

**Federal Forest Policy and Community Vitality in the  
Pacific Northwest:  
How Did the Northwest Forest Plan Affect  
Population, Wealth and Income in Rural  
Communities?**

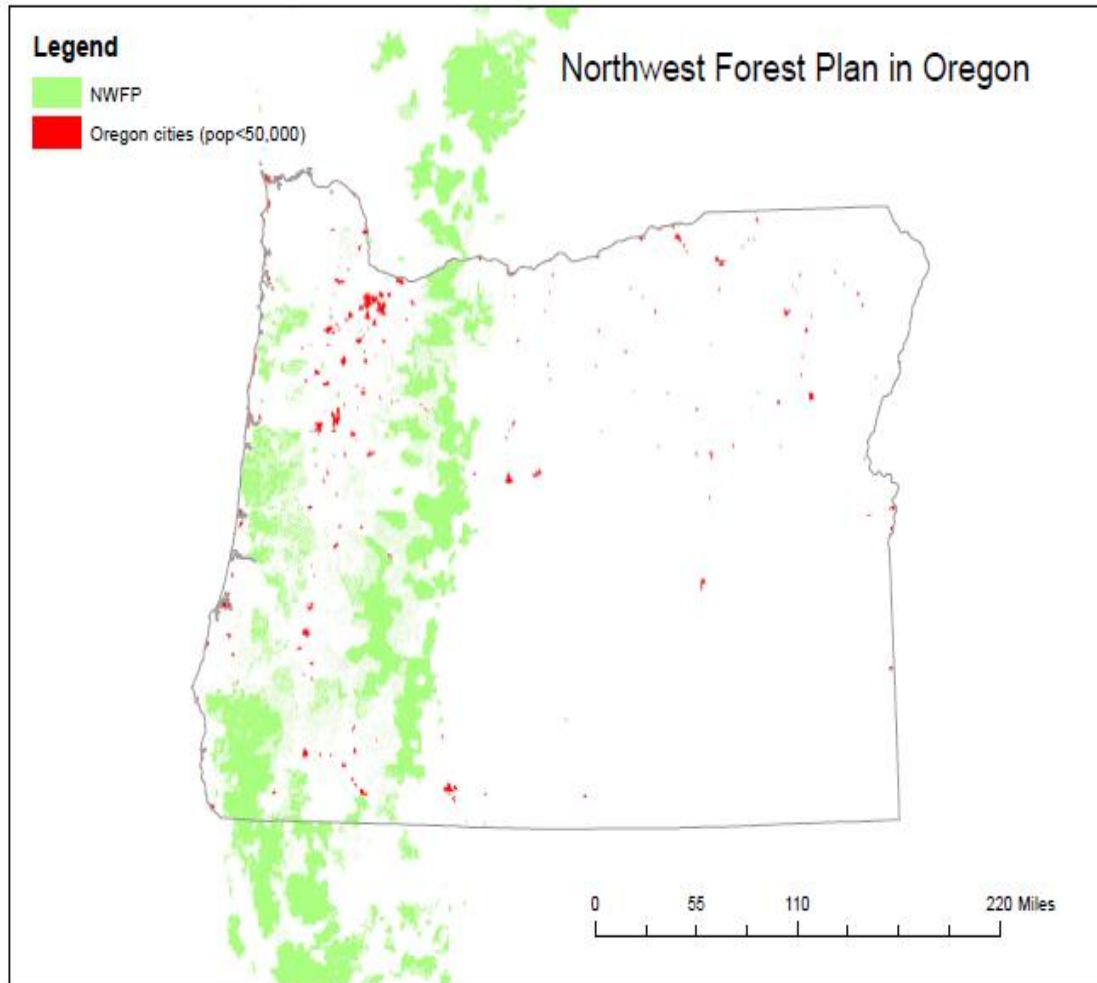
**Yong Chen and Bruce Weber**  
Rural Poverty Research Symposium  
Federal Reserve Bank of Atlanta  
Atlanta, GA  
December 2-3, 2013



# Federal Forest Policy and Oregon Rural Communities: Context

- Many Oregon rural communities were historically timber-dependent.
  - 13 % of all jobs in Oregon in early 1990s were supported by wood products
  - Wood products industry was in major transition as mills modernized
- Federal government owns 51% of the land and 60% of forestland in Oregon

# Northwest Forest Plan (NWFP)



Implemented in 1994, the NWFP shifted 11 million acres of federal forest land in WA, OR and CA from timber production to ecosystem management

# Oregon Timber Harvests 1965-2010

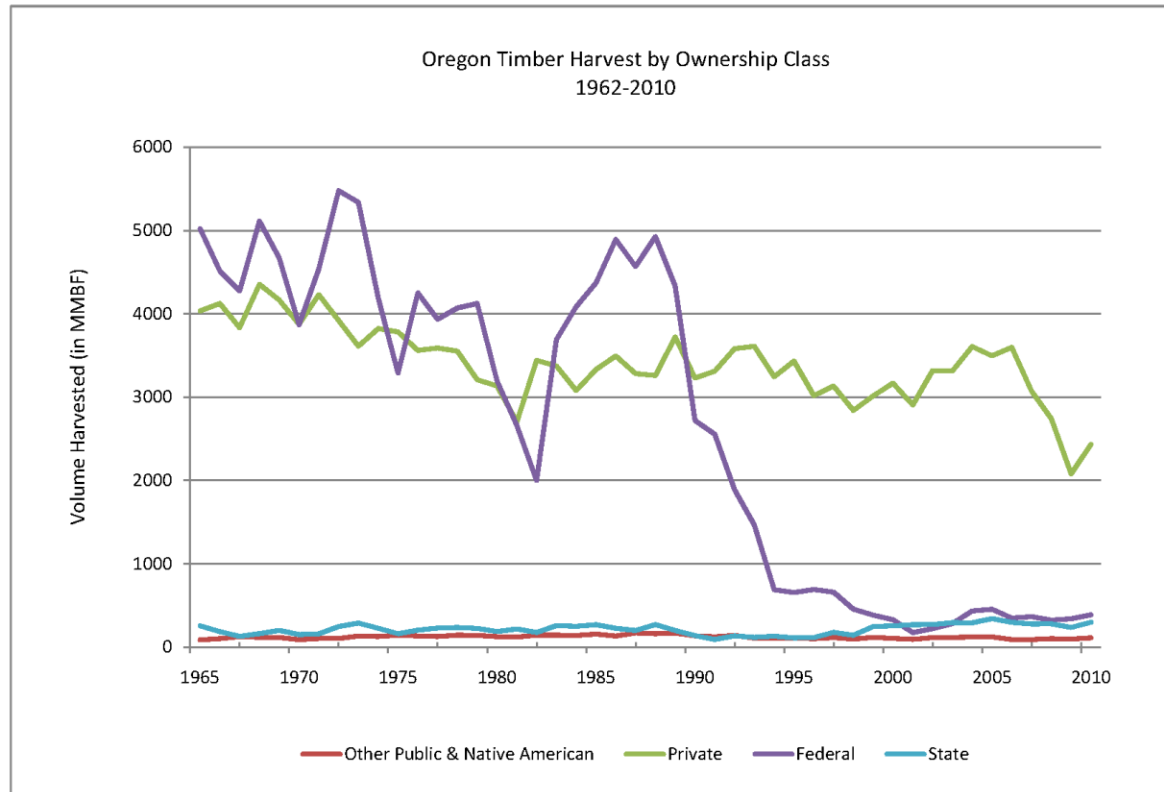
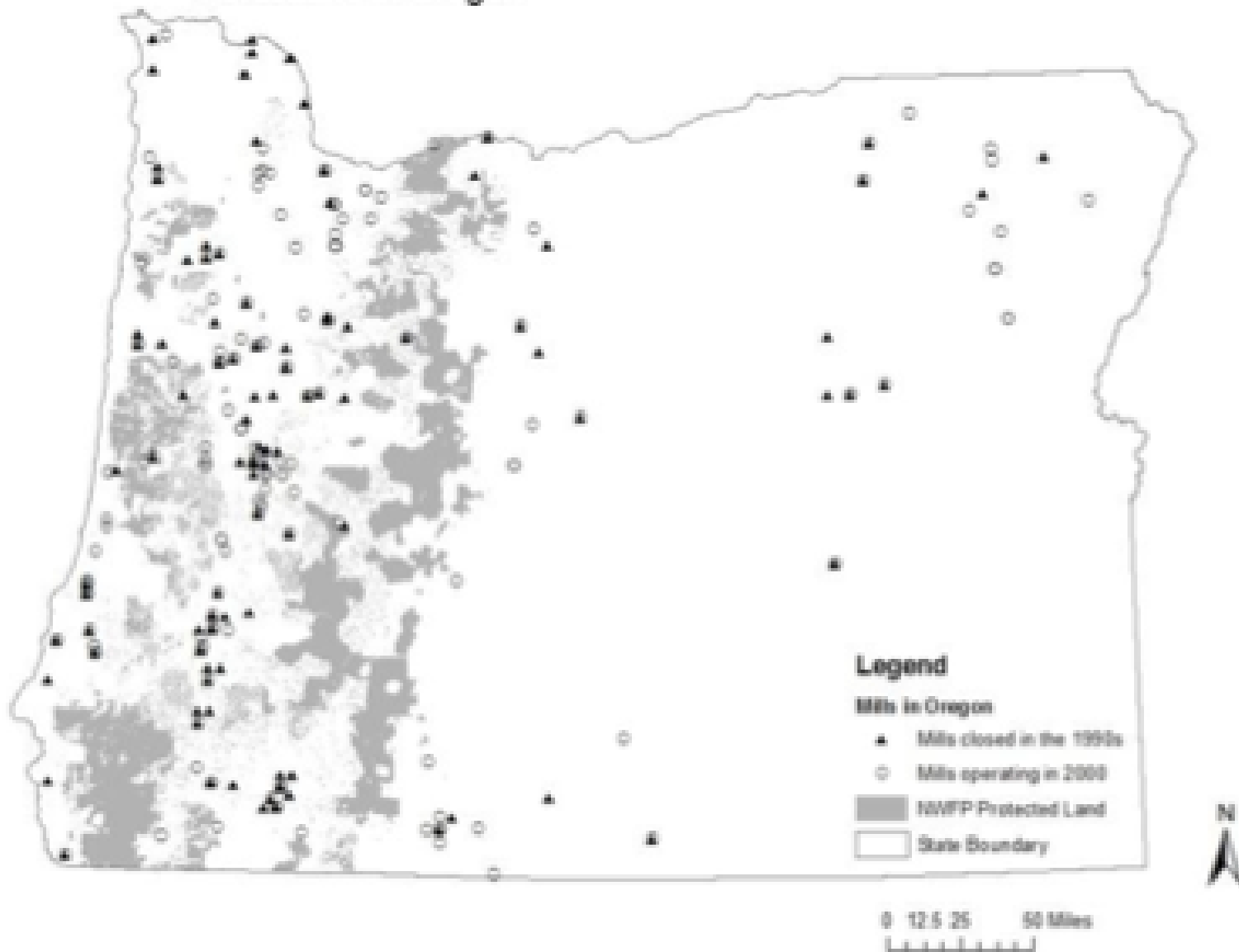


Figure 2: Lumber Mills and Northwest Forest Plan Protected Forestland in Oregon



# Assessing the Impact of the NWFP

- How did the implementation of the Northwest Forest Plan affect:
  - Population growth (change in #people/year)
  - Growth in property wealth (change in market value of real property in \$100,000/year)
  - Growth in median family income (change in median family income in \$1000/year)
- Examined 234 Oregon communities with population less than 50,000

# Why is this important?

- There is still a raging debate about whether protecting forests has a negative or positive impact on rural communities
- Those engaged in the debate and the policy decisions should understand the impacts, the pathways by which the impacts are transmitted, and the time frames over which these impacts occur

# Assessing the Impact of the NWFP

- Pathways for impacts:
  - Enhanced amenities in nearby communities (+)
  - Reduced mill employment when mills close (-)
  - Reduced logging employment in nearby communities (-)



# Assessing the Impact of the NWFP

- We created 3 policy impact variables:
  - Community is adjacent to NWFP land: dummy variable = 1 if community within 10 miles of NWFP-protected land [***amenity impact pathway***]
  - Number of mills closed in community during decade [***mill employment impact pathway***]
  - Adjacency to NWFP \* Logging-dependence: = 1 if NWFP-adjacent and share of community employment in logging is more than 10 percent) [***logging employment impact pathway***]
- Examined impacts for 1990-2000, 2000-2010

# Control Variables

- Population Growth
  - % elderly, % Hispanic, % with college degree, unemployment rate, income rank, wealth rank
  - Climate and location: heating degree days, distance to Portland, distance to National Park
- Growth in Real Property Values
  - Median number of rooms, commuting time
  - Climate and location (as above)
- Growth in Median Household Income
  - % nonwhite, % with college degree, unemployment rate, % managerial and professional jobs
  - Climate and location (as above)

# Partial Effects of NWFP

- Population growth
  - Neither NWFP-adjacency nor mill closures directly affected population growth in either 1990s or 2000s
- Growth in Real Property Values
  - NWFP-adjacency had a positive effect and Mill closures had a negative effect on property values in 1990s
- Growth in Median Household Income
  - Median household incomes grew more slowly in logging-dependent communities adjacent to NWFP-protected land in 1990s

# Total Effects of NWFP: 1990-2000

	Community Adjacent to Northwest Forest Plan Protected Land	Number of Mill Closures in a community	Logging-dependence in NWFP-adjacent communities
Population growth	85.07*	-41.96*	
Growth in Real Property Wealth	85.53**	-42.19**	
Growth in Median Household Income			-0.77 **

\* = significant at 0.1 level

\*\* = significant at 0.05 level

\*\*\* = significant at 0.01 level

# Impact of Northwest Forest Plan: 1990s

- In the 1990s, when NWFP was implemented, it appears to have
  - Increased amenity-related migration and growth in real property value in communities adjacent to NWFP-protected forests.
  - Reduced population and property values in towns with NWFP-induced mill closures
  - Reduced median household income in logging-dependent communities close to NWFP-protected land

# Total Effects of NWFP: 2000-2010

	Community Adjacent to Northwest Forest Plan Protected Land	Number of Mill Closures in a community	Logging-dependence in NWFP-adjacent communities
Population growth			
Growth in Real Property Wealth	<b>159.42***</b>		
Growth in Median Household Income			

\* = significant at 0.1 level

\*\* = significant at 0.05 level

\*\*\* = significant at 0.01 level

## Impact of Northwest Forest Plan: 2000s

- In the 2000s, the NWFP appears to have had an even greater impact on property value growth in nearby communities
- but the impact on population and income growth seems to have disappeared

# Policy impact summary: NWFP created winners and losers

- Policies to protect the environment -- old-growth forests and endangered species such as the spotted owl – appear to have created amenities that both attracted mobile populations and, *in the longer term*, increased local wealth in nearby rural communities
- These policies also appear to have slowed growth in population and wealth in mill towns *in the short run*, and slowed income growth in those nearby communities dependent on logging



# Policy implications

- Federal agencies with forest management responsibilities have evidence that protection of amenity-creating natural resources
  - generates some growth-enhancing population and long-term wealth impacts for nearby communities
  - does not generate income-enhancing impacts
  - generates short-term negative impacts on mill towns and adjacent logging towns

# Policy implications

- Some of the negative impacts of reduced timber harvests on displaced workers may be offset by complementary policies that support infrastructure development, business development, work supports and job retraining
- Some negative impacts of reduced harvests on local government revenues may be offset by new payment formulas on Federal forestland

# Unanswered Questions

- What is the impact of NWFP-type protections on
  - local income inequality?
  - local poverty rates?
  - local social cohesion?
  - local governance?

Financial support for this project was provided by  
USDA Economic Research Service under  
Cooperative Agreement 58-6000-0-0053 and by  
the Agricultural Experiment Station at Oregon  
State University



United States Department of Agriculture

**Economic Research Service**

The Economics of Food, Farming, Natural Resources, and Rural America

# Appendix

- Previous Literature
- Summary statistics
- Simultaneous equations regression model and results
- Data sources
- Map of Oregon's rural communities

# Related Literature on NWFP

- Negative impact on employment (e.g. Beuter et al. 1990, Charnley 2006)
- Positive impact on county migration (e.g. Lewis et al 2002, 2003, Eichmann et al. 2010)
- No studies on impacts on household income

# Literature on amenity-related growth and income

- Negative:
  - Rosen-Roback model (e.g. Blomquist et al. 1988, Gyourko and Tracy 1991 and Schmidt and Courant 2006), creating low paying jobs (McKean et al. 2005) less equitable income distribution (Gibson 1993, Marcouiller and Green 2000).
- Positive:
  - Associated income transfer (Shumway and Otterstrom 2001) and created additional sources of income (Reeder and Brown 2005, Lorah and Southwick 2003, Rasker 2006, Deller et al. 2001 and English et al. 2000)
- No significance (Lewis, Hunt and Platinga 2003)

# Summary Statistics

YEAR	1990				2000			
Name	MIN	MAX	MEAN	STD	MIN	MAX	MEAN	STD
Population Change	-52.6	1191.7	102.1	202.8	-2222.9	1240.0	74.3	239.9
Wealth Change	-0.8	2720.3	186.2	378.6	-4395.3	2482.6	195.5	532.8
Income Change	-2.2	4.0	0.8	0.7	-4.9	2.6	-0.1	0.7
Population	34.0	44757.0	3600.7	5875.2	63.0	49184.0	4604.7	7430.9
Wealth	10.4	20765.3	1308.0	2618.9	20.9	47968.2	3147.2	6299.7
Income	16.8	80.5	32.4	8.3	19.3	105.0	40.4	11.2
Income rank	4.0	273.0	129.4	75.3	4.0	276.0	132.5	77.5
Wealth rank	1.0	267.0	124.9	77.0	1.0	265.0	122.6	75.5
Pop_65plus	6.0	4296.0	543.9	817.3	9.0	5206.0	629.4	964.2
Pop_Hispanic	0.0	4226.0	182.3	402.4	0.0	10171.0	438.7	978.0
Pop_Nonwhite	0.0	5702.0	309.0	624.7	0.0	10548.0	610.9	1236.4
Education	0.0	73.0	17.2	11.0	2.5	62.0	16.0	10.2
Median rooms	4.1	8.2	5.2	0.5	4.2	9.1	5.3	0.5
Unemployment Rate	0.0	30.9	8.2	4.3	0.0	15.3	3.9	2.3
Manag_Prof_Jobs	0.0	49.9	20.0	7.5	9.1	57.3	25.7	8.6
Heating Degree Days	4078.0	9022.0	5314.6	909.0	4078.0	9022.0	5311.0	908.5
Distance to Portland	0.0	292.2	109.8	82.4	0.0	292.2	109.3	82.5
Commuting Time	4.2	35.6	17.8	5.0	6.7	44.2	21.7	6.0
Distance to National Park	0.9	179.4	49.7	29.8	0.9	179.4	49.6	29.9
Mill_closure_90s	0.0	7.0	0.5	1.0	0.0	7.0	0.5	1.0
NWFP-adjacent community	0.0	1.0	0.6	0.5	0.0	1.0	0.6	0.5
Farming, Fishing and Forestry Jobs	0.0	33.3	7.1	5.8	0.0	22.7	3.4	3.5
No. Observations	224				225			



# Simultaneous Equations Model

$$\Delta POP_{j,t} = \Delta Asset_{j,t} + \Delta Income_{j,t} + \text{natural growth (population size, \% elderly, \% Hispanic, education)}$$

+ household migration (climate and location, unemployment rate)

+ policy (NWFP-adjacency, Mill closures, NWFP dependency \* Logging dependence)

$$\Delta Asset_{j,t} = \Delta POP_{j,t} + \Delta Income_{j,t} + \text{assets}$$

+ residential real assets (housing characteristics, climate and location, commuting time)

+ policy (NWFP-adjacency, Mill closures, NWFP dependency \* Logging dependence)

$$\Delta Income_{j,t} = \Delta POP_{j,t} + \Delta Asset_{j,t} + \text{demographics (\%nonwhite, education)}$$

+ economic (income, \% managerial/professional jobs, unemployment) + climate and location

+ policy (NWFP-adjacency, Mill closures, NWFP dependency \* Logging dependence)

# Factors affecting community growth

- Population growth
  - Communities with smaller populations, higher shares of Hispanics and greater property value growth had faster population growth
- Growth in Real Property Values
  - Property values grew faster in communities with faster population growth, more wealth, larger homes and warmer climates
- Growth in Median Household Income
  - Incomes grew faster in communities with lower incomes, lower unemployment and more amenities (warmer climate and better locations)

# Regression results: Population change

		1990-2000			2000-2010		
		Regression Coefficient	Standard Error		Regression Coefficient	Standard Error	
Population change	Intercept	-157.74	218.05		-43.50	107.75	
	Wealth change	0.99	0.18	***	-0.02	0.06	
	Income change	91.38	64.86		40.95	44.39	
	Population	-0.032	0.011	***	0.015	0.007	**
	Income rank	0.28	0.23		0.30	0.13	**
	Wealth rank	0.182	0.155		0.139	0.146	
	Pop_65plus	0.043	0.080		-0.031	0.074	
	Pop_Hispanic	0.08	0.03	**	0.03	0.02	*
	Education	-0.74	1.92		-0.44	1.11	
	Unemployment Rate	3.955	2.694		-2.413	2.295	
	Heating Degree Days	0.001	0.018		0.005	0.013	
	Distance to Portland	0.27	0.21		-0.01	0.20	
	Distance to National Park	4.68	27.17		-32.63	21.50	
	Mill_Closure_90s	14.60	8.94		7.91	12.17	
	NWFP-adjacent community	-30.35	23.57		33.59	44.20	
	NWFP-adjacent*logging dependent community	60.42	54.88		-136.81	133.77	
	R-square	0.67			0.29		
Adjusted R-square	0.65			0.23			
Instrument Irrelevance Stat	40.791			9.591			
Overidentification (p-value)	7.28	(1.00)		0.70	(1.00)		

# Regression Results: Wealth Change

		1990-2000			2000-2010			
		Regression Coefficient	Standard Error		Regression Coefficient	Standard Error		
Change in Real Property Value	Intercept	-214.94	83.57	**	-4.90	296.86		
	Population change	0.60	0.08	***	1.10	0.35	***	
	Income change	-2.53	15.47		56.38	96.65		
	Wealth	0.11	0.01	***	0.02	0.01		
	Median rooms	22.11	11.69	*	-27.83	35.55		
	Commuting time	0.18	1.50		-4.80	2.88	*	
	Heating Degree Days	0.02	0.01	***	0.06	0.02	**	
	Distance to Portland	-0.06	0.06		-0.31	0.41		
	Distance to National Park	12.30	10.61		-35.41	33.76		
	Mill Closure_90s	-16.97	6.18	***	-12.70	24.60		
	NWFP-adjacent community	34.42	12.08	***	159.42	50.01	***	
	NWFP-adjacent*logging dependent community	-10.29	15.69		158.38	383.62		
	R-square	0.92			0.18			
	Adjusted R-square	0.92			0.14			
	Instrument Irrelevance Stat	62.251			41.581			
Overidentification (p-value)	2.26	(0.99)		0.08	(1.00)			

# Regression Results: Income change

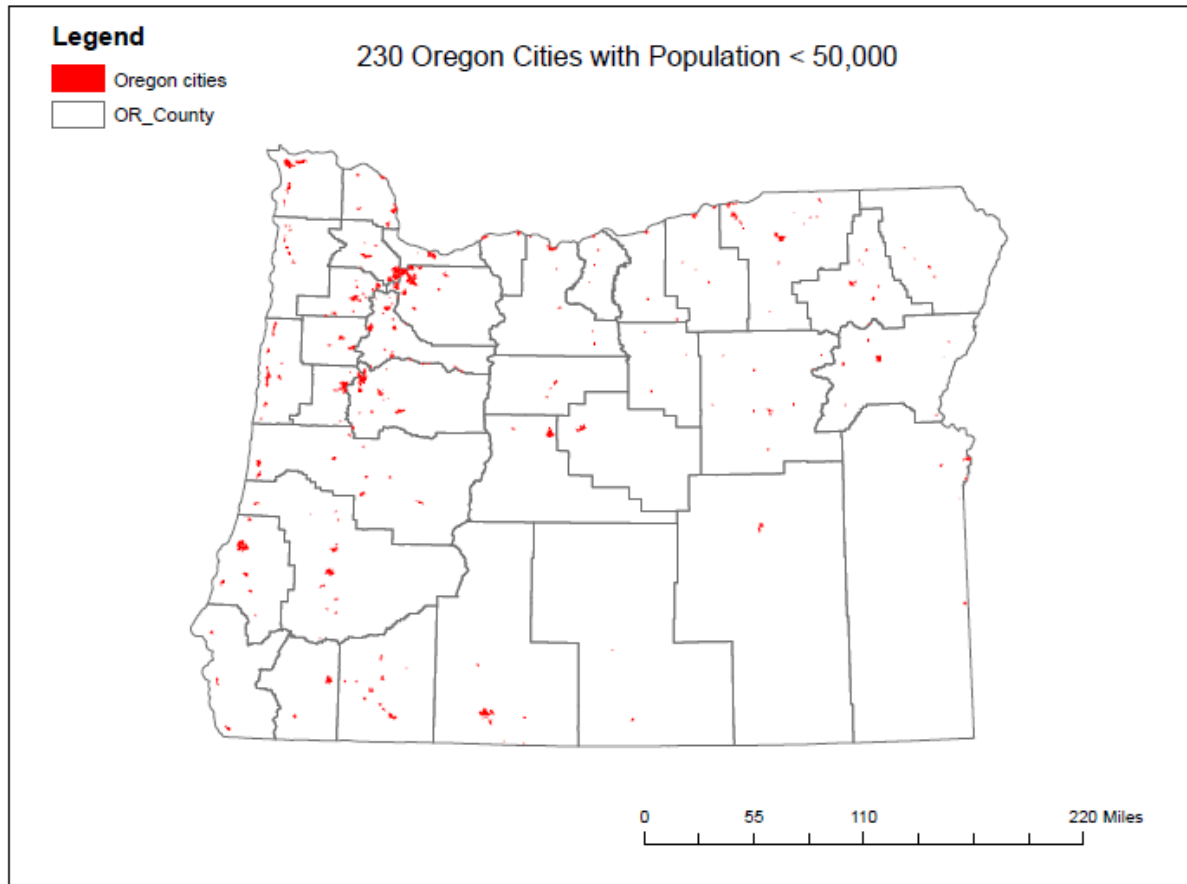
	1990-2000			2000-2010		
	Regression Coefficient	Standard Error		Regression Coefficient	Standard Error	
Intercept	4.56	0.97	***	0.40	0.50	
Population change	0.00	0.00		0.00	0.00	
Wealth change	0.00	0.00		0.00	0.00	
Income	-0.04	0.01	***	-0.01	0.01	**
Pop_Non-white	0.00	0.00		0.00	0.00	
Education	0.02	0.03		0.00	0.01	
Manag_Prof_Jobs	-0.05	0.04		0.01	0.01	
Unemployment Rate	-0.04	0.01	***	0.00	0.02	
Heating Degree Days	0.00	0.00	*	0.00	0.00	
Distance to Portland	-0.0022	0.0007	***	0.0010	0.0006	
Distance to National Park	-0.4067	0.1659	**	0.0788	0.1036	
Mill_Closure_90s	-0.01	0.04		-0.02	0.03	
NWFP-adjacent community	0.04	0.18		0.02	0.12	
NWFP-adjacent*logging dependent community	-0.77	0.30	**	-0.32	1.06	
R-square	0.08			0.12		
Adjusted R-square	0.02			0.07		
Instrument Irrelevance Stat	39.876			38.817		
Overidentification (p-value)	5.24	(0.81)		5.38	(0.80)	

Change in Median Household Income

# Data Sources

- City population: Census, ACS
- Real property value: OR Dept. Revenue
- Community characteristics: Census, ACS
- Climate: Western Regional Climate Center
- Urban amenities: Oregon Geospatial Enterprise Office
- NWFP: NWFP Regional Ecosystem Office

# Study Area



- Timber dependence: In 1987 (1996) the lumber and paper sectors provided 38% (26%) of Oregon's manufacturing employment