scale ranks northern Minnesota/Wisconsin/upper Michigan as amenity unattractive, using GWR found stronger localized employment growth effects of a colder January

(Key Points Regarding Amenity Demand and Economic Growth continued)

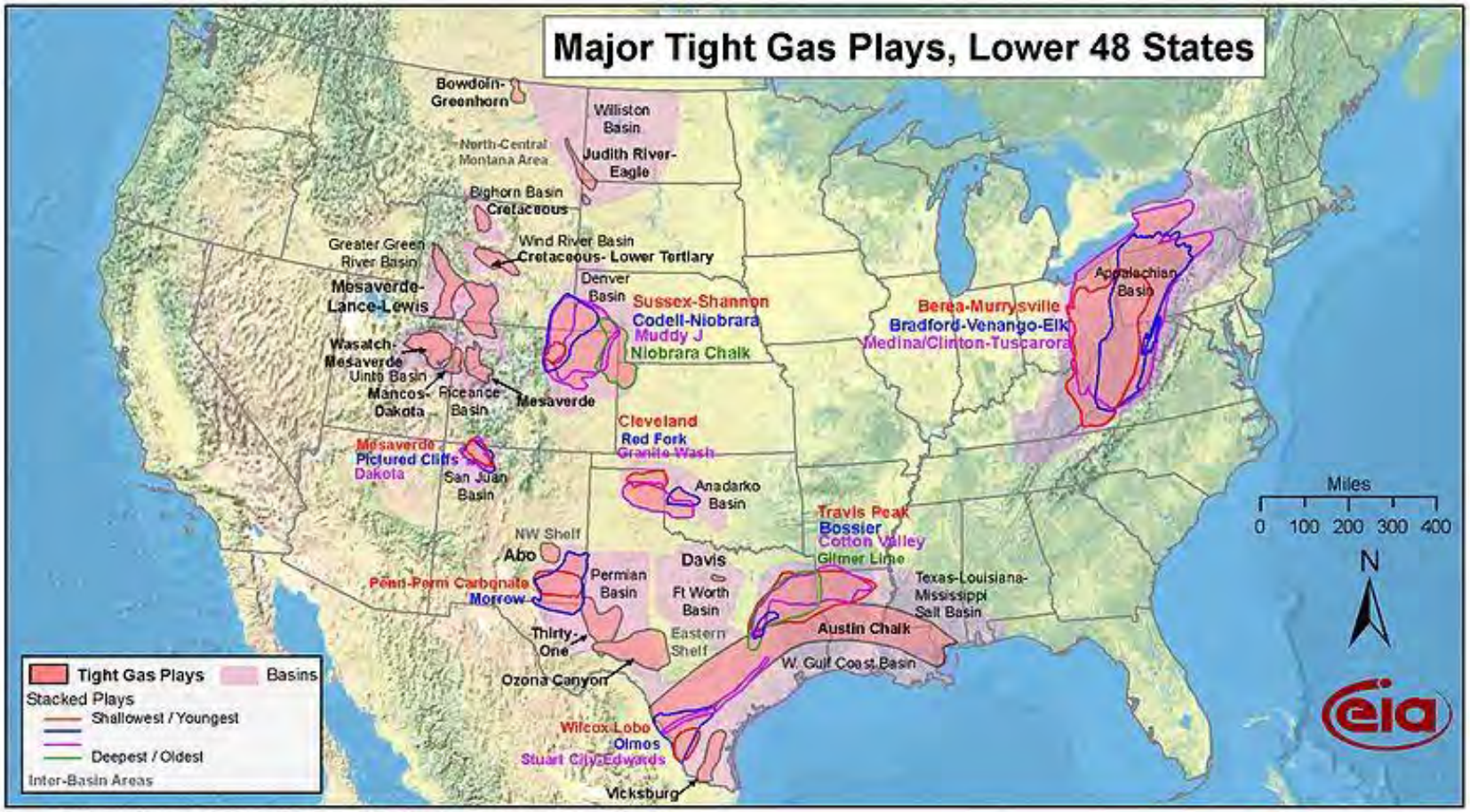
6) Natural amenities can directly affect firm location, not just indirectly through labor supply

Rickman & Wang, 2017. "U.S. Regional Population Growth 2000- 2010: Natural Amenities or Urban Agglomeration?" *Papers in Regional Science*.

- stronger population growth into high natural amenity areas; but rather than finding reduced price-adjusted wages, **found rising price-adjusted-wages**, which was supportive of sorting of individuals with higher levels of unmeasured skills into high-amenity areas, or of firm-location responses to high natural-amenity levels

- per capita income growth is stronger in high-amenity areas to the extent there is **sorting of individuals with high levels of unmeasured skills or sorting of high-productivity firms**

Regional Economic Impacts of Energy Development



Source: Energy Information Administration based on data from various published studies
Updated: June 6, 2010

(Regional Economic Impacts of Energy Development continued)

Energy development affects regional economies through the **demand for labor**, and can be reflected in changes in **employment, earnings and population** (Marchand and Weber, 2017, *Journal of Economic Surveys*)

The effects can positively **spillover to the nonenergy economy** through multiplier effects, or **alternatively** possibly **crowd out** other economic activity through higher input prices and harm to the natural environment

- Marchand (2012, *Journal of Urban Economics*) found that 10 new energy extraction jobs created an additional 3 construction jobs, 2 retail trade jobs, and 4.5 services jobs in Western Canada
- Weber (2014, *Resource and Energy Economics*) estimated an employment multiplier of 2.4 for natural gas extraction in counties in the states of Arkansas, Louisiana, Oklahoma and Texas
- Brown (2014, *Economic Review*) estimated an employment multiplier of 1.7 for natural gas jobs in key gas-producing states
- Weinstein (2014, *Journal of Regional Analysis and Policy*) estimated an average (shorter-run) employment multiplier of 1.3 over the United States
- Lee (2015, *Energy Policy*) estimated a long-run multiplier of 1.65 for jobs in oil production for Texas

(Regional Economic Impacts of Energy Development continued)

Munasib and Rickman (2015, *Regional Science and Urban Economics*) found **regional variation** in the economic impacts of oil and gas extraction using the Synthetic Control Approach

- wage and salary employment multiplier of 1.77 for key shale counties in Arkansas
- wage and salary employment multiplier of 3.37 for the oil and gas producing counties of North Dakota (and for the nonmetropolitan area more broadly)
- an absence of statistically significant effects in any combination of energy-producing counties in Pennsylvania

Tsvetkova and Partridge (2016, *Energy Economics*) estimated oil and gas employment multiplier for the United States; multiplier values varied depending on the specification and time period

- for nonmetropolitan counties, the estimates range from each oil and gas job creating no jobs elsewhere to an additional 1.7 jobs in the long run defined as ten years
- multiplier peaks at 6 years, only here does the multiplier (equal to 3) exceed the average employment multiplier across other export industries
- crowding out from the sixth to the tenth year (multiplier equal to 1.7), consistent with Dutch Disease

(Regional Economic Impacts of Energy Development continued)

Crowding out through reducing educational outcomes

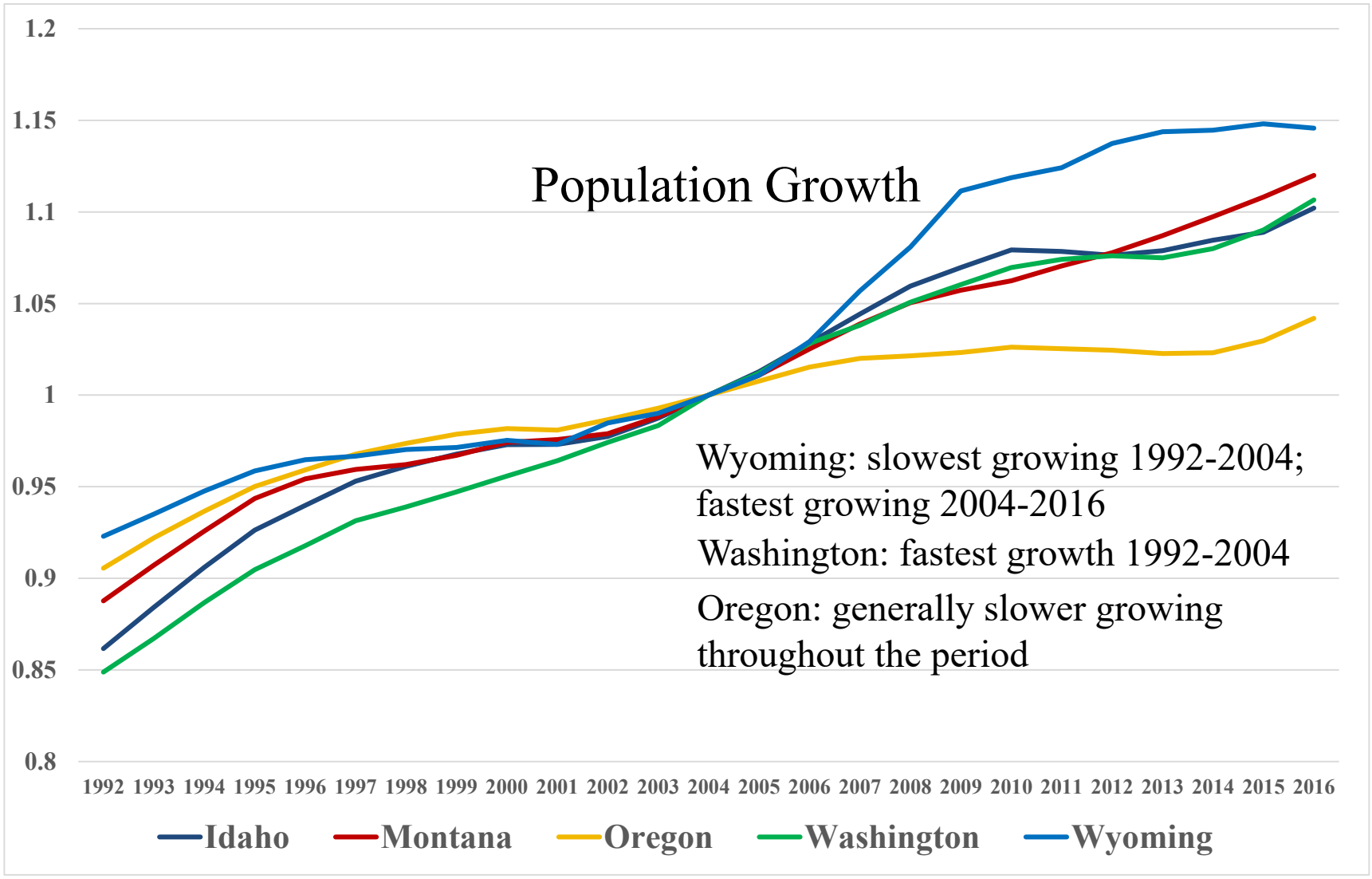
- Black et al. (2005, *Industrial and Labor Relations Review*) increased returns to low-skilled labor from the 1970s boom in coal mining led to **more high school dropouts** across U.S. Appalachian counties
- Emery et al. (2012, *Industrial and Labor Relations Review*) found that males **delayed** their timing of education in the 1970s energy boom in Alberta, but **did not decrease** their eventual **educational attainment**
- Douglas and Walker (2016, *Journal of Regional Science*) find that coal dependence in Appalachian counties from 1970 to 2010 was associated with an **increased share of high school dropouts** and **decreased share of college graduates**, which contributed to roughly a quarter of the decline in local per capita income over the study period
- Rickman, Wang and Winters (2016, *Energy Economics*) found that the oil and gas shale boom **significantly lowered high school and college attainment among the original residents** of Montana, North Dakota, and West Virginia.

(Regional Economic Impacts of Energy Development continued)

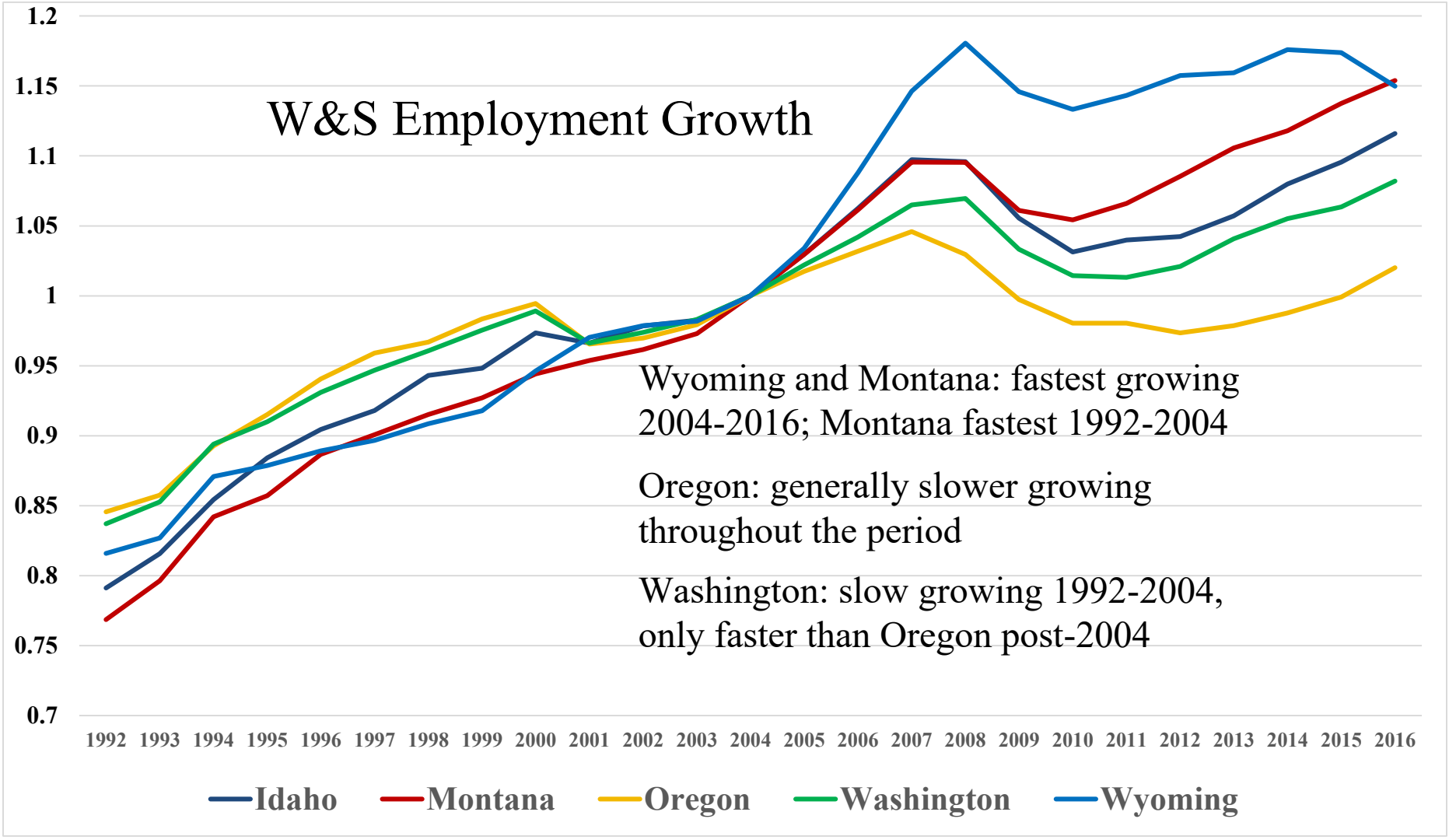
Crowding out through reducing quality of life

- contamination of **ground water**, accidental **chemical spills**, reduction in **air quality, noise, land footprint** (Lipscomb et al., 2012; Rahm, 2011; White, 2012; Atkin, 2014)
- Gopalakrishnan and Klaiber (2014) found **negative effects on property values** in Washington County, Pennsylvania, for proximity to shale gas exploration
- Muehlenbachs et al. (2014) found large **negative price effects for homes** dependent on groundwater in Florida and Texas
- Throupe et al. (2013) found **reductions in home values located near "fracking" sites**
- **Housing prices fell in locations close to earthquakes** in Oklahoma associated with the disposal of wastewater from hydraulic fracking of oil and gas began to increase after 2010 (Cheung et al., 2016)

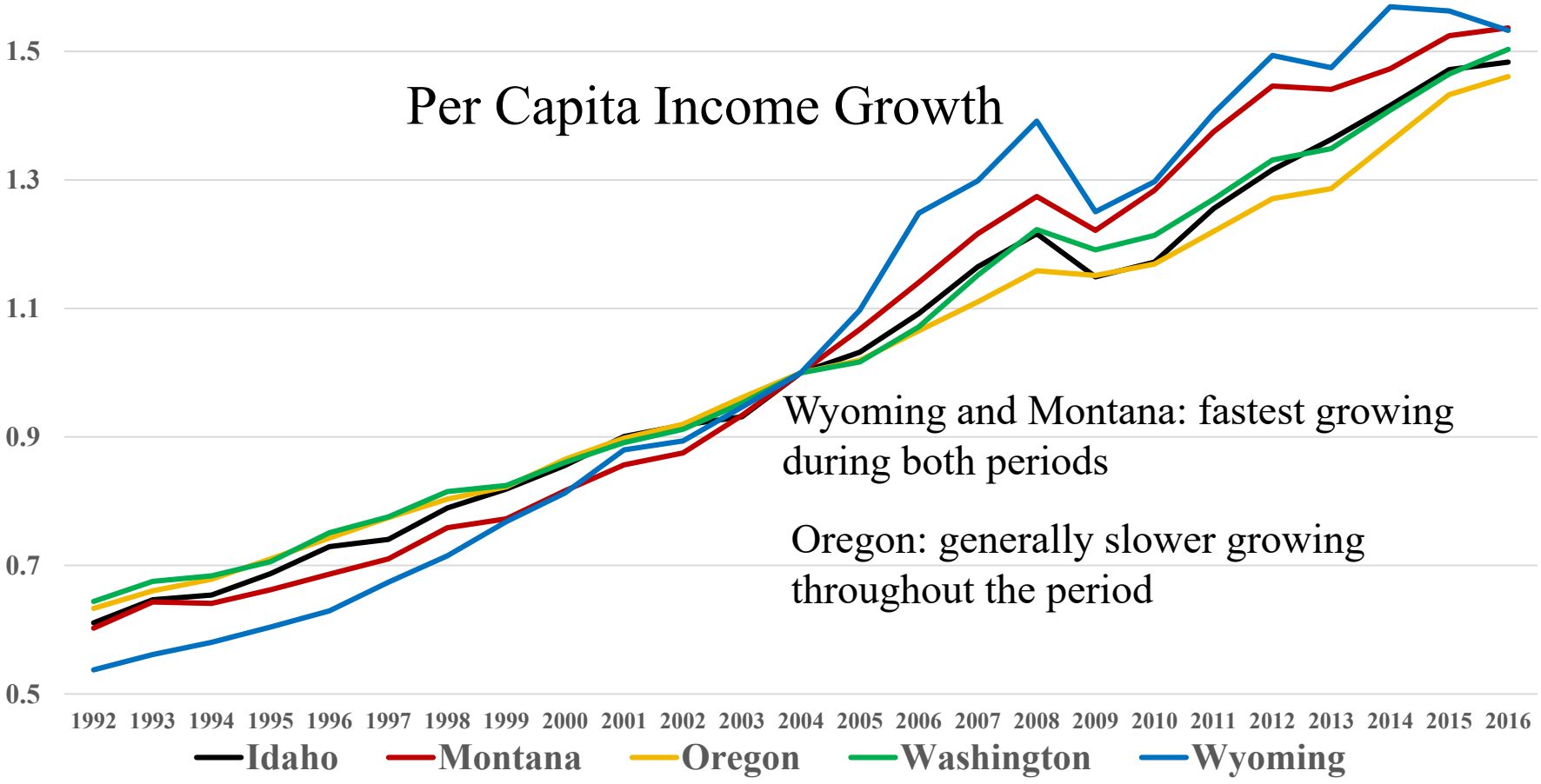
Pacific Northwest Nonmetropolitan Economic Growth 1992-2016 (2004=1) (Source: BEA)



Pacific Northwest Nonmetropolitan Economic Growth 1992-2016 (2004=1) (Source: BEA)



Pacific Northwest Nonmetropolitan Economic Growth 1992-2016 (2004=1) (Source: BEA)



Synthetic Control Method (SCM) (2004/2016-1992/2004)

How did each state do post-2004 compared to a control that it matched pre-2004?

SCM provides a comparison state, or **synthetic control**, that is a **combination** of **donor states**; **weights** applied to states **based on matching pre-intervention characteristics and pre-intervention** paths of the indicator (outcome) variables between the state of interest and the synthetic control group (Abadie and Gardeazabal 2003; Abadie et al., 2010)

- has been at the applied U.S. state level (e.g., Abadie et al., 2010; Bohn et al., 2014; Ando, 2015; Liu, 2015; Munasib and Rickman, 2015; Eren and Ozbeklik, 2016; Luechinger and Roth, 2016; Rickman, Wang and Winters 2016)
- effective in case studies, avoids necessity of finding a "twin" for comparison, which is difficult at the state level (few units of comparison)
- avoids extrapolation bias that can occur with regression analysis (Abadie et al., 2015, *American Political Science Review* 59(2)) (weights all between 0 and 1)
- can then apply difference-in-differences between state of interest and the synthetic control group; i.e., compare 2004-2016 to 1992-2004

(Synthetic Control Method continued)

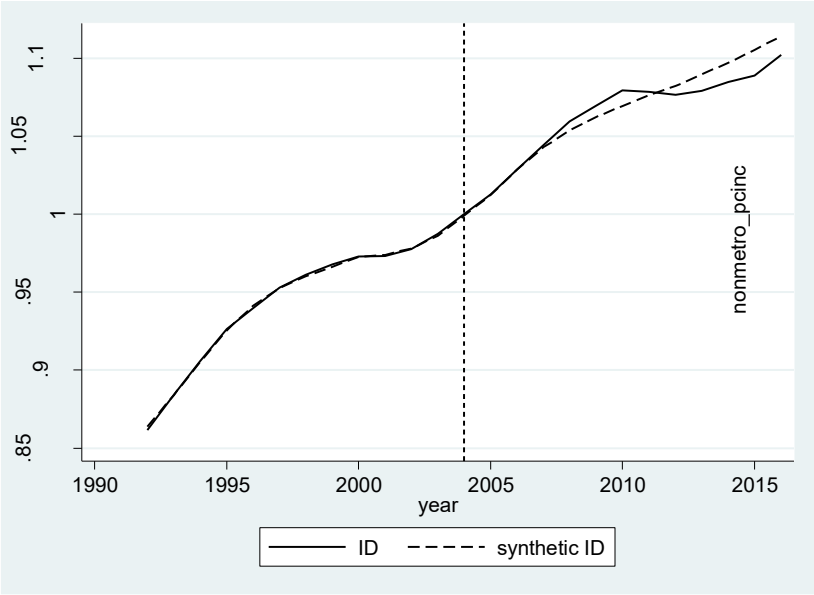
Bi-level optimization; find optimal weights for both predictor variables and states; matching based on both predictor variables and pre-treatment outcomes (Abadie and Gardeazabal, 2003)

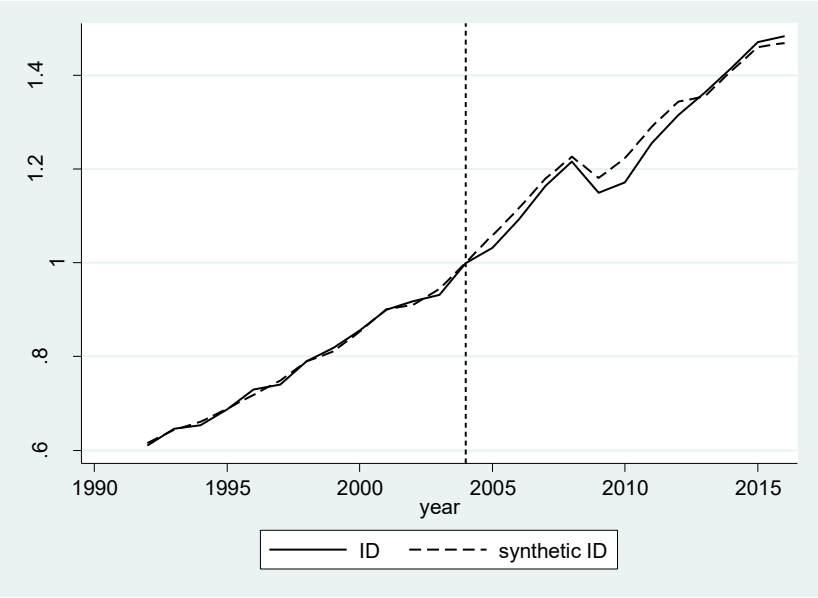
Predictions are based on the 'optimal' weights applied to the outcomes of the contributor states to the synthetic control group

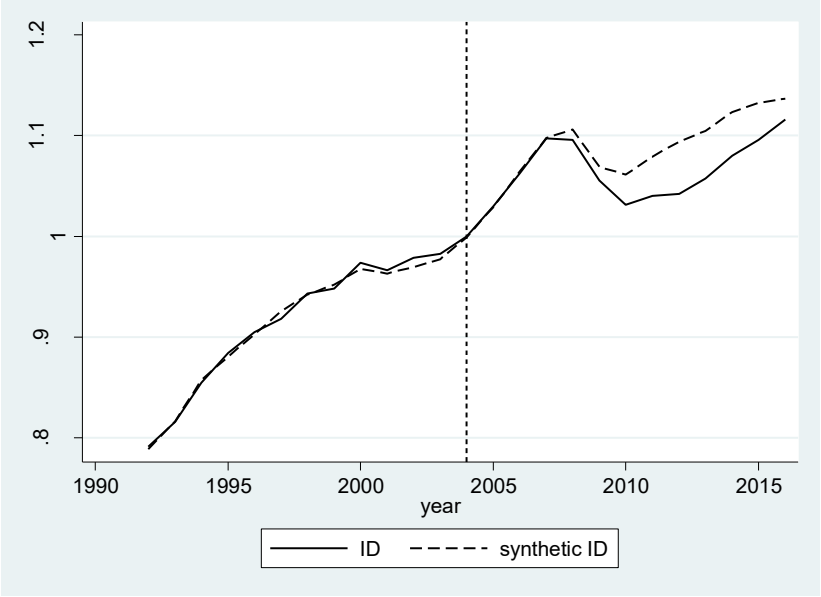
Predictor Variables from regional science literature (pre-intervention) (Munasib and Rickman, 2015; Rickman, Wang and Winters 2016)

- USDA (ERS) county measures aggregated to state level: natural amenity rank; rural-urban continuum code; manufacturing dependence; mining dependence; farm dependence; retirement destination; recreation dependence; (based on data 2000 or earlier)
- distances to different sized metropolitan areas
- per capita income 2000; natural population growth (2002-2007)
- industry mix employment growth (2002-2007) (Dorfman et al., 2010)
- educational attainment of adult population (25+): bachelor's degree (2000)
- pre-intervention values of outcome variable (1995, 1998, 2001)

Idaho SCM Results



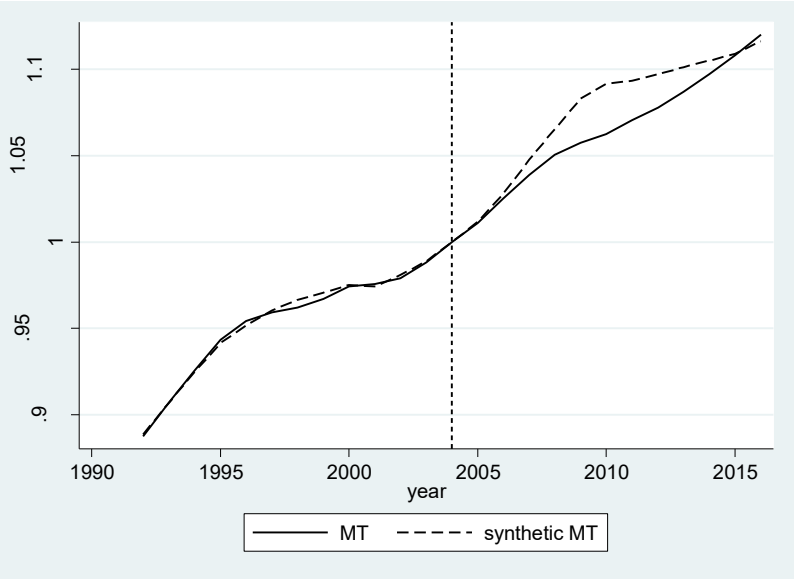


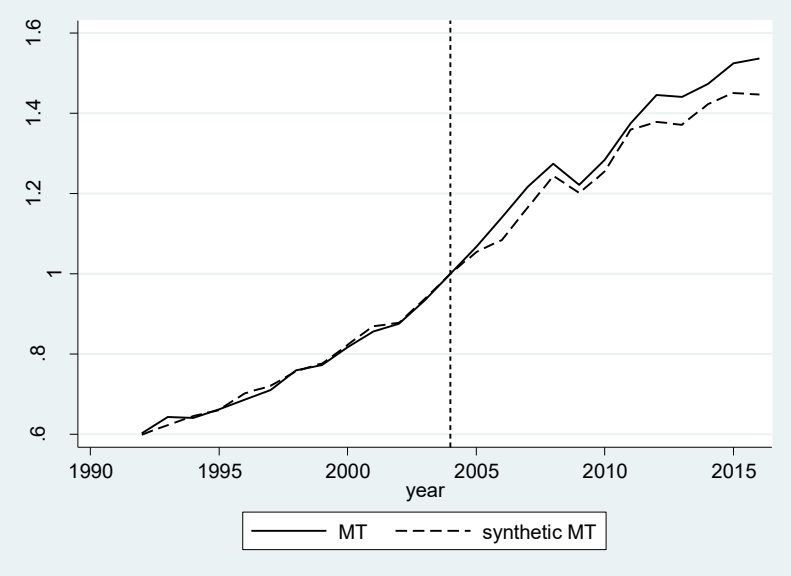


State	Pop	Emp	PCINC	Predictor Variable	Treated	Synthetic
CO	0	0	0.066	Bachelors Degree	0.148	0.156
FL	0	0	0.303	Farm Dependence	0.195	0.111
KY	0	0	0.065	Manufacturing Dep	0.034	0.093
MS	0	0.22	0.099	Mining Dependence	0.037	0.120
MT(1)	0.598	0.153	0.195	Amenity Rank	2.036	2.338
NV	0.118	0	0	Recreation Dependence	0.200	0.268
NM(3)	0.19	0.283	0	Retirement Destination	0.158	0.342
NY	0	0	0.101	Rural Urb Continuum	6.034	5.982
SD	0	0.02	0	Natural Pop 0207	0.040	0.026
UT(2)	0.093	0.323	0.15	IndMix 9000	0.134	0.152
VT	0	0	0.017	Tot Dist 1500	525.430	400.360
WA	0	0	0.005	Nearest MSA	95.388	120.295
				PCINC2000	21,974	21,589

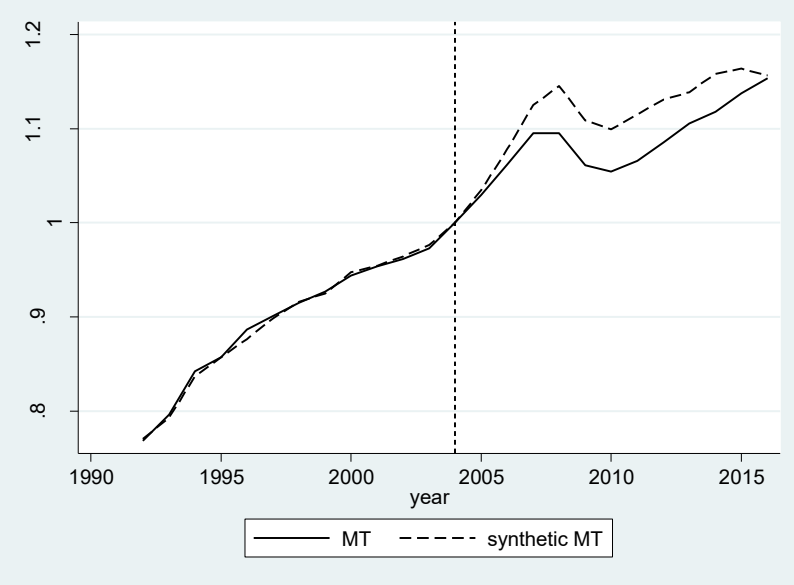
Montana SCM Results

nonmetro_pop





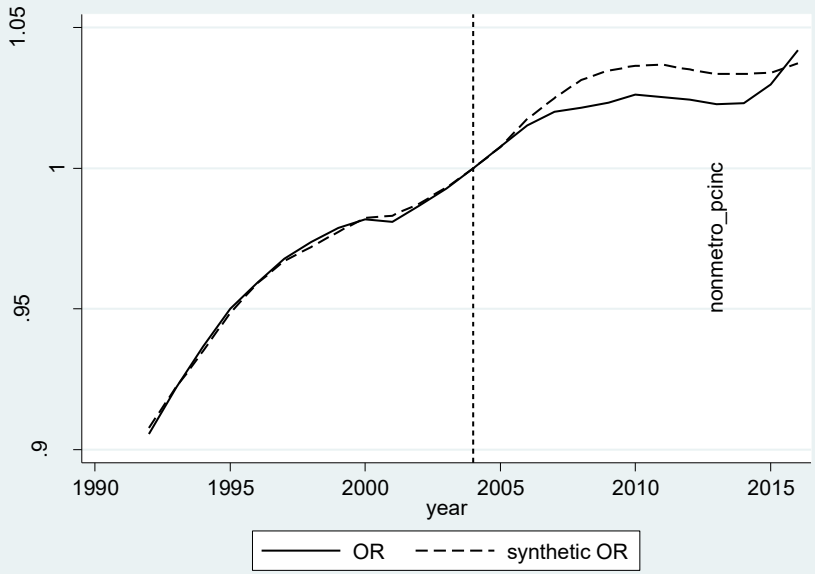
nonmetro_emp

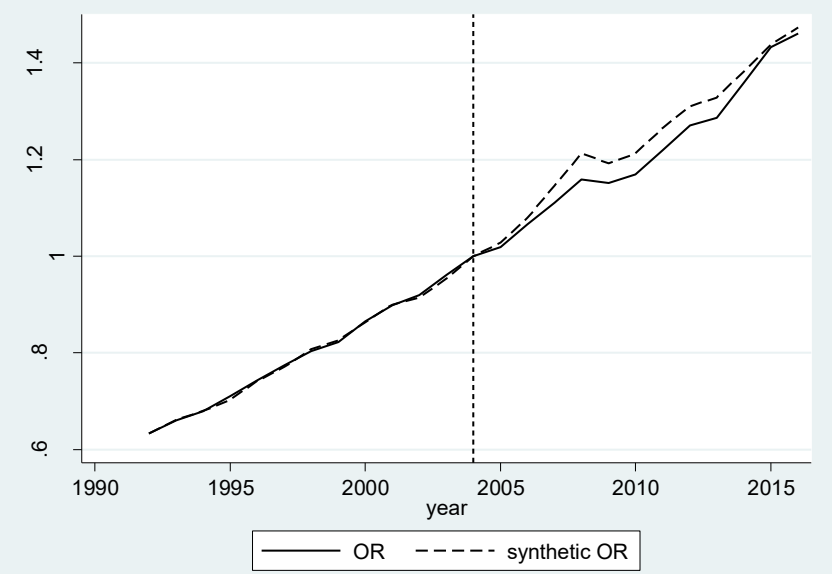


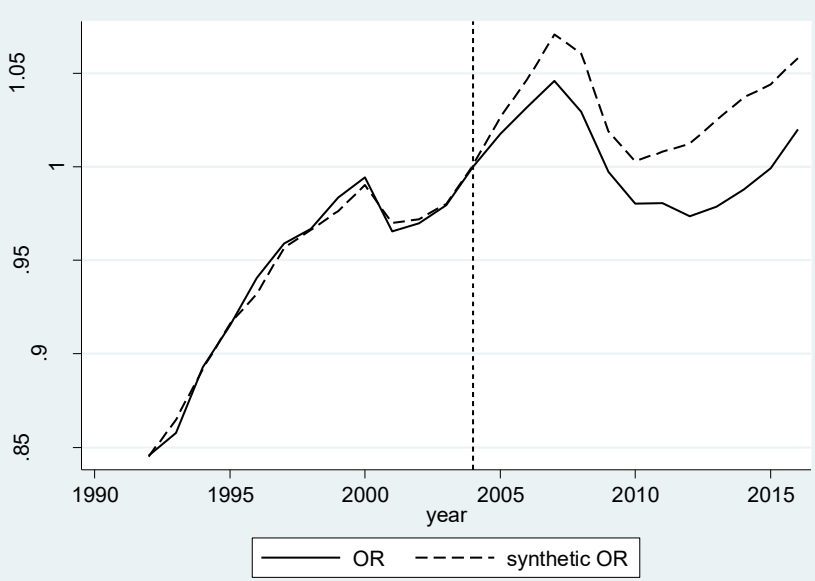
State	Pop	Emp	PCINC
ID(3)	0.599	0	0
NV	0	0	0.201
NM(1)	0	0.356	0.494
SD	0.035	0	0.305
UT	0	0.339	0
WY(2)	0.366	0.305	0

Predictor Variable	Treated	Synthetic
Bachelors Degree	0.173	0.147
Farm Dependence	0.144	0.140
Manufacturing Dep	0.000	0.032
Mining Dependence	0.069	0.198
Amenity Rank	2.146	2.648
Recreation Dependence	0.342	0.237
Retirement Destination	0.295	0.260
Rural Urb Continuum	6.398	6.127
Natural Pop 0207	0.017	0.034
IndMix 9000	0.173	0.148
TotDist 1500	594.806	374.722
Nearest MSA	154.321	126.675
PCINC2000	22,108	23,341

Oregon SCM Results



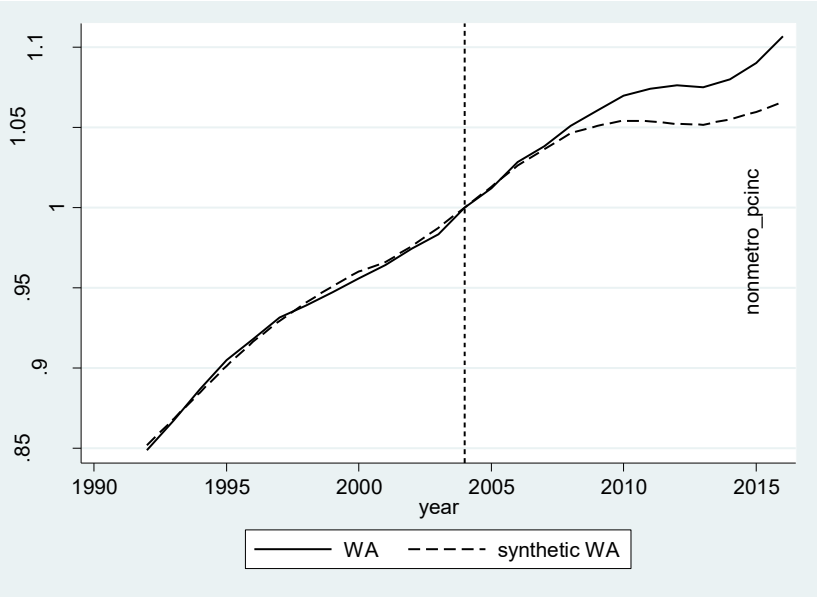


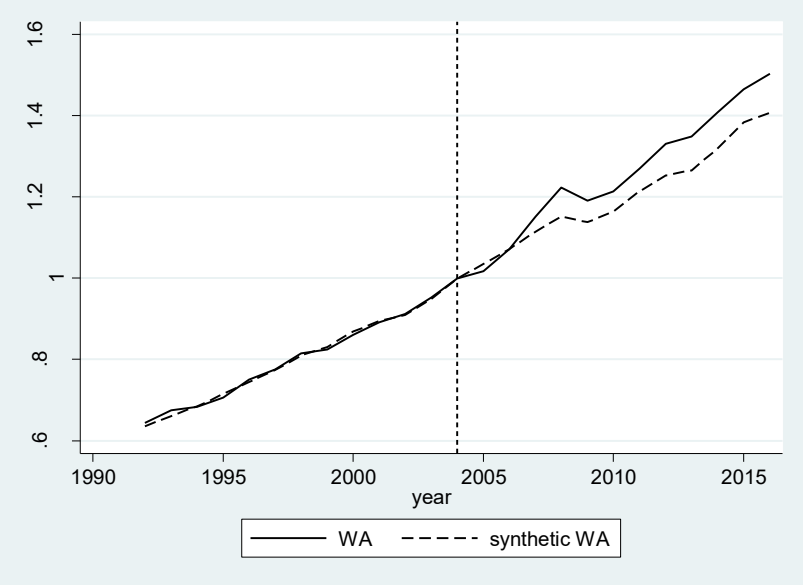


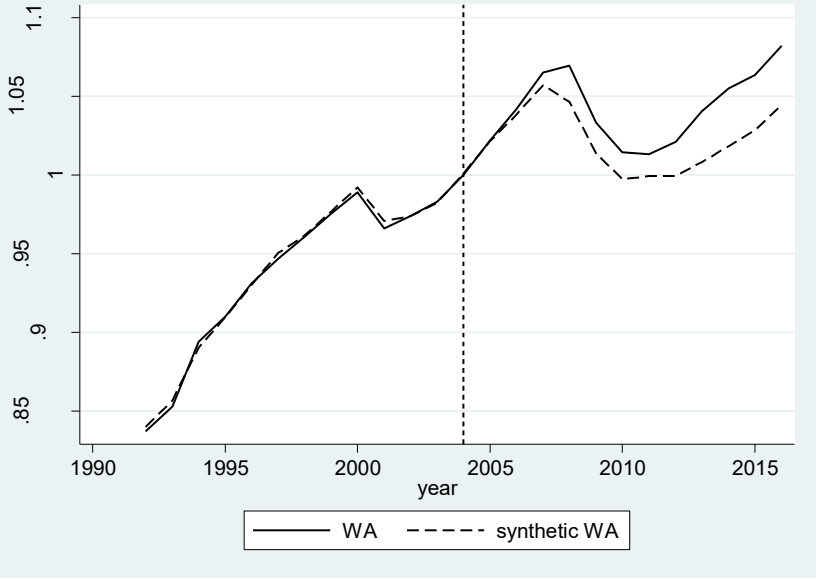
State	Pop	Emp	PCINC
AL	0.000	0.015	0.037
AZ(2)	0.188	0.063	0.079
CA	0.013	0.000	0.018
CT	0.086	0.000	0.030
FL(3)	0.124	0.161	0.019
IL	0.037	0.000	0.000
KS	0.000	0.015	0.000
MD	0.000	0.166	0.000
MT	0.121	0.011	0.000
NV	0.000	0.080	0.000
NM	0.000	0.000	0.020
NY	0.013	0.000	0.000
NC	0.000	0.237	0.033
PA	0.229	0.000	0.000
SC	0.000	0.000	0.241
TN	0.000	0.033	0.000
VA	0.079	0.000	0.000
WA(1)	0.110	0.220	0.523

Predictor Variable	Treated	Synthetic
Bachelors Degree	0.165	0.161
Farm Dependence	0.027	0.064
Manufacturing Dep	0.301	0.274
Mining Dependence	0.000	0.024
Amenity Rank	4.363	2.134
Recreation Dependence	0.211	0.248
Retirement Destination	0.371	0.372
Rural Urb Continuum	5.034	5.127
Natural Pop 0207	0.005	0.012
IndMix 9000	0.165	0.151
TotDist1500	171.840	159.677
Nearest MSA	79.683	74.572
PCINC2000	22,630	23,036

Washington SCM Results

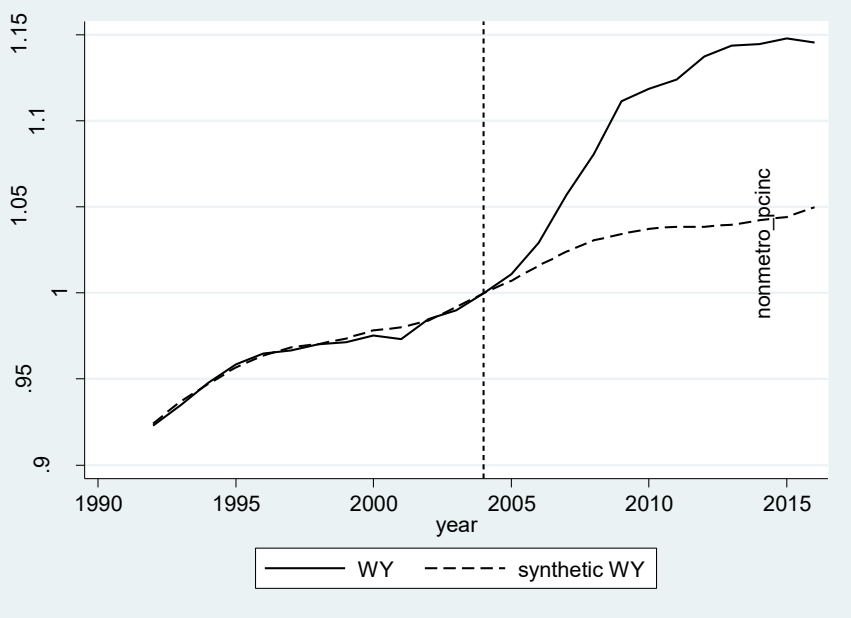


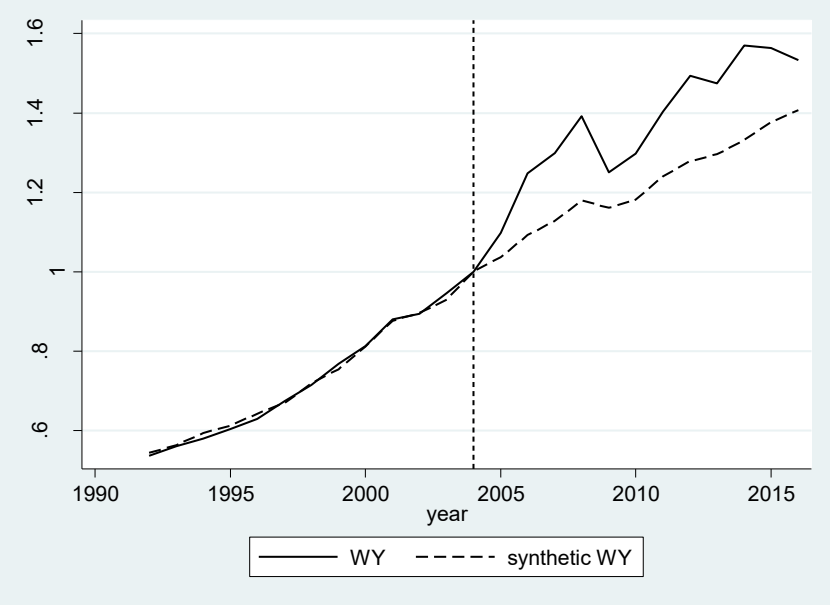


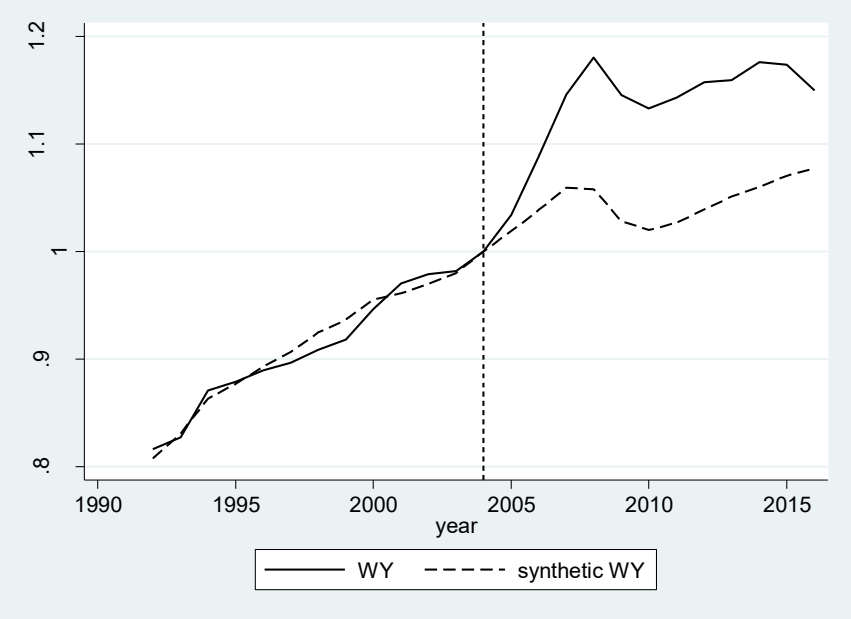


State	Pop	Emp	PCINC	Predictor Variable	Treated	Synthetic
AZ	0	0.066	0.013	Bachelors Degree	0.182	0.161
CA	0.159	0	0	Farm Dependence	0.126	0.075
CO	0	0.065	0	Manufacturing Dep	0.101	0.209
FL(2)	0.399	0.008	0.163	Mining Dependence	0.010	0.026
GA	0	0.067	0.111	Amenity Rank	3.087	2.882
ID	0.098	0	0	Recreation Dependence	0.202	0.262
MD	0	0.17	0	Retirement Destination	0.414	0.380
NE	0	0.112	0	Rural Urb Continuum	5.083	5.338
NV	0	0	0.117	Natural Pop 0207	0.015	0.011
NH(3)	0.22	0	0	IndMix9000	0.153	0.162
OR(1)	0	0.513	0.398	TotDist 1500	118.49	164.689
TN	0	0	0.197	Nearest MSA	64.673	81.519
UT	0.124	0	0	PCINC2000	23,905	23,412

Wyoming SCM Results







State	Pop	Emp	PCINC
CA	0.112	0	0.075
ID	0.206	0	0
ME	0.189	0	0
MD(2)	0	0	0.607
MT(1)	0.297	0.382	0
NH	0	0.102	0.27
NM	0.008	0.18	0
NY	0.175	0	0
SD	0.013	0	0.034
UT	0	0	0.015
VT(3)	0	0.336	0

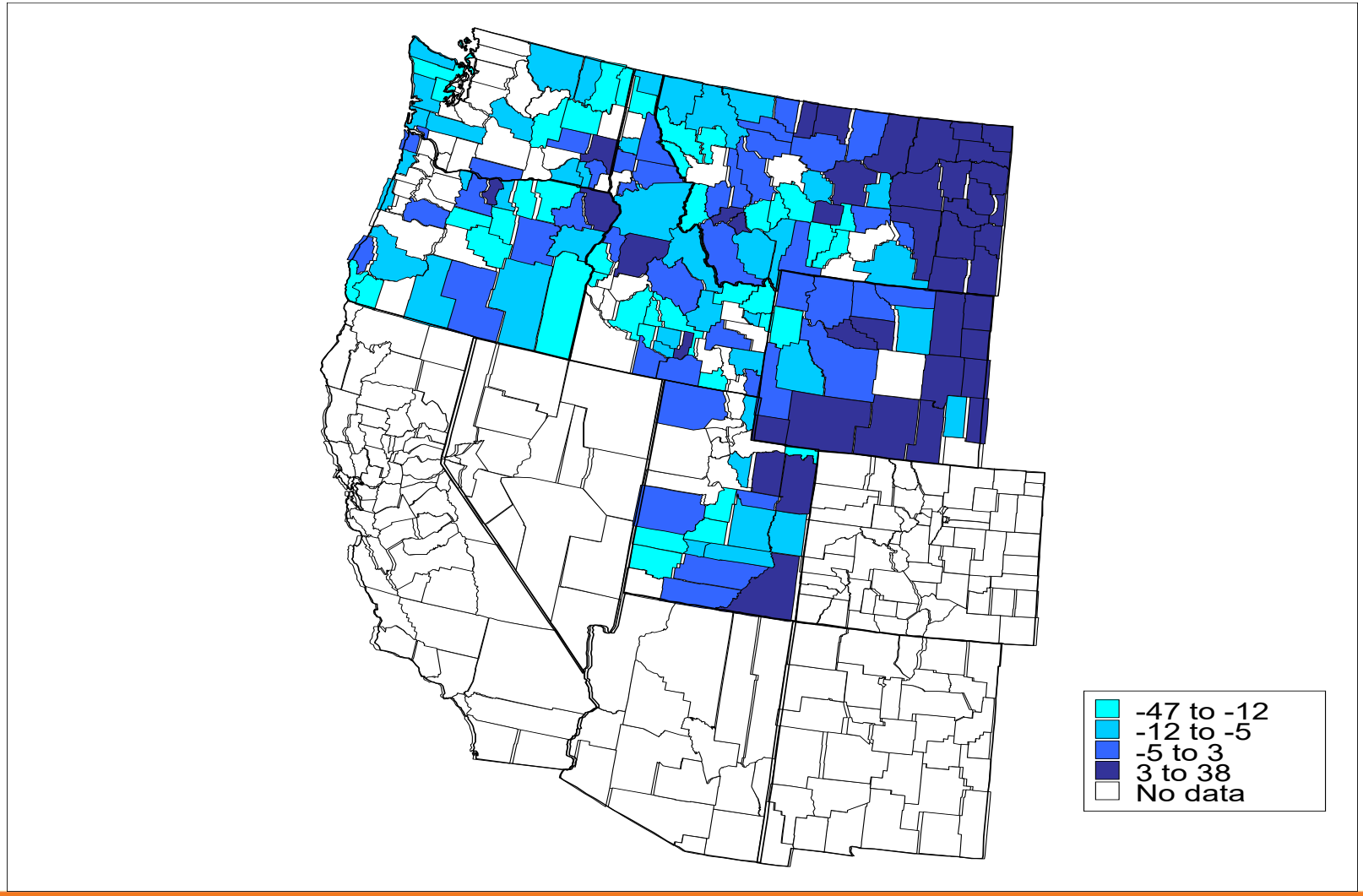
Predictor Variable	Treated	Synthetic
Bachelors Degree	0.149	0.172
Farm Dependence	0.043	0.065
Manufacturing Dep	0.000	0.093
Mining Dependence	0.368	0.032
Amenity Scale	3.174	1.320
Recreation Dependence	0.301	0.379
Retirement Destination	0.115	0.211
Rural Urb Continuum	6.423	5.682
Natural Pop 0207	0.029	0.015
IndMix9000	0.155	0.174
TotDist1500	322.817	262.746
NearestMSA	142.122	95.819
PCINC2000	28,443	25,445

Pacific Northwest Nonmetropolitan County Relative to U.S. Economic Growth (%) (2016-2004)-(2004-1992)

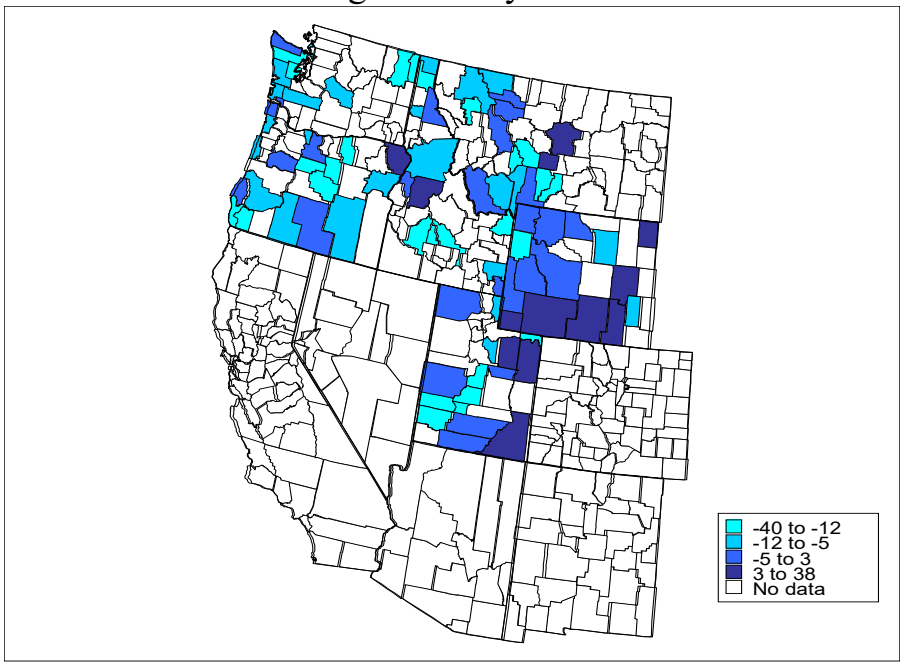
	W&S Employment	Population	PC Income
Idaho(32)	-4.7	**-2.7**	3.4
Montana(52)	3.3	6.6	**19.4**
Oregon(25)	-3.5	-0.9	10.2
Utah(19)	**-15.4**	1.5	-7.1
Washington(22)	-0.1	-2.5	18.6
Wyoming(21)	**5.0**	**9.2**	**-9.0**
All PNW States(171)	-1.5	2.3	8.5
High Amenity(90)	-7.3	-0.2	-0.4
Energy Boom(37)	10.3	13.4	6.7
Amenity_Energy(16)	4.4	11.4	-4.5

High Amenity: ERS Amenity Ranking of 5 or 6
Energy Boom: Tsvetkova and Partridge (2016)
Unweighted Averages

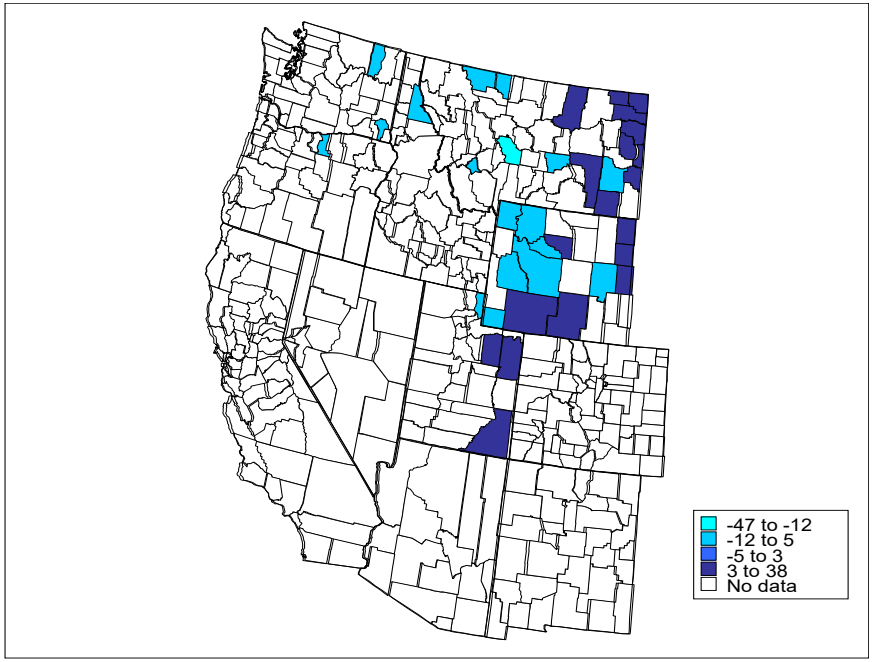
Pacific Northwest Nonmetropolitan Relative Population Growth (%) (2016-2004)-(2004-1992)



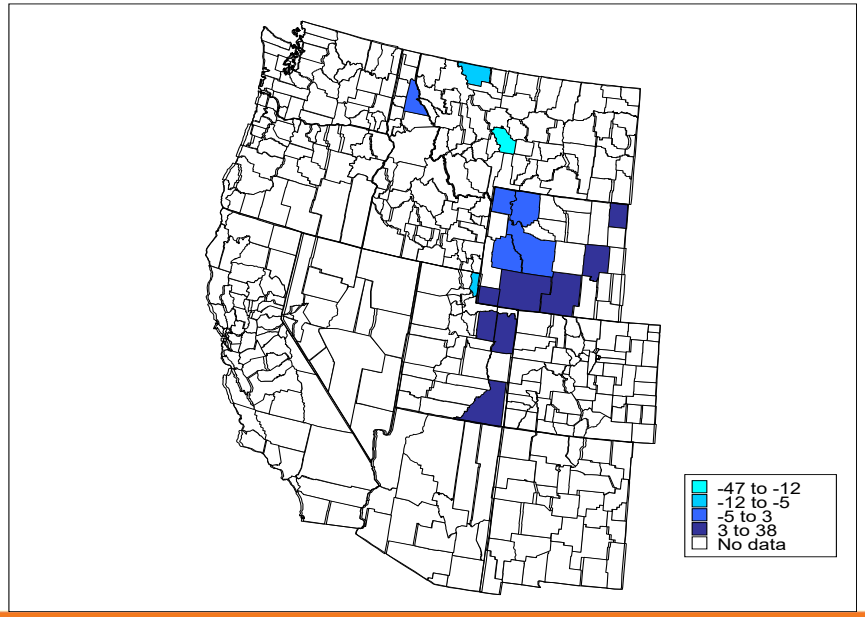
High Amenity Counties



Energy Boom Counties



Amenity/Energy Boom Counties



Pacific Northwest Nonmetropolitan Relative Population Growth (2016-2004)-(2004-1992) Regression Results

	Coefficient	t-stat
Constant	-2.69	-0.68
Amenity Rank 2	6.08	0.80
Amenity Rank 3	**10.72**	**3.82***
Amenity Rank 4	2.28	1.27
Bachelors Degree (% Adult Population Age 25+)	**-32.73**	**-1.68*****
Energy Boom County	**9.00**	**3.97***
Retirement County	-2.04	-1.04
Manufacturing County	1.98	0.68
Mining County	4.96	1.61
Nonmetro county with urban population of 20,000 or more, not adjacent to a metro area	4.79	1.15
Nonmetro county with urban population of 2,500-19,999, adjacent to a metro area	-4.45	-1.38
Nonmetro county with urban population of 2,500-19,999, not adjacent to a metro area	2.77	0.89
Nonmetro county completely rural or less than 2,500 urban population, adj. to metro area	-4.57	-1.33
Nonmetro county completely rural or less than 2,500 urban population, not adj. to metro	0.12	0.04
R-squared (N=171)	0.36	
Regression F-statistic		**6.93***
Wald Test F-statistic: Amenity Variables=0		**4.89***
Wald Test F-statistic: Rural-Urban Continuum=0		**3.11****

* significant below the 0.01 level
**significant below the 0.05 level
***significant below the 0.10 level

Pacific Northwest Nonmetropolitan Relative W&S Employment Growth (2016-2004)-(2004-1992) Regression Results

	Coefficient	t-stat
Constant	-12.42	-2.03
Amenity Rank 2	6.09	0.51
Amenity Rank 3	**22.15**	**5.06***
Amenity Rank 4	**8.75**	**3.11***
Bachelors Degree (% Adult Population Age 25+)	**-62.24**	**-2.05****
Energy Boom County	**9.35**	**2.64***
Retirement County	-4.40	-1.45
Manufacturing County	**10.32**	**2.27****
Mining County	3.63	0.75
Nonmetro county with urban population of 20,000 or more, not adjacent to a metro area	0.34	0.05
Nonmetro county with urban population of 2,500-19,999, adjacent to a metro area	1.61	0.32
Nonmetro county with urban population of 2,500-19,999, not adjacent to a metro area	3.87	0.79
Nonmetro county completely rural or less than 2,500 urban population, adj. to metro area	-4.94	-0.92
Nonmetro county completely rural or less than 2,500 urban population, not adj. to metro area	0.38	0.07
R-squared (N=171)	0.31	
Regression F-statistic		**5.55***
Wald Test F-statistic: Amenity Variables=0		**9.52***
Wald Test F-statistic: Rural-Urban Continuum=0		0.89

* significant below the 0.01 level
**significant below the 0.05 level
***significant below the 0.10 level

Pacific Northwest Nonmetropolitan Relative Per Capita Income Growth (2016-2004)-(2004-1992) Regression Results

	Coefficient	t-stat
Constant	-5.02	-0.49
Amenity Rank 2	3.89	0.20
Amenity Rank 3	**19.35**	**2.65***
Amenity Rank 4	**16.80**	**3.58***
Bachelors Degree (% Adult Population Age 25+)	**-97.81**	**-1.93*****
Energy Boom County	-3.24	-0.55
Retirement County	0.10	0.02
Manufacturing County	-1.95	-0.26
Mining County	-6.63	-0.82
Nonmetro county with urban population of 20,000 or more, not adjacent to a metro area	-4.41	-0.41
Nonmetro county with urban population of 2,500-19,999, adjacent to a metro area	6.65	0.79
Nonmetro county with urban population of 2,500-19,999, not adjacent to a metro area	-1.64	-0.20
Nonmetro county completely rural or less than 2,500 urban population, adj. to metro area	11.90	1.33
Nonmetro county completely rural or less than 2,500 urban population, not adj. to metro area	5.00	0.59
R-squared (N=171)	0.18	
Regression F-statistic		**2.65***
Wald Test F-statistic: Amenity Variables=0		**5.23***
Wald Test F-statistic: Rural-Urban Continuum=0		1.11

* significant below the 0.01 level
**significant below the 0.05 level
***significant below the 0.10 level

Conclusions

Economic growth slowed in high-amenity areas post-2004

- increasing housing prices
- congestion feedback effects on quality of life
- increasing man-made amenities in high natural amenity areas not dominant if they occurred

Energy rich areas grew the fastest (in employment and population) despite the drop in energy prices at the end of the period

- positive economic impacts of increased energy development
- lack of impact on per capita income is evidence against agglomeration economies

Thank you