

# **Regional Economic Resilience After the Great Recession: The economic performance of U.S. Metropolitan Statistical Areas**

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# Observations

- The Great Recession provides an opportunity to test hypotheses about economic resilience
- Builds on the pre-Great Recession econometric work in *Coping with Adversity*



# Motivating Questions

- Did regions where industries associated with the causes of the Great Recession [finance, automotive assembly, and home building] rebound more slowly than did other regions?
- Is the dominance of a small group of industries in a region's economic base a warning sign that a regional economy is vulnerable to a severe economic shock?
- Does pre-shock regional economic structure affect the resilience of regional economies?

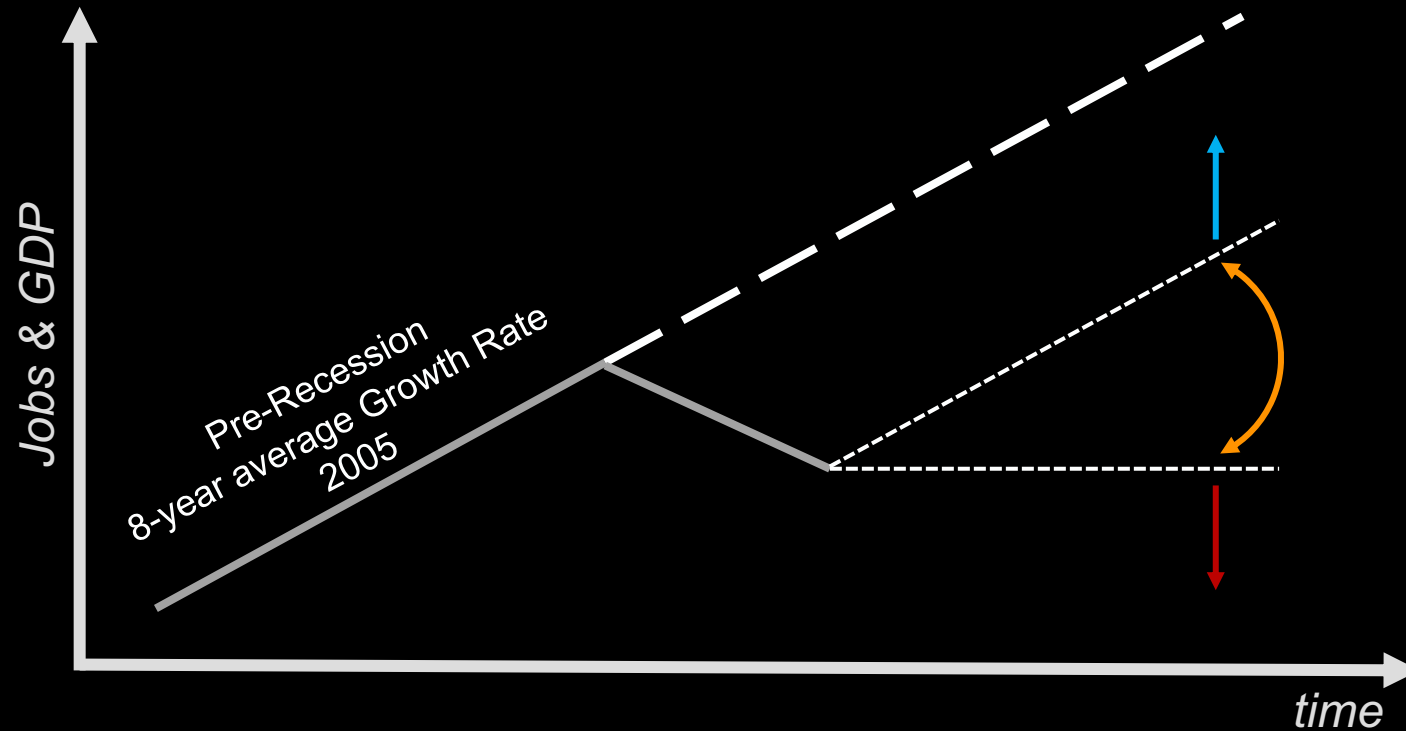


# About the Paper

- Event study of the impact of the Great Recession on all U.S. metropolitan areas
- Examines relationships between **pre-recession regional characteristics** and **post-recession economic outcomes**.
- Method: Ordered logistic regression
- Dependent variables: Annual post-recession growth “states” from 2011 to 2015 & summative assessment of the end-state for GMP & Jobs
- Dependent variables derived from the annual one-year growth rates in GMP & Jobs, relative to the pre-recession 8-year growth rates from 1997 to 2005 [see next slide]



# Three Ordered Post-Event Performance States



## 1 Year Growth Rate, 2011-2015

<b>Recovered</b>	<b>Positive, reaches or exceeds pre-recession levels</b>	<b>3</b>
<b>Slower Growth</b>	<b>Positive and below pre-recession growth rate</b>	<b>2</b>
<b>Structural Decline</b>	<b>Negative</b>	<b>1</b>



# Summative Performance of GMP and Jobs

- Judgement reflecting the end-state of the regional economy after the 5-year recovery period
- Generated by a series of rules that incorporate the 1s, 2s, and 3s, of each year over the 5-year recovery period
  - MECE [Mutually Exclusive and Collectively Exhaustive]
  - Used Boolean Logic
  - Detailed methodological note will be an appendix in the paper
- Purpose was to remove some of the statistical noise from annual fluctuations and to prevent the last year's growth rate from dominating the analysis



# Part 1

## Macroeconomic Performance: Index of change in Gross Product and Jobs

- Indexes of change in GDP and Jobs
- Index of change in three industries
  - Auto related
  - Home construction
  - Financial services



# GDP and Jobs Relative to the Eve of the Great Recession

Gross Domestic Product

Jobs

Index: November 2007 = 100



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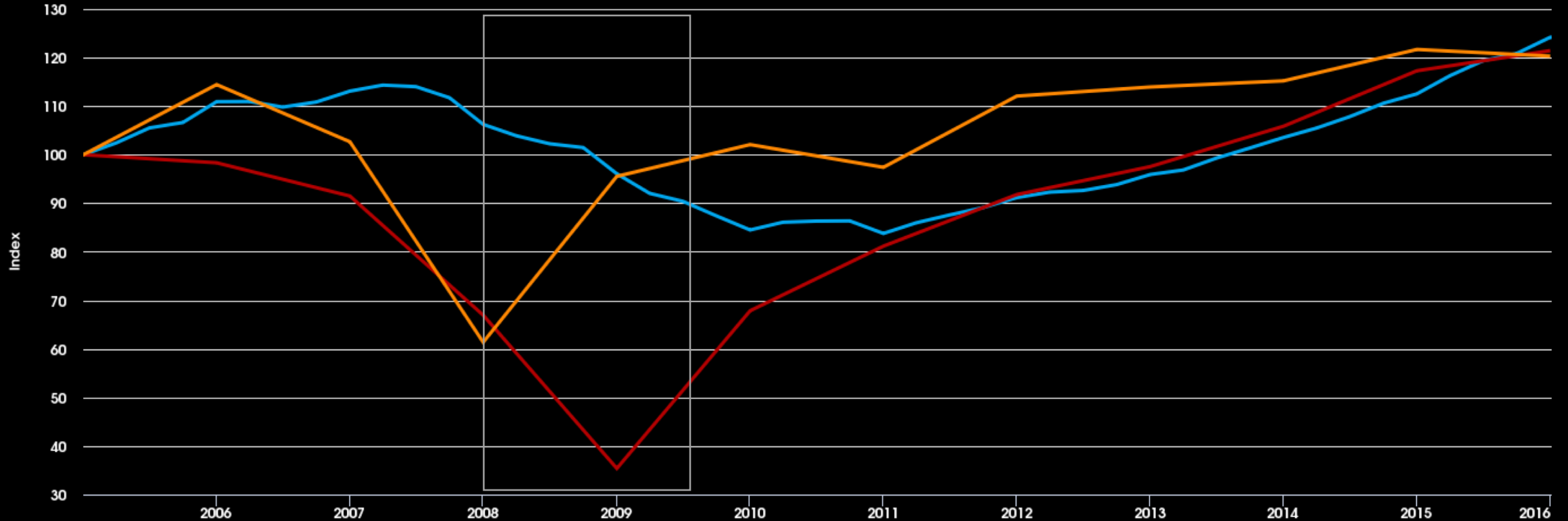
Source: FRED, St. Louis Federal Reserve Bank



# U.S. GDP in Three Industries

Index: January 2005 = 100

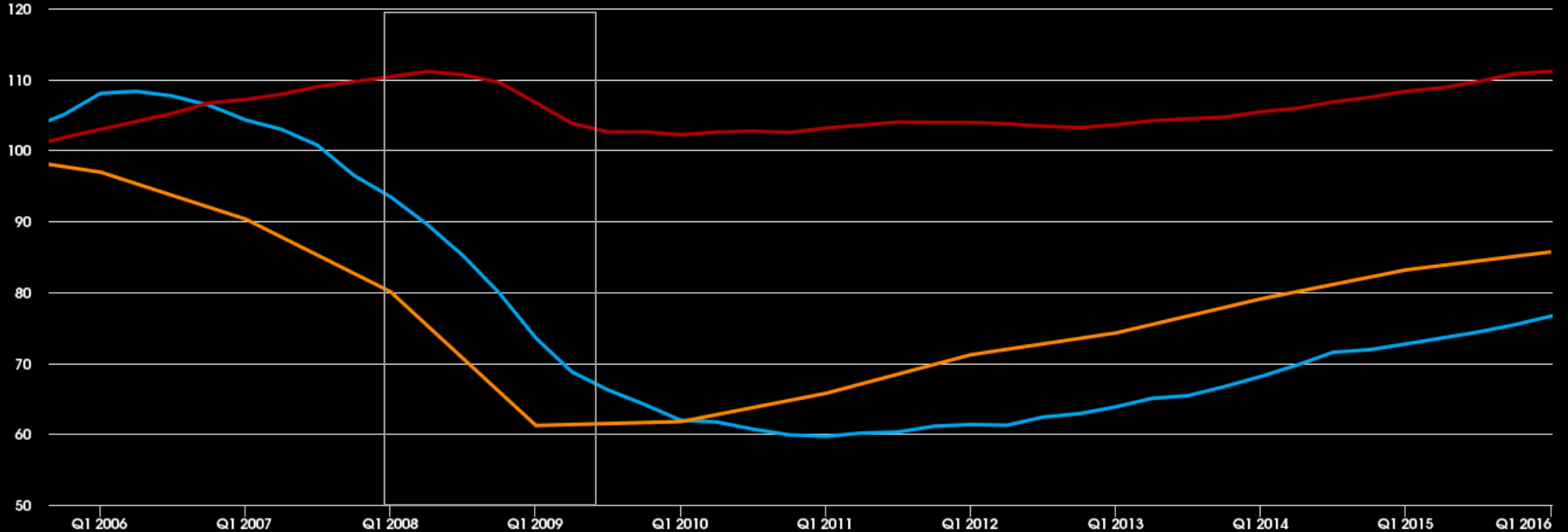
Home Construction  
Auto Manufacturing  
Finance



# U.S. Jobs in Three Industries

Home Construction  
Auto Manufacturing  
Finance

Index: January 2005 = 100



Sources: BEA, BLS

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Retrieved from FRED, St. Louis Federal Reserve Bank

Year	Number of MSAs					
	Employment Shock			GMP Shock		
	U.S.	MSA	Percent	U.S.	MSA	Percent
2005	No	8	2.3%	No	71	20.1%
2006	No	7	2.0%	No	78	22.0%
2007	No	28	7.9%	No	116	32.8%
2008	No	72	20.3%	Yes	244	68.9%
2009	Yes	317	89.5%	Yes	177	50.0%
2010	No	46	13.0%	No	68	19.2%
2011	No	4	1.1%	No	138	39.0%
2012	No	5	1.4%	No	50	14.1%
2013	No	7	2.0%	No	38	10.7%
2014	No	1	0.3%	No	15	4.2%



## Part 2

# Ordered Logistic Regression Analysis: The Resilience of GMP and Jobs in U.S. Regional Economies



# Hypotheses

- H<sub>1</sub>: Regions with higher reliance on the *auto*, *home construction*, and/or *financial* industries had lower probabilities of recovering from the disruptions caused by the Great Recession.
- H<sub>2</sub>: Recovery in GMP and Jobs have different economic structures
- H<sub>3</sub>: A diversified economic base is associated with economic resilience



# Data

- Regional economies are operationalized as MSAs,  $n = 354$
- Outcome variables (GMP, EMP) from Moody's Analytics Economy.com
- Industry-specific job variables are from Upjohn Institute's County Business Pattern, "Isserman" database
- The LQs used to identify the economic base have thresholds of 1.8
- Control variables from the Census/ACS, IPUMS NHGIS, NOAA, BEA, FAA, FDIC, IPEDS



# Model

$$GMP_{i,t} = \beta_0 + \beta_1 R_{i,2005} + \beta_2 P_{i,2005} + \beta_3 C_i + \varepsilon$$

$$Jobs_{i,t} = \beta_0 + \beta_1 R_{i,2005} + \beta_2 P_{i,2005} + \beta_3 C_i + \varepsilon$$

R: Vector of LQs in the auto assembly & parts, home construction, and financial services industries

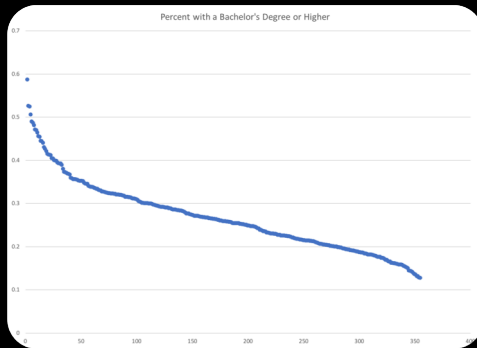
P: Region's economic base (either a ratio of base jobs to total jobs — *economic base dominance*, **OR** *four-industry concentration ratio*— employment in the base's top 4 industries divided by total employment)

C: Geographic, demographic, institutional, and economic characteristics controlled for in the model

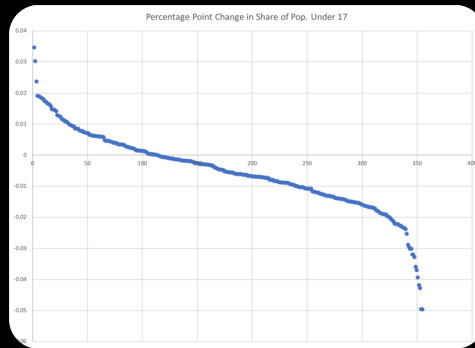


# Three Specification Challenges

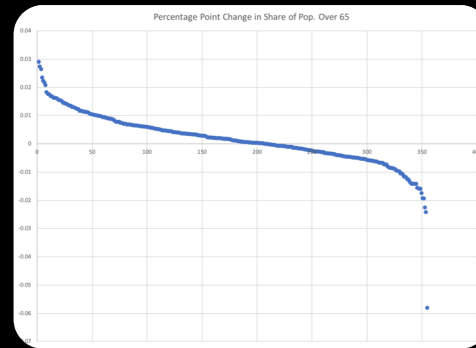
- Operationalizing **agglomeration**: population as a proxy or economic variables?
- Collinearity with **Census Divisions**: structure or dummies
- The challenge of ordered logit with **continuous demographic variables with thin tails**; we changed to categorical (dummy) variables



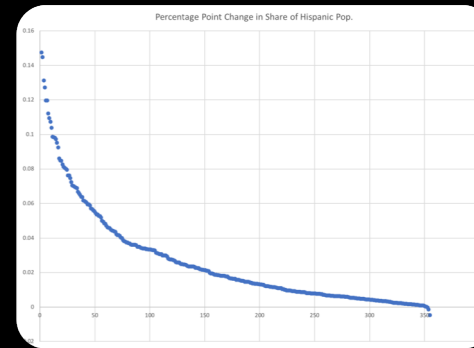
Bachelor's or Higher



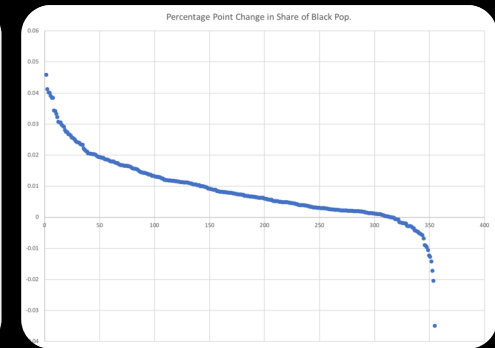
> 18 Population



≤ 65 Population



Hispanic Population



Black Population

Percentage Point Change in the Share of...





# Selecting from the models

## Measures of the Performance of the Ordered Logit Regression Models

Dependent Variable Recovery of:			Pseudo R <sup>2</sup>					
Gross Metropolitan Product	Census Region included?	Industry Concentration Variable	Summative	2011	2012	2013	2014	2015
Jobs	No Census Regions	Four Industry CR	0.29	0.13	0.19	0.22	0.26	0.27
	<b>No Census Regions</b>	<b>Economic Base Dominance</b>	<b>0.29</b>	<b>0.13</b>	<b>0.19</b>	<b>0.22</b>	<b>0.26</b>	<b>0.28</b>
	9 Census Regions	Four Industry CR	0.32	0.19	0.25	0.28	0.29	0.34
	9 Census Regions	Economic Base Dominance	0.32	0.18	0.25	0.28	0.29	0.34
	<b>No Census Regions</b>	<b>Four Industry CR</b>	<b>0.29</b>	<b>0.29</b>	<b>0.23</b>	<b>0.24</b>	<b>0.24</b>	<b>0.31</b>
	No Census Regions	Economic Base Dominance	0.29	0.27	0.22	0.24	0.24	0.31
	9 Census Regions	Four Industry CR	0.34	0.31	0.27	0.28	0.27	0.38
	9 Census Regions	Economic Base Dominance	0.34	0.30	0.26	0.27	0.27	0.38
Dependent Variable Recovery of:			Likelihood Ratio Chi-Square Test					
Gross Metropolitan Product	Census Region included?	Industry Concentration Variable	Summative	2011	2012	2013	2014	2015
Jobs	No Census Regions	Four Industry CR	101***	43**	65***	76***	91***	90***
	<b>No Census Regions</b>	<b>Economic Base Dominance</b>	<b>102***</b>	<b>42**</b>	<b>65***</b>	<b>76***</b>	<b>91***</b>	<b>92***</b>
	9 Census Regions	Four Industry CR	98***	103***	77***	83***	81***	105***
	9 Census Regions	Economic Base Dominance	98***	98***	75***	82***	78***	106***
	<b>No Census Regions</b>	<b>Four Industry CR</b>	<b>114***</b>	<b>63***</b>	<b>90***</b>	<b>102***</b>	<b>104***</b>	<b>118***</b>
	No Census Regions	Economic Base Dominance	117***	62***	90***	102***	104***	122***
	9 Census Regions	Four Industry CR	116***	115***	92***	98***	92***	134***
	9 Census Regions	Economic Base Dominance	117***	108***	90***	95***	90***	134***

Notes: \*p<0.1, \*\*p<0.05, \*\*\*p<0.01. Degrees of freedom in equations omitting Census Region variables is 26; degrees of freedom in equations including Census Regions is 34.



# Results: Causal Hypotheses GMP & Jobs

*\*All coefficients are log-odds ratios*

	2011 GMP	2012 GMP	2013 GMP	2014 GMP	2015 GMP	GMP Summative
Auto Sector LQ	<b>1.10**</b>	1.10	<b>1.30***</b>	<b>1.20***</b>	<b>1.20**</b>	<b>1.30***</b>
Home Construction LQ	0.75	0.74	1.30	<b>2.30**</b>	0.92	<b>2.00*</b>
Home Construction Emp. Growth	<b>0.23**</b>	<b>0.17***</b>	0.41	<b>0.09***</b>	<b>4.00*</b>	0.76
Bank HQs	1.00	<b>1.00**</b>	0.99	1.00	0.99	0.99
Base Dominance (Share of exports in economy)	0.15	1.30	0.46	0.18	<b>0.01***</b>	<b>0.02***</b>

	2011 EMP	2012 EMP	2013 EMP	2014 EMP	2015 EMP	EMP Summative
Auto Sector LQ	<b>1.40***</b>	<b>1.40***</b>	<b>1.20***</b>	<b>1.10*</b>	<b>1.20**</b>	<b>1.10**</b>
Home Construction LQ	0.57	0.81	1.30	1.50	1.90	1.50
Home Construction Emp. Growth	0.82	0.42	0.49	<b>0.16**</b>	0.67	0.37
Bank HQs	1.00	1.00	1.00	1.00	1.00	1.00
Four Industry Concentration Ratio	<b>0.02**</b>	<b>0.03**</b>	<b>0.002***</b>	<b>0.002***</b>	<b>0.04*</b>	<b>0.003***</b>



# Results (policy & place) GMP & Jobs

*\*All coefficients are log-odds ratios*

	2011 GMP	2012 GMP	2013 GMP	2014 GMP	2015 GMP	GMP Summative
State Capital	0.94	0.94	0.97	0.87	0.57	1.00
Right to Work	1.10	1.20	0.81	0.99	0.81	1.00
Enplanement Tier 1	0.09	0.71	7.5	2.20	521	566
Enplanement Tier 2	1.70	4.80	<b>11.00**</b>	<b>6.50*</b>	46,109	<b>22.00*</b>
Enplanement Tier 3	1.90	0.82	<b>3.40*</b>	1.10	0.99	1.70
Research Universities	0.91	0.87	1.10	1.10	<b>2.00***</b>	<b>2.00***</b>
Low Pct. of Pop. with Bachelor's or Higher	1.40	1.40	<b>3.90*</b>	1.30	0.35	0.70
High Pct. of Pop. with Bachelor's or Higher	1.10	1.00	1.20	1.00	1.90	1.10
MSA Age	0.97	1.00	<b>1.10*</b>	<b>1.10**</b>	1.00	<b>1.10**</b>

	2011 EMP	2012 EMP	2013 EMP	2014 EMP	2015 EMP	EMP Summative
State Capital	0.58	0.76	1.40	0.93	1.30	1.30
Right to Work	<b>1.80**</b>	1.20	<b>1.80**</b>	<b>1.80**</b>	<b>2.80***</b>	<b>2.80***</b>
Enplanement Tier 1	0.13	0.16	95.00	24.00	34.00	11.00
Enplanement Tier 2	3.00	2.30	2.60	0.19	0.09	0.15
Enplanement Tier 3	1.20	0.75	0.48	0.60	0.21	<b>0.14*</b>
Research Universities	0.91	0.94	1.00	<b>1.50*</b>	1.30	1.30
RPCI Pct. Growth	1.30	1.90	1.20	0.08	<b>0.002***</b>	0.17
Low Pct. of Pop. with Bachelor's or Higher	0.51	1.50	1.00	<b>4.00*</b>	0.83	2.10
High Pct. of Pop. with Bachelor's or Higher	1.40	1.30	<b>2.40**</b>	1.20	<b>2.60**</b>	2.00
MSA Age	<b>1.10**</b>	<b>1.10*</b>	1.00	1.00	<b>1.10**</b>	<b>1.10**</b>



# Results (demographics: race/ethnicity)

*\*All coefficients are log-odds ratios*

	2011 GMP	2012 GMP	2013 GMP	2014 GMP	2015 GMP	GMP Summative
10 Pct. Growth in Share of Hispanic Pop.	2.60	0.82	1.00	2.80	0.87	1.70
5 Pct. Growth in Share of Hispanic Pop.	1.30	1.10	<b>2.50***</b>	<b>2.40**</b>	0.98	1.90
High Decline in Share of Black Pop.	1.80	0.74	1.90	1.80	0.45	0.90
High Growth in Share of Black Pop.	<b>0.47**</b>	<b>0.22***</b>	<b>0.34***</b>	<b>0.28***</b>	0.73	<b>0.42**</b>

	2011 EMP	2012 EMP	2013 EMP	2014 EMP	2015 EMP	EMP Summative
10 Pct. Growth in Share of Hispanic Pop.	2.30	1.40	<b>4.70*</b>	1.70	1.20	<b>9.30*</b>
5 Pct. Growth in Share of Hispanic Pop.	0.84	1.50	1.90	<b>2.80**</b>	<b>2.20*</b>	<b>3.20**</b>
High Decline in Share of Black Pop.	0.39	1.40	0.84	<b>4.90*</b>	<b>11.00*</b>	7.80
High Growth in Share of Black Pop.	<b>0.34***</b>	<b>0.30***</b>	<b>0.39***</b>	<b>0.41**</b>	0.66	<b>0.40**</b>



# Results (demographics: age)

*\*All coefficients are log-odds ratios*

	2011 GMP	2012 GMP	2013 GMP	2014 GMP	2015 GMP	GMP Summative
High Decline in Share of Pop. Under 17	<b>2.90**</b>	1.30	1.50	1.20	1.40	1.30
High Growth in Share of Pop. Under 17	1.10	0.48	<b>0.12***</b>	<b>0.12***</b>	1.10	<b>0.20***</b>
High Decline in Share of Pop. Over 65	0.71	0.95	2.00	1.50	1.70	1.80
High Growth in Share of Pop. Over 65	1.80	0.79	1.80	0.85	1.60	3.00

	2011 EMP	2012 EMP	2013 EMP	2014 EMP	2015 EMP	EMP Summative
High Decline in Share of Pop. Under 17	<b>2.90*</b>	1.90	1.60	1.70	0.67	1.10
High Growth in Share of Pop. Under 17	1.20	1.50	0.47	0.38	<b>0.20**</b>	<b>0.30*</b>
High Decline in Share of Pop. Over 65	0.62	1.50	<b>4.70*</b>	<b>12.00**</b>	<b>13.00**</b>	<b>7.50*</b>
High Growth in Share of Pop. Over 65	1.50	0.79	0.80	0.35	0.31	0.33



# Recap

H<sub>1</sub>: Largely rejected

1. Automobile: Rejected
2. Home construction: Mixed
3. Finance: Rejected

H<sub>2</sub>: Strong support for different responses to the Great Recession shocks in terms of GMP and job recovery

H<sub>3</sub>: Diversity in a region's economic base is associated with economic resilience



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