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# Explaining Differences in Unemployment Rates across Iowa Counties in the Early Stages of the Great Recession

Joslyn Sailer

**ABSTRACT.** Iowa fared better than most other states in the recent recession. Yet within Iowa, there was considerable variation in how each county performed. I use a regression model to investigate the reasons for the differences. Counties that did better than average tended to have larger farm, retail trade, and real estate sectors; they also had larger percentages of both 15 to 19 year olds and Social Security recipients. Counties that fared worse than average typically relied more heavily on government employment.

## **I. Introduction**

The Great Recession was the most severe U.S. economic crisis since the Great Depression. Even though the recession officially ended in Iowa in December 2009 (O'Connor 2011), aftershocks from this devastating period continue to affect individuals and families. High unemployment, low housing prices, and low consumer confidence persist.

The Great Recession began in the housing sector. A housing boom began in the early 2000's. Between 2000 and 2006, there was significant growth in construction of new housing. The construction was in response to rising house prices during this six-year period. In 2006, interest rates began to climb and the housing market experienced a slowdown. In 2008, a credit crunch as well as increased foreclosures and delinquencies triggered the housing crisis. As the demand for housing fell, employment in the construction industry fell. This created a "domino" effect. The decrease in employment and construction lead to a decrease in demand for durable goods causing a decline in manufacturing employment, and so on.

States that experienced greater housing booms prior to the recession were more affected by the housing crash and so had larger increases in their unemployment rates. Iowa was hit later and not as badly as most other states. Iowa had little exposure to the housing bubble and did not export much energy or have a large high-tech industry (O'Connor 2011). In 2010, Iowa's annual unemployment rate was the fifth lowest in the nation (O'Connor 2011).

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While Iowa may have seen a smaller percentage change in its unemployment rate than other states, the percentage change in unemployment rates among the Iowa counties varied noticeably. Winnebago County had an 83.3 percent increase (3.6% to 6.6%) in its unemployment rate between 2006 and 2008, while Cherokee County had an 11.90 percent decrease (4.2% to 3.7%). According to the Winnebago County website,

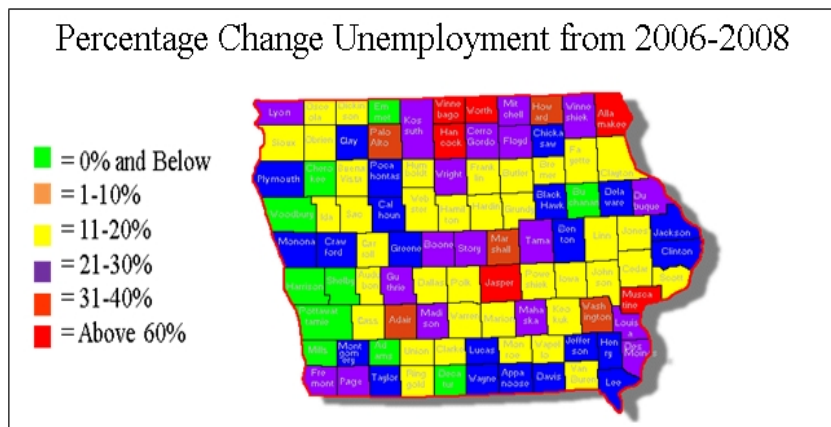
We have a wide variety of businesses and communities spread throughout our county including agricultural businesses, financial institutions...as well as world class manufacturing companies. Some of those world class manufacturing companies include Winnebago Industries, Larson Manufacturing Co., Rembrandt Foods... (Winnebago County 2012)

Winnebago County is heavily dependent on manufacturing, particularly luxury RVs and construction goods. Cherokee County, on the other hand,

...sits in the midst of the richest farmland in North America. A highly productive agriculture sector is the foundation of our diversified economy. Cherokee County not only is a leader in the production of crops and livestock, it's home to ethanol and biodiesel plants, the second largest producer of wind energy in the U.S., a variety of construction companies and a large number of manufacturers producing everything from truck bodies to solid waste recycling equipment, sports apparel, and meat products. (Cherokee County 2006)

Cherokee County focuses on agriculture, wind energy production, and manufacturing. The type of manufacturing, however, is different than in Winnebago county.

The following map shows differences in the percentage change in the unemployment rate between June 2006 and June 2008. The main objective of this paper is to explain differences in the percentage change in unemployment across Iowa counties between June 2006 and June 2008.



A regression analysis will be used to explain the variation in the percentage change in county unemployment rates between 2006 and 2008; that is the dependent variable. Independent variables for the Iowa counties are based on conditions in 2006, which was prior to the recession. A variety of regression models were tested. The final regression model is:

$$\mu = \beta_0 + \beta_1 \text{ Ages 15-19} + \beta_2 \% \text{ Real Estate Em.} + \beta_3 \% \text{ Government Em.} + \beta_4 \% \text{ Mort. Debt Bal.} + \beta_5 \% \text{ Auto Debt Bal.} + \beta_6 \% \text{ Farm Em.} + \beta_7 \% \text{ Soc. Sec. Recipients} + \beta_8 \% \text{ Retail Trade Em.} + \beta_9 \% \Delta \text{ Bankruptcies 00 - 06} + \beta_{10} \% \text{ Manufacturing Em.}$$

Alternative regression models are reported below.

## II. Variables from All Regressions and Their Expected Signs

### A. INDUSTRY

Nationally, manufacturing and construction accounted for half of the jobs lost during the recession (Boushey 2011). Iowa is less dependent on construction employment compared to other states (O'Connor 2011). Decreases in manufacturing employment, on the other hand, appear to have affected some counties. "Unemployment rates are higher in counties

with small, struggling manufacturing centers (Ottumwa, Charles City, Newton, Oelwein, Shenendoah) and in the state's eastern reaches" (Gordon 2009). It is expected that counties with more manufacturing employment would have larger increases in unemployment during the recession. Therefore "% Manufacturing Em." is expected to have a positive coefficient.

When the housing bubble burst, housing demand fell and real estate transactions declined. Since the start of 2008, the finance and real estate sectors together lost over a half million jobs (Isidore 2010). It is likely that counties with larger real estate sectors may have had larger increases in unemployment. Real estate employment (% Real Estate Em.) is expected to have a positive coefficient.

Counties with higher percentages of state and local government employment may have had larger increases in their unemployment rates. During the recession, state and local revenues fell. As revenues fell, the government had to lay off employees and cut payroll for remaining employees. "State governments have cut 120,000 jobs since their peak in August 2008, while local governments have cut 527,000. Overall, state payrolls have declined 2.3 percent and local by 3.6 percent" (Gordon 2011). It is expected that state and local government employment (% St/Loc Gov. Em.) will have a positive coefficient.

A large share of Iowa's population is employed in the agriculture sector. The state's successful farming industry may have protected people from the recession because food expenditures are less likely to fall. It is likely farmers remained employed during the economic downturn.

Agriculture wasn't spared from the economic recession, but it fared better than most other industries. In fact, economists say several successful years of raising crops helped financially insulate the state...According to the government statistics, the nation's farmers made a record \$87 billion in 2008 (Wilde 2010).

During recessions, the demand for food does not fall as much as spending on durables. The farming variable (% Farm Em.) is likely to have a negative coefficient.

The retail trade sector in Iowa suffered during the 2000-2001 recession.

Another industry that has experienced a significant downturn

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since August 2000 is retail trade, which has lost 10,600 jobs over the past seven years. Most of this decline - about 9,300 - was due to the effects of the recession and the resultant decrease in consumer spending levels. (Workforce Data and Business Development Bureau 2008)

Although this analysis refers to the recession of 2000, the effect may have also occurred during the Great Recession, especially since the financial crisis worsened consumer finances and the ability to borrow. It is expected that counties with a higher share of employment in the retail trade sector had larger increases in their unemployment rate. The retail trade (% Retail Trade Em.) coefficient is expected to have a positive coefficient.

#### B. BANKING

Counties with higher percentages of mortgage and/or auto debt balance 90+ days delinquent are likely to have had larger increases in their unemployment rates. During the housing boom, interest rates were low and people borrowed a lot relative to their income. The percentages of delinquent loans are an indication of the extent to which consumers borrowed beyond their ability to pay. In a study of the consequence of rising household debt on unemployment in U.S. counties, Mian and Sufi (2010) found that counties that experienced the largest increase in household debt before the recession saw larger subsequent increases in unemployment and larger decreases in residential investment and durable consumption. Counties where debt ratios rates rose more may have had more troubled banks, and therefore lending may have been reduced in these areas. People had less ability to borrow and a large portion of their income was spent on debt payments. In turn, they were less able to consume. It is expected that the percent of mortgage debt balance 90+ days delinquent (% Mort Debt Bal.) and the percent of auto debt balance 90+ days delinquent (% Auto Debt Bal.) will both have positive coefficients.

Counties with greater increases in bankruptcies from 2000-2006 may have had greater increases in their unemployment rates. Weller and Gino claim that

the combination of modest income growth and rising costs has

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already taken a toll on America's middle class. By 2003, the personal bankruptcy rates reached a record high... Recently, personal bankruptcies have become more closely associated with job loss than in the past... The situation since 2003 suggests that further increases in personal bankruptcies are possible as prices have risen further amid a continuously weak labor market. (Weller 2005)

Families may have overspent during this period due to low interest rates. In turn, they may have had trouble meeting financial obligations. It is expected that the percentage change in bankruptcy filings from 2000-2006 (%  $\Delta$  Bankruptcies 00-06) will have a positive coefficient.

### C. DEMOGRAPHICS

Counties with a higher percent of young adults may have had a larger increase in their unemployment rate (Gordon 2009).

With respect to workers' age, the age group with the highest unemployment and underemployment rates remains the youngest group of the 16- to 24-year-olds... The rate of those working part time for economic reasons in the youngest age group had doubled, indicating that when employers reduce hours, they are most likely to do so for the youngest, least experienced, and most likely lowest-paid workers (O'Connor 2011).

It is expected that counties with a larger percent of their population ages 15-19 or 20-24 would experience higher unemployment. Workers in young age groups are less experienced and less likely to remain employed. Variables for the 15-19 age group (% Ages 15-19) and/or the 20-24 age group (% Ages 20-24) are expected to have positive coefficients.

Counties with a higher percent of social security recipients in 2006 may have had lower increases in their unemployment rate. This is because the recession drove many people eligible for Social Security out of the labor force.

Nearly one in seven (13.5 percent) Americans reported starting to collect Social Security retirement benefits to make ends meet,

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and half as many (6.9 percent) started to collect pension benefits...Older persons who were out of the labor force, the majority of whom were retired, along with retirees returning to the workforce, were more likely than any other group to say they had started to collect Social Security retirement benefits... (Rix 2011).

It is likely that most recipients do not look for work, and therefore were not in the labor force. The percentage of social security recipients, relative to county population in 2006 (% Soc Sec. Rec./Pop), is likely to have a negative coefficient.

#### D. HOUSING

As stated previously, the housing crash is believed to be the primary cause of the Great Recession. "The combination of cheap credit and low lending standards resulted in the housing frenzy that laid the foundation for the crisis" (Brunnermeier 2009, 82). It is expected that states that had a high percentage change in housing units, and so had bigger building booms between 2000 and 2006, experienced larger rises in unemployment rates following the bust. While this may hold true for states, there may be little variation in the increase of housing units across Iowa.

According to the U.S. Census Population and Housing Estimates, Iowa added 97,066 housing units between 2000 and 2007, approximately an 8% increase statewide. Of the new units Iowa added during this time 81% were added in Iowa's metropolitan counties (Swenson 2010).

Metropolitan counties may have had the largest growth in the number housing units, but when the percentage change is considered, it is likely that small and large counties experienced similar percentages in housing growth. Calhoun County had a 0.25 percentage point decline in housing units from 2006-2008. Dallas County, on the other hand, had a 24.54 percentage point increase in housing units from 2006-2008. The majority of counties experienced a zero to seven percent change in housing units, indicating little variation. The percentage change in housing units from 2000-2006 (% $\Delta$  Housing Units 00-06) is likely to have a positive coefficient.



During the housing boom there was also rapid appreciation in housing prices. It is likely that counties with higher percentage increases in housing prices had larger increases in unemployment when the bubble burst. The rise in housing prices is measured as the percentage change in the ratio of county median housing price to county median income from 2000 to 2006. When this ratio rises, houses become more costly relative to one's income. Between 2000 and 2006, Sac County, Webster County, and Van Buren County had the highest percentage increase in housing costs. Data for median housing prices in 2000, however, were available for only 68 counties. The percentage change in housing costs from 2000-2006 ( $\% \Delta \text{ MedHP/MedIn } 00-06$ ) is likely to have a positive coefficient.

#### E. EDUCATION

Counties with higher shares of educated citizens and more educational opportunities may have seen smaller increases in their unemployment rates during the Great Recession. Those with advanced skills are more likely to be hired and remain employed and may find jobs faster if they lose their job.

Education lowers unemployment rates for two distinct reasons. First, educated workers invest more in on-the-job training. Because specific training "marries" firms and workers, firms are less likely to lay off educated workers when they face adverse economic conditions. In addition, when educated workers switch jobs, they typically make the switch without suffering an intervening spell of unemployment. It seems as if educated workers are better informed or have better networks for learning about alternative job opportunities. (Borjas 2010, 499-500).

It is likely that counties with a higher percentage of high school and college graduates will experience a smaller increase in the unemployment rate. High school dropouts have limited job opportunities as they have fewer skills. Education data is limited at the county level. The percentages used are from the 2000. The percent of population that had completed college in 2000 ( $\% \text{ Complete College } 00$ ) is expected to have a negative coefficient.

### **III. Data**

#### **A. HOUSING**

The ratio of the median house price to median income measures housing cost, or the ability of individual households to pay mortgage payments or monthly rent. When the measure is higher, it is more difficult to pay housing costs. I calculated a percentage change of the ratio of median housing price to median income for a six year period from 2000 to 2006. Median Housing prices were collected from the Iowa Association of Realtors. Housing prices are available for 68 counties. The average income for each county was found on the U.S. Census Bureau website.

#### **B. HOUSING UNITS**

Housing units indicate the total number of housing units in the county. I calculated a percentage change in housing units for a six year period from 2000 to 2006. Data for housing units was found on the U.S. Census Bureau website.

#### **C. BANKING**

Banking data is limited at the county level. The percent of mortgage debt balance 90+ days delinquent, percent of auto debt balance 90+ days delinquent, and credit card debit 90+ days delinquent, all for the year 2006, were found on the New York Fed website. According to the New York Fed, debt at least 90 days late is seriously delinquent. The percentage levels are available for 63 counties.

The number of bankruptcies per county was divided by the county population. The percentage of bankruptcies relative to population was calculated for 2000, 2006, and the percentage change from 2000 to 2006. Bankruptcy information was found on the Iowa Data Center website.

#### **D. INDUSTRY**

The industry variables give percentages of a county's labor force employed in the farm, construction, finance, real estate, manufacturing, information, government, and retail trade sectors for 2006. Employment for educational services was only available for 36 counties. The data

acquired for the industries was found on the Bureau of Economic Analysis website.

#### E. DEMOGRAPHICS

The demographic variables give percentages of the population for a county by age groups and ethnicities. The age groups are 15-19, 20-24, 65-74, and over 65 (all for 2006). Percentages of the population were calculated for blacks/African Americans, Hispanic/Latinos, and Asians. Also, the male and female population percentages were calculated. Demographic statistics were found on the U.S. Census Bureau website.

The number of social security recipients in 2006 was divided by the 2006 county population. This is the percentage of the county receiving benefits. The number of social security recipients by county was found on the U.S. Social Security Administration website. The percentages of social security recipients are multiplied by 10 because statistics reported on the Social Security Administration (SSA) website conflict with the Census Bureau website and other SSA reports. After the percentages are multiplied by 10, numbers are relatively consistent with other sources.

#### F. EDUCATION/ENROLLMENT

Education data are limited at the county level. Education attainment levels were only available for the year 2000. Data was found for the percent of county population that had completed college, completed high school only, and/or had less than a high school education. The percentages were found on the United States Department of Agriculture website.

Descriptive statistics for the final regression are shown in Table 1.0

TABLE 1.0–Descriptive Statistics

	Description	Mean (S.D.)
<b>Dependent Variable</b>		
URATE 0608	Percentage change unemployment rates 2006- 2008	17.09 (14.6)
<b>Independent Variables</b>		
% Ages 15-19 06	Percentage of county population ages 15-19	7.32 (0.93)
% Real Estate Em. 06	Percentage of total employed in real estate sector	2.61 (0.74)
% St/Loc Gov. Em. 06	Percentage of total employed in state & local government sector	12.28 (4.59)
% Mort Debt Bal. 90+	Percent of mortgage debt balance 90+ days delinquent	1.18 (0.87)
% Auto Debt Bal. 90+	Percent of auto debt balance 90+ days delinquent	1.59 (1.13)
% Farm Em. 06	Percentage of total employed in farm sector	9.89 (5.57)
% Soc Sec. Rec./Pop 06	(Percentage of social security recipients/2006 county population)*100	14.28 (5.36)
% Retail Trade Em. 06	Percentage of total employed in retail trade sector	11.02 (1.84)
% Δ Bankruptcies 00-06	Percentage change bankruptcy filings 2000-2006	-40.35 (20.75)
% Manufacturing Em. 06	Percentage of total employed in manufacturing sector	13.56 (6.97)

#### IV. Methodology and Results

The dependent variable is the percentage change in county unemployment rates between 2006 and 2008. The estimated model is a multivariate regression and uses Ordinary Least Squares (OLS). This statistical technique uses the observed data to estimate a relationship between the dependent variable and the independent variables. The regression uses robust standard error to correct for heteroskedasticity.

For some variables, data was not available for small counties. The values of the variables that were significant typically varied considerably across counties. A clear example of such variation is the percent of population employed by the state and local government in 2006. While Dubuque County had 6.26 percent of population employed in the

government sector, Story County had 32.70 percent of the population employed in the government sector. If data were not available for the county, the county was not included in the regression. The final regression has 61 counties and these 61 counties have data for all variables. Although smaller samples are less reliable, the availability of data forces this restriction.

Table 1.1 shows the OLS regression results. The variables included were also consistently significant in alternative regressions. As stated, the sample size is 61. The R-squared is 0.466 and the Adjusted R-Square is 0.359. R-squared is a statistical measure that gives the fraction of the dispersion in the dependent variable that is "explained" by the dispersion of the independent variable (Borjas 2010, 19).

TABLE 1.1—OLS (n = 61)

Missing or incomplete observations dropped: 38  
 Dependent variable: Percentage Change Unemployment Rates 2006-2008  
 Heteroskedasticity-robust standard errors, variant HC1

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
const	115.38	22.45	5.14	<0.00001	***
% Ages 15-19 06	-6.77	1.63	-4.15	0.00013	***
% Real Estate Em. 06	-6.47	1.89	-3.43	0.00122	***
% St/Loc Gov. Em. 06	0.85	0.27	3.11	0.00311	***
% Mort Debt Bal. 90+	-4.56	1.48	-3.08	0.00329	***
% Auto Debt Bal. 90+	-2.91	1.16	-2.49	0.01593	**
% Farm Em. 06	-0.71	0.31	-2.30	0.02546	**
% Soc Sec. Rec./Pop 06	-0.46	0.23	-2.02	0.04914	**
% Retail Trade Em. 06	-1.67	0.90	-1.85	0.06951	*
%Δ Bankruptcies 00-06	0.11	0.07	1.58	0.12126	
% Manufacturing Em. 06	0.33	0.24	1.36	0.17855	
Mean dependent var	16.92979	S.D. dependent var		11.21232	
Sum squared resid	4027.716	S.E. of regression		8.975206	
R-squared	0.466030	Adjusted R-squared		0.359236	
F (10,50)	4.644169	P-value (F)		0.000112	
Log-likelihood	-214.3527	Akaike criterion		450.7054	
Schwarz criterion	473.9251	Hannan-Quinn		459.8054	

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Table 1.2 presents calculations for the variance inflation factors. A variance inflation factor is an index that measures the increase in the variance of a coefficient due to multicollinearity. The multicollinearity test checks for correlation between the variables. All variables have inflation factors below 10. Therefore, the variables in the general regression model do not appear to be collinear.

TABLE 1.2–Variance Inflation Factors

Minimum possible value = 1.0  
Values > 10.0 may indicate a collinearity problem

% Ages 15-19 06	1.890	% Farm Em. 06	1.457
% Real Estate Em. 06	1.385	% Soc Sec. Rec./Pop 06	1.654
% St/Loc Gov. Em. 06	1.863	% Retail Trade Em. 06	1.764
% Mort Debt Bal. 90+	1.162	% Δ Bankruptcies 00-06	1.271
% Auto Debt Bal. 90+	1.190	% Manufacturing Em. 06	1.709

$VIF(j) = 1/(1 - R(j)^2)$ , where  $R(j)$  is the multiple correlation coefficient between variable  $j$  and the other independent variables

A number of variables were not significant and were excluded from the final model. Figure 1.3 shows the discarded regressions. The regressions also have a sample size of 61 counties. With the exception of farm employment (% Farm Em.) and social security recipients (% Soc Sec. Rec./Pop 06), the variables from the final model maintain their significance in the discarded regressions. Farm employment and the percent of social security recipients are not significant when college education (% Complete College 00) is added in regression 2. Farm employment is not significant when the percent of food assistance recipients (% Food Assistance Recipients) is added in regression 3.

Figure 1.3 : Discarded Regressions

	Basic Regression		Regression 2		Regression 3		Regression 4		Regression 5	
	Coeff	t-ratio	Coeff	t-ratio	Coeff	t-ratio	Coeff	t-ratio	Coeff	t-ratio
CONSTANT	115.38	5.14***	111.29	4.76***	65.49	0.73	116.42	5.00***	107.49	4.62***
% Ages 15-19	-6.77	-4.15***	-7.35	-4.23***	-6.75	-4.12***	-6.24	-4.08***	-6.26	-3.61***
% Real Estate Em.	-6.47	-3.43***	-6.83	-3.68***	-6.39	-3.27***	-6.65	-3.46***	-6.02	-3.06***
% Government Em	0.85	3.11***	0.77	2.72***	0.77	2.85***	0.91	3.07***	0.83	3.12***
Mort. DB 90+ Days Del.	-4.56	-3.08***	-4.49	-2.99***	-4.59	-3.16***	-4.53	-3.13***	-4.53	-3.14***
Auto DB 90+ Days Del.	-2.91	-2.49**	-2.69	-2.24**	-2.99	-2.52**	-2.89	-2.59**	-2.97	-2.47**
% Farm Em	-0.71	-2.30**	-0.39	-0.84	-0.76	-2.37**	-0.95	-2.33**	-0.50	-1.62
% Soc. Sec. Recipients	-0.46	-2.02**	-0.39	-1.55	-0.43	-1.88*	-0.48	-2.12**	-9.28	-2.28**
% Retail Trade Em	-1.67	-1.85*	-1.65	-1.83*	-1.75	-1.88*	-1.77	-1.84*	-1.62	-1.84*
% Δ Bankruptcies 00-06	0.11	1.58	0.10	1.49	0.10	1.48	0.12	1.80*	0.12	1.65
% Manufacturing Em	0.33	1.36	0.38	1.47	0.28	1.20	0.32	1.35	0.29	1.20
% Complete College 00			0.29	1.06						
% Male Population					1.05	0.55				
% Asian							-1.60	-1.04		
% Food Assistane Recipients									1.22	1.25
<b>R-Squared/ R-Squared Adjusted</b>	<b>0.47 / 0.36</b>		<b>0.47 / 0.36</b>		<b>0.47 / 0.35</b>		<b>0.47 / 0.35</b>		<b>0.47 / 0.36</b>	

## V. Discussion of Results

### A. INDUSTRY

Table 1.1 shows that the coefficients for real estate, government, farm, and retail trade employment were statistically significant. While government (% St/Loc. Gov. Em. 06) and farm (% Farm Em. 06) employment have the expected coefficients, the coefficients for real estate (% Real Estate Em. 06) and retail trade (% Retail Trade Em. 06) employment are contrary to expectations. Manufacturing (% Manufacturing Em. 06) employment is not significant.

The real estate variable is negative and significant, which is contrary to the hypothesis that counties with greater real estate sectors would have had greater increases in unemployment. Because Iowa was not directly affected by the housing boom, it is possible that the Iowa real estate sector did not suffer compared to other states. The coefficient is -6.47, indicating that for every percentage of real estate employment, the unemployment rate fell -6.47 percentage points from 2006-2008.

The positive and significant coefficient of government employment confirms the hypothesis that counties with a higher percentage of workers in the state and local government sectors had larger increases in their unemployment rates. State and local governments cut jobs and payrolls as tax revenues fell and budgets became tight. The coefficient is 0.85. The positive coefficient indicates that the county unemployment rate rose 0.85 percentage points for every percent of government employment.

The farm employment variable is negative and significant. This is consistent with the hypothesis that counties with high farm employment had lower increases in their unemployment rates. Counties with larger agricultural sectors had smaller increases in their unemployment rates. As mentioned, the demand for food does not fall as much as spending on durables. The coefficient is -0.71. The county unemployment rate fell 0.71 percentage points from 2006-2008 for every percent of farm employment.

Retail trade employment is negative and significant, but only at the 10% level. The sign of the coefficient is contrary to expectations, indicating that the Great Recession did not affect the retail trade sector the same way as the 2000-2001 recession had. It is possible, however, that the retail trade sector suffered in 2000 because consumers began to shop online. Results indicate that counties with greater retail trade



employment had lower increases in their unemployment rates. The coefficient is -1.67; the county unemployment rate fell 1.67 percentage points for every percent of retail trade employment.

Manufacturing employment does not have a significant coefficient. The result is somewhat surprising. However, the 2011 Iowa Policy Project claims that, "while Iowa is more dependent on manufacturing jobs than the nation (15 rather than 10 percent of employment), the manufacturing sector suffered a smaller percentage job loss" (O'Connor 2011). It is also important to consider the type of manufacturing within Iowa. Although luxury goods and construction manufacturing may have suffered, the manufacturing of food and farm equipment did not.

#### B. BANKING

The percent of auto debt balance 90+ days delinquent (% Auto debt balance 90+) and the percent of mortgage debt balance (% Mort Debt Bal. 90+) both have significant and negative coefficients. The negative coefficients are contrary to the hypothesis that counties with higher delinquency percentages in 2006 had larger increases in their unemployment rates. Counties with higher debt percentages had smaller increases in their unemployment rates. The percent of mortgage debt balance 90+ days delinquent has a coefficient of -4.56. The coefficient indicates that for every percent of mortgage debt balance 90+ days delinquent, the county unemployment rate fell 4.56 percentage points from 2006-2008. The percent of auto debt balance 90+ days delinquent has a coefficient of -2.91. The coefficient indicates that for every percent of auto debt balance 90+ days delinquent, the county unemployment rate fell 2.91 percentage points from 2006-2008.

The percentage change in bankruptcy filings from 2000-2006 (%  $\Delta$  Bankruptcies 00-06) does not have a significant coefficient.

#### C. DEMOGRAPHICS

The percent of county population ages 15-19 (% Ages 15-19) was negative and significant. The negative coefficient is contrary to the hypothesis that counties with a higher population percent of teens had larger increases in unemployment rates. Teenagers may have also had limited job prospects, and therefore did not enter the labor market or chose to attend college instead. The coefficient is -6.77, indicating that

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every percent of county population ages 15-19 lowered the unemployment rate 6.77 percentage points from 2006-2008.

The percent of county population receiving social security benefits in 2006 (% Soc Sec. Rec./Pop 06) has a significant negative coefficient. The negative coefficient is consistent with the hypothesis that counties with a higher percentage of recipients in 2006 had smaller increases in their unemployment rate. As stated earlier, people receiving social security benefits are less likely to look for work and therefore not participate in the labor force. The coefficient is -4.68. The coefficient indicates that for every percent of county population receiving social security benefits, the county unemployment rate fell 4.68 percentage points from 2006-2008.

## D. HOUSING

As for housing variables, the percentage change in housing units (% $\Delta$  Housing Units 00-06) and the percentage change in housing costs (% $\Delta$  MedHP/MedIn 00-06) were not significant. Housing data was limited at the county level. When '% $\Delta$  MedHP/MedIn 00-06' is included in the regression, the sample size decreases from 61 to 45. In turn, the significance levels of the variables change. The differences are shown in the chart below.

In regression 1 and 2, '% $\Delta$  Housing Units 00-06' and '% $\Delta$  MedHP/MedIn 00-06' are added separately. Neither of the variables is significant. In regression 2, the sample size decreases to 45 counties. Further, the significance levels are altered. For example, 'Mort Debt Bal. 90+' is significant at the 1% level in regression 1, but is not significant in regression 2. The differences may be a result of the smaller sample size. In regression 3, both housing variables, '% $\Delta$  Housing Units 00-06' and '% $\Delta$  MedHP/MedIn 00-06' are added to the regression. When both variables are added, '% Real Estate Em. 06' is no longer significant. There is no evidence of collinearity in regression 3. The results provide evidence that Iowa was not particularly affected by the housing boom.

It is interesting to note that in regression 3, '% $\Delta$  Housing Units 00-06' has a negatively significant coefficient. The negative coefficient indicates that counties with greater housing booms had lower increases in their unemployment rates. This result is contrary to what other states experienced. States with greater housing booms had greater increases in unemployment. The greater increases in unemployment likely occurred as the construction sector began suffering in 2006.

Regression 1		Regression 2		Regression 3	
	<i>t-ratio</i>		<i>t-ratio</i>		<i>t-ratio</i>
const	4.67***	const	5.92***	const	6.51***
% Ages 15-19 06	-4.14***	% Ages 15-19 06	-5.67***	% Ages 15-19 06	-6.25***
% Real Estate Em. 06	-3.25***	% Real Estate Em. 06	-2.46**	% Real Estate Em. 06	-1.49
% St/Loc Gov. Em. 06	3.11***	% St/Loc Gov. Em. 06	5.46***	% St/Loc Gov. Em. 06	6.17***
Mort Debt Bal. 90+	-3.11***	Mort Debt Bal. 90+	-1.25	Mort Debt Bal. 90+	-1.67
Auto Debt Bal. 90+	-2.51**	Auto Debt Bal. 90+	-5.06***	Auto Debt Bal. 90+	-5.84***
% Farm Em. 06	-1.94*	% Farm Em. 06	-2.95***	% Farm Em. 06	-4.00***
% SS Rec./Pop 06	-2.06**	% SS Rec./Pop 06	-2.24**	% SS Rec./Pop 06	-4.03**
% Retail T Em. 06	-1.88*	% Retail T Em. 06	-3.08***	% Retail T Em. 06	-3.54***
% Δ Bank 00-06	1.57	% Δ Bank 00-06	1.64	% Δ Bank 00-06	2.11**
% Manu Em. 06	1.18	% Manu Em. 06	2.22**	% Manu Em. 06	1.49
% Δ Housing Units 00-06	-0.71	% Δ MedHP/MedIn 00-06	0.49	% Δ Housing Units 00-06	-2.72**
				% Δ MedHP/MedIn 00-06	-0.02
N = 61		N = 45		N = 45	
R-Squared = 0.47		R-Squared = 0.64		R-Squared = 0.68	
Adj. R-Squared = 0.35		Adj. R-Squared = 0.51		Adj. R-Squared = 0.56	

## E. EDUCATION

The education variables were insignificant in alternative regressions, as shown in Figure 1.3 - Regression 2.

## VI. Conclusions

The start of the recession is associated with the end of the housing-price bubble and a decline in construction. Alternative regressions confirm that the housing boom did not severely affect the counties of Iowa, as compared with other states. Various industries were significant in the Table 1.1 regression. Iowa counties with greater real estate, farm, and retail trade sectors had lower increases in their unemployment rates. On the other hand, counties with higher percentages of state and local government employment had higher unemployment rates. In addition, counties with higher auto and/or mortgage debt balances 90+ days delinquent in 2006 had smaller increases in their unemployment rates. Finally, counties with larger percentages of population ages 15-19 and larger percentages of social security recipients in 2006 had smaller increases in their unemployment rates.

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