Industry Employment and Its Effect on Metropolitan Economies' Recovery from Recessions

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Abstract

This paper examines the economic recovery of metropolitan statistical areas (MSA) in the United States from the 2001 and 2007 financial recessions. The goal of this study is to see how employment at the industry level affects the number of months it takes MSAs to recover from financial recessions back to prerecession peak levels of unemployment. This study uses data from 86 Metropolitan Statistical Areas in 2001 and 92 Metropolitan Statistical Areas in 2007 from across the United States. The data for employment is broken down based on industries indicated by the Bureau of Labor Statistics (BLS). Consistent with much of the literature referred to in this study, industry employment has a lasting effect on a MSA's ability to recover from a recession. In result of the study, I found that computer and mathematics, architecture, community and social, legal, and sales occupations all have a positive effect on the economic recovery of metropolitan statistical areas.

Introduction

Financial recessions and crises have a profound effect on an economy and its future for years after the recessions end. Plenty of research is done on the effects these recessions have on economies whether it be at the national, regional, or state level. Although this is the case, there are not quite as many studies that focus on the effects of recessions on metropolitan areas in particular. I am curious to see how employment has an effect on metropolitan areas' recovery from recessions. In particular, how high-skill industry employment effects metropolitan areas' recovery. For that reason, I am examining the effects of industry employment on the economic recovery of Metropolitan Statistical Areas (MSA) in the United States after the 2001 and 2007 recessions.

The main question that I am focusing my research on is, "How does the share of employment based on industry affect the economic recovery of metropolitan statistical areas after the 2001 and 2007 recessions?". I chose the 2001 and 2007 recessions because they are two very different recessions. The 2001 recession was a relatively mild recession. The collapse of the "dotcom" bubble is the main cause of the recession (Investopedia). It did not have as much of a lasting impact and there was not as much financial and economic damage. The 2007 recession was much more severe. The housing crisis and fall of many large firms and banks set the economy into a spiral and caused much more damage (Investopedia). These two unique recessions will give a good understanding on how MSA economies truly recover from all types of recessions. In response to my research question, I hypothesize that a higher concentration in industries that contain high-skill occupations will allow an MSA to recover faster from a recession. To test this, I will use the following industries to represent high-skill occupations:

management, business, computer & mathematics, architecture, community & social, legal, education, healthcare support, healthcare practitioner, sales, and office employees. These industries are chosen as containing high-skill occupations from the Occupational Information Network (O*NET). Also, I chose these to have a positive effect on economic recovery because these are industries that include high paying jobs and employ people through business cycles.

In my study, I ran two regressions for the two separate recessions using measures for industry employment, educational attainment, race, region, income per capita, population density, and unemployment rate. From this data I found that I can only partially accept my hypothesis but can still come to the conclusion that industries including high-skill occupations still have a positive effect on the recovery of MSAs after recessions.

Literature Review

The existing literature on metropolitan areas' resilience from recessions has largely explored what factors are held responsible for some metropolitan areas recovering faster than others. These studies discuss how they define recovery, their significance of industry employment in being able to recover from these recessions, and the impact of high-skill occupations on recovery.

Defining recovery in the context of recessions has not necessarily come to a general consensus throughout the literature I have read. Fusillo et al. (2021) and Cellini & Torissi, (2014) believe that the defining variable for recovery is a direct measure of output. Other authors believe that since the study is based on employment, a broader economic indicator like recovery months would better represent recovery (Weinstein & Patrick, 2019). Both of these

options have different benefits based off their respective study and are valid ways to define recovery.

Concerning the effects of industry in recovery from recessions, literature has shown that industries do have an impact on recovery. From the works of Doran and Fingleton, (2018), they found that certain industries' proportion of the workforce had a positive effect on economic recovery while others didn't. The authors found that manufacturing, education, finance, and insurance employees had a positive effect on recovery; while construction, arts, entertainment, and recreational services exhibited poor recovery. Other authors also find that industry employment plays a large part in recovery. Fusillo, et al. (2021) found that metro areas with more diverse industry employment allows these areas the ability to recover faster from recessions. Finally, John Humphrey (1996) did a study specifically on employment trends in Sao Paulo, Brazil. Through the results of the regression, Humphrey came to the conclusion that employment based on industry did have an effect on economic recovery, showing that commerce and services industries had a positive effect on the economy while manufacturing had a negative effect on the economy in the metropolitan area. From these studies we can conclude that industry employment does in fact play a part in the recovery from a recession for metropolitan areas.

Studies also came to another conclusion when looking at the causes of resilience for metropolitan areas. Fusillo et al. (2021) found evidence of skill also playing an important role in recovery. The authors discovered through their studies that high-level skills are also positively associated with resilience. In the article they interpret this to mean that these skills enable economic development. Therefore, higher skill leads to higher economic development.

Additionally, Weinstein & Patrick (2019) have a study on skill composition occupations and its effect on the recovery of metropolitan areas. In their study, they looked at high cognitive, motor, and people skill. The results found that high people skill concentrations allowed for metropolitan areas to adapt and recover from recessions at a quicker rate than other metropolitan areas.

When trying to explain why these high-skill occupations have a positive effect on economic recovery, Cirillo et al. (2018) provide evidence through their study of why. The authors' study on European countries showed that low-skill occupations (managers, clerks, craft, and manual workers) incur wage decreases and job loss during the change of business cycles. Conversely, high-skill jobs maintain their wages and continue to stay employed during business cycles. This aids in their ability to impact economic recovery positively.

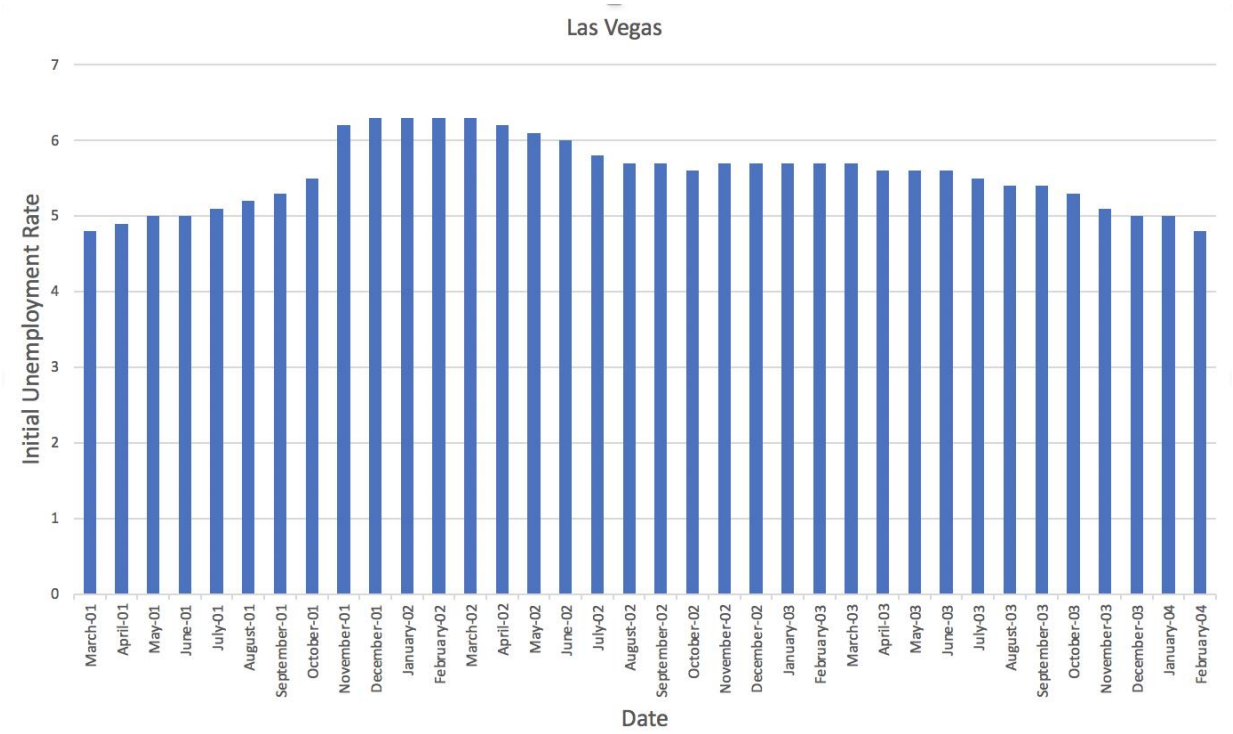
From reviewing these articles, I am able to conclude a few things. First, there are many ways to define recovery in studies such as these and finding the proper way is important. Next, the industrial composition and industry employment of a metropolitan area play an important part in the recovery from a recession. Additionally, I can conclude that high-skill occupations have a positive impact on recovery for metropolitan areas. Because of this, I can assume that industries that include high-skill occupations will have a positive impact on economic recovery.

Data & Methodology

With the goal of my research being targeted towards metropolitan statistical areas during the 2001 and 2007 recessions, my sample includes all metropolitan areas in the United States in 2001 and 2007 with a population of at least 500,000. Since this is the case, the number

of observations I have for 2001 are 86, and the number of observations I have for 2007 are 92. Because I am focusing on two separate and unique recessions, I will be running two regressions.

When finding my dependent variable, I used the guidance of Weinstein & Patrick (2019). In their study they measured economic recovery through the number of months it takes to recover from a recession. My dependent variable I am using is the number of months it takes to recover from the 2001 and 2007 economic downturns. To calculate this number, I am using the National Bureau of Economic Research (NBER) month of peak economic levels for the nation. For the 2001 recession the NBER identified it as March of 2001, and for the 2007 recession it was December of 2007. I then count the number of months it takes for each MSA's unemployment rate to recover to the level it was at during the peak month. If the unemployment rate did not fully recover to the point of the NBER peak, I would count the number of months it took to get to its lowest point. These unemployment rates are taken from the Bureau of Economic Analysis (BEA). To better understand this, Diagram 1 shows the unemployment rate for Las Vegas before, during, and after the 2001 recession to the point of its recovery.



(Diagram 1)

The industry employment numbers are all acquired from the Bureau of Labor Statistics (BLS). For each metropolitan statistical area, I compiled the number of employees for the following industries: management, business, computer & math, architecture, life & physical, community & social, legal, education, arts, healthcare practitioner, healthcare support, protective service, food preparation, building cleaning, personal care, sales, office & administration, and installation employees. I took the employment for each industry and divided it by the total employment for the MSA to calculate the percentage of employment in each industry. By doing this, I am taking away the effect of outliers such as New York City that have much higher populations and thus much higher employment and controlling for MSA size. While collecting the industry data, the farming industry, and construction industry were chosen

as the dropped groups. Because of the amount of missing data for these two industries, I found it necessary to drop these groups.

Additional to the industry employment information, I also included several control variables. The first is the natural log of income per capita. The reason why I added this as a control variable is because income per capita as a measure of income is an important indicator of the financial position of a city. I believe that income per capita would have a positive effect on economic recovery because the higher incomes are in a metro area, I assume they will be able to recover faster. This data was acquired for the Bureau of Economic Analysis (BEA). I also controlled for race. I included the share of the population by race for Black, Asian, and Hispanic while omitting White. I included this as a control variable because I believe that the diversity of a metropolitan area will have a massive impact on economic recovery. With that being said, I think that diversity positively impacts economic recovery, so higher percentages of minority groups would potentially decrease the number of months it takes to recover. This data was acquired by the Census. Region was chosen as a dummy variable. With this variable I included Northeast, Midwest, and South while omitting the West region by using the Census regions provided by the Census. The reason why I included this is because authors like Anne L. Sussman, (2019) believe that the extent of downturns vary substantially based on region. With that being said, I believe that the impact of the West and Northeast regions would be more positive than that of the South and Midwest. I also included weighted population density for the metropolitan areas (BEA). Population size plays a big part in a metropolitan areas' recovery and many of the articles I read showed that a measure of population is important to control for. I believe that a higher population density would lead to a negative impact on economic

recovery. Finally, I controlled for the percentage of the population that is 25 years old or older with at least a bachelor's degree. Prior readings have shown that having a measurement of educational attainment is an important variable to control for (Weinstein & Patrick, 2019). Higher education typically leads to acquiring higher skilled jobs. Because of this, I think that the higher the percentage of the population that has at least a bachelors degree, the faster the metropolitan area will recover from a recession.

After acquiring all of this data, I ran two regressions. One for the 2001 recession and one for the 2007 financial crisis. For my regressions I have two regression equations:

$$\text{Number of Recovery Months (2001)} = \beta_0 + \beta_1(\text{Management}) + \beta_2(\text{Business}) + \beta_3(\text{Computer \& Math}) + \beta_4(\text{Architecture}) + \beta_5(\text{Life \& Physical}) + \beta_6(\text{Community \& Social}) + \beta_7(\text{Legal}) + \beta_8(\text{Education}) + \beta_9(\text{Arts}) + \beta_{10}(\text{Healthcare Practitioner}) + \beta_{11}(\text{Healthcare Support}) + \beta_{12}(\text{Protective Service}) + \beta_{13}(\text{Food Prep}) + \beta_{12}(\text{Building Cleaning}) + \beta_{13}(\text{Personal Care}) + \beta_{14}(\text{Sales}) + \beta_{15}(\text{Office \& Admin.}) + \beta_{16}(\text{Installation}) + \beta_{17}(\text{Income per Capita}) + \beta_{18}(\text{Race}) + \beta_{19}(\text{Region}) + \beta_{20}(\text{Weighted Pop. Density}) + \beta_{21}(\text{25+ w BA}) + \beta_{22}(\text{Unemployment Rate})$$

$$\text{Number of Recovery Months (2007)} = \beta_0 + \beta_1(\text{Management}) + \beta_2(\text{Business}) + \beta_3(\text{Computer \& Math}) + \beta_4(\text{Architecture}) + \beta_5(\text{Life \& Physical}) + \beta_6(\text{Community \& Social}) + \beta_7(\text{Legal}) + \beta_8(\text{Education}) + \beta_9(\text{Arts}) + \beta_{10}(\text{Healthcare Practitioner}) + \beta_{11}(\text{Healthcare Support}) + \beta_{12}(\text{Protective Service}) + \beta_{13}(\text{Food Prep}) + \beta_{12}(\text{Building Cleaning}) + \beta_{13}(\text{Personal Care}) + \beta_{14}(\text{Sales}) + \beta_{15}(\text{Office \& Admin.}) + \beta_{16}(\text{Installation}) + \beta_{17}(\text{Income per Capita}) + \beta_{18}(\text{Race}) + \beta_{19}(\text{Region}) + \beta_{20}(\text{Weighted Pop. Density}) + \beta_{21}(\text{25+ w BA}) + \beta_{22}(\text{Unemployment Rate})$$

From these regressions I am able to interpret my results and make a conclusion on whether or not industries that include high-skill occupations have a positive effect on economic recovery.

Results

The first regression I ran was for the 2001 recession. This regression had an R-squared value of .4604. This means that the data describes 46.04% of the variation in economic recovery. When testing for heteroskedasticity, using the White test I found that

heteroskedasticity was evident in my regression. Since this is the case, robust standard errors were used. Multicollinearity was not a concern. In this regression, a few of the variables are found to be significant and I will interpret these variables.

(2001 Regression Table)

2001 Regression

Independent Variables	**ln Recovery Months**
Initial unemployment rate	-.037 (.052)
ln Income per capita	-.716* (.377)
Black population	.017** (.008)
Hispanic population	.009 (.005)
Asian population	-.012 (.017)
Midwest	-.078 (.164)
South	.128 (.165)
Northeast	-.034 (.169)
Weighted population density (in hundreds)	.003** (.00001)
% 25+ with at least BA Degree	.061*** (.018)
% Management Employees	-.016 (.048)
% Business Employees	.077 (.067)
% Computer & Math Employees	-.188** (.079)
% Architecture Employees	-.041 (.047)
% Life & Physical Science Employees	-.015 (.085)
% Community and Social Employees	.28*** (.104)
% Legal Employees	-.454** (.223)
% Education Employees	-.022 (.038)
% Arts Employees	-.163 (.101)
% Healthcare Practitioner Employees	-.056 (.069)
% Healthcare Support Employees	-.227* (.123)
% Protective Service Employees	-.349*** (.113)

% Food Preparation Employees	.077* (.041)
% Building Cleaning Employees	-.066 (.121)
% Personal Care Employees	-.033 (.071)
% Sales Employees	-.145** (.055)
% Office and Administration Employees	-.011 (.036)
% Installation Employees	.073 (.103)
% Production Employees	-.035* (.019)
Constant	13.07*** (.019)
R-Squared	0.4606
F-Stat	4.53
Observations	86

Note: Robust standard errors for independent variables are shown in parentheses. The symbols *, **, *** correspond to a 10%, 5% and 1% level of significance.

The results for the industry employment showed a few things. Not all of my variables of interest were found significant. The percentage of computer and mathematics employees had a positive effect on economic recovery as hypothesized. For every one percentage point increase in the share of employment in computer and mathematics occupations, there is a 18.8% decrease in the number of months it takes to recover from a recession. This is significant at the 5% level. At the 1% level, the percentage of community and social employees is significant. For every one percentage point increase in the share of employment in community and social occupations, there is a 28% increase in the number of months it takes to recover. This means that there is a negative relationship between the share of community and social employees, and economic recovery. The percentage of legal employees has a positive effect on economic recovery. At the 5% level, for every one percentage point increase in the share of employment in legal occupations there is a 45.4% decrease in the number of months it takes to recover. The percentage of healthcare support employees is significant at the 10% level. For every one

percentage point increase in the share of employment in healthcare support occupations there is a 22.7% decrease in the number of recovery months, and thus a positive effect. At the 5% significance level, for every one percentage point increase in the share of employment in sales occupations, the number of months to recover decreases by 14.5%. Therefore, the percent of sales employees had a positive effect on economic recovery. These industries are all listed as having high-skill occupations by the Occupational Information Network (O*NET). O*NET indicated that these industries include high-skill occupations, so I hypothesized that these industries would have a positive effect on economic recovery. Of the industries that are expected to have a positive effect, the computer & mathematical, legal, healthcare support, and sales industries all went along with my hypothesis. The only variable of interest that did not go along with my hypothesis was the community & social industry which had a negative effect on economic recovery.

There were a few additional industries that had significance. At the 1% significance level, the percentage of protective service employees actually has a positive effect on economic recovery. For every one percentage point increase in the share of employment in protective service occupations there is a 34.9% decrease in the number of months it takes to recover. Also, the share of employment in food preparation occupations is significant at the 10% level. This means that for every one percentage point increase in the share of employment in food preparation occupations, there is a 7.7% increase in the number of months it takes to recover. Finally, the percentage of production employees has a positive effect on economic recovery at the 10% level. For every one percentage point increase in the share of employment in production occupations there is a 3.5% decrease in the number of months it takes to recover.

When referring to my hypothesis, these would all have a negative effect on economic recovery. Although the percent of food preparation employees goes with my hypothesis, the percent of protective service employees and production employees did not go along with my hypothesis.

There were also a few control variables that were significant as well. The natural log of income per capita is significant at the 1% level. This means that for every one unit increase, there is a .716% decrease in the number of recovery months. This positive effect is what I expected considering higher income in a metropolitan area would lead to faster economic recovery. The Black population is also significant at the 5% level. For every one percentage point increase in the Black population, there is a 1.7% increase in the number of months it takes to recover. This negative effect is not what I expected. I assumed that since we learned in our Urban and Regional economics class that diversity has a positive effect on economies, that it would have a positive effect on recovery. At the 5% significance level, weighted population density is significant. For every one unit increase in population density per 100, there is a .003% increase in the number of months it takes to recover. This goes along with what I hypothesized. Having a more densely populated metropolitan area leads to longer recovery times. Finally, the percentage of the population over 25 years old with at least a bachelor's degree is significant at the 1% level. For every one percentage point increase in the population that is 25 years or older with at least a bachelor's degree, there is a 6.1 percent increase in the number of months it takes to recover. Since educational attainment leads to high-skill occupations, this does not go along with my hypothesis. Although this is the case, it could be explained by the idea that there are higher concentrations of people with higher education in metropolitan areas. Because of this, since high-skill job security is strong, finding these jobs is harder.

The second regression was run for the 2007 recession in metropolitan statistical areas. To preface this regression, although it is valid, is barely valid. With this being the case, I still found it necessary to provide the reader with the results and interpret the results.

The R-squared value for the 2007 regression is .4051. This means that the data describes 40.51% of the variation in economic recovery. Table 2 shows the full results for the regression. After doing the White test it is shown that heteroskedasticity is not a concern, so I do not have to include robust standard error. Additionally, after testing for multicollinearity, I can conclude that it is not a concern.

(2007 Regression Table)

2007 Regression

Independent Variables	**ln Recovery Months**
Initial unemployment rate	-.041 (.026)
ln Income per capita	-.151 (.198)
Black population	-.0045 (.0037)
Hispanic population	-.0047** (.002)
Asian population	.011* (.007)
Midwest	-.045 (.098)
South	.036 (.097)
Northeast	-.0001 (.095)
Weighted population density	-.0000006 (.000007)
% 25+ with at least BA Degree	.009 (.0103)
% Management Employees	-.044 (.028)
% Business Employees	.0147 (.037)
% Computer & Math Employees	-.096*** (.035)
% Architecture Employees	.1051*** (.0303)
% Life & Physical Science Employees	-.090 (.061)

% Community and Social Employees	-.143 (.088)
% Legal Employees	.042 (.094)
% Education Employees	.012 (.022)
% Arts Employees	-.049 (.064)
% Healthcare Practitioner Employees	.033 (.034)
% Healthcare Support Employees	-.014 (.052)
% Protective Service Employees	.104* (.053)
% Food Preparation Employees	-.026 (.023)
% Building Cleaning Employees	.033 (.057)
% Personal Care Employees	-.011 (.018)
% Sales Employees	.007 (.027)
% Office and Administration Employees	-.015 (.018)
% Installation Employees	-.099 (.069)
% Production Employees	-.0023 (.012)
Constant	7.016*** (2.26)
R-Squared	0.4051
F-Stat	1.46
Observations	92

Note: Standard errors for independent variables are shown in parentheses. The symbols *, **, *** correspond to a 10%, 5% and 1% level of significance.

Of the variables of interest, there are only two that are statistically significant. The percentage of computer and mathematical employees has a positive effect on economic recovery at the 1% significance level. For every one percentage point increase in the share of employment in the number of computer and mathematics occupations, there is a 9.6% decrease in the number of months it takes to recover. This positive effect on economic recovery went along with what I hypothesized. Also, at the 1% significance level, the percentage of architecture employees is also significant. For every one percentage point increase in the share of employment in architecture occupations, there is a 10.51% increase in the number of

months it takes to recover, meaning it has a negative effect. This was contrary to hypothesis, assuming that the share of architecture employees would have a positive effect on economic recovery. I believe this could be the case for the 2007 recession due to the fact there was a housing crisis, so no one was looking to need an architect to help with building a house.

Of the control variables, there were a few that were significant. First, at the 10% level, protective service employees is significant. For every one percentage point increase in protective service employees there is a 10.4% increase in the number of months it takes to recover. These low-skill occupations have a negative impact on economic recovery, as hypothesized. Race was also found to be significant in this regression. For every one person increase in the black population, there is a 0.47% decrease in the number of months it takes to recover. This positive effect on economic recovery I what I hypothesized because of the benefits of diversity. This is significant at the 5% level. The Asian population has a negative effect on economic recovery in this regression. Significant at the 10% level, for every one person increase in the Asian population, there is a 1.1% increase in the number of months it takes to recover. The negative effect of Asian population was not what I hypothesized.

Conclusion

In the regression done for the 2001 recession, there are several conclusions that I can make. In terms of my variables of interest, not all of them were significant. Of the ones that were significant, the following variables met my expectations from my hypothesis: the percentage of computer and mathematical employees, the percentage of legal employees, the

percentage of healthcare support employees, and the percentage of sales employees. All of these variables had a positive effect on economic recovery. Of the significant control variables, the natural log of income per capita, and the weighted population density had effects that I hypothesized. The percentage of food preparation employees, and the percentage of production employees had effects on recovery that I did not hypothesize.

For the 2007 financial crisis regression, not a lot of the variables were significant. Of the ones that were, only a couple that reacted in a way that I hypothesized. The percentage of computer and mathematical employees had a positive effect on economic recovery which is what I expected. Also, the percentage of protective service employees' negative effect is also what I expected. On the contrary, architecture had a negative effect on economic recovery which I did not expect.

Overall, I can partially accept my hypothesis that is previously stated. Although some of the variables did as hypothesized, the lack of significance and few variables that did not do as expected lead me to not be able to fully accept my hypothesis. In my first regression, only some of the variables of interest had the positive effect on economic recovery that I hypothesized. Although the computer & mathematical, legal, healthcare support, and sales industries had a positive effect on economic recovery; the percent of community and social employees having a negative effect on economic recovery means I couldn't fully accept my hypothesis. Additionally, in the 2007 regression, although the percent of computer & mathematics employees had a positive effect on economic recovery, the negative effect of architecture employees means I could not fully accept my hypothesis. In conclusion, although

my hypothesis cannot be fully accepted, I still believe the results showed that industries that include high-skill occupations have a positive effect on economic recovery.

When looking toward the future with this study, I think it would be interesting to see how the study would react to the recovery from the economic downturn COVID-19 has caused. It would also be interesting to see if similar themes pertain to metropolitan areas in Europe during their recessions.

Appendix A

Table 1: *Description and Source of Variables* 2001

Variable	Description	Mean	Standard Dev.	Minimum	Maximum
Ln Recovery	Logarithm of number of months it takes for MSA to recover from recession	3.97	.315	3.04	4.43
Unemployment Rate	Initial unemployment rate for MSAs	4.09	1.31	2.5	10.6
Ln income	Logarithm of the income per capita for MSAs	10.35	.19	9.60	11.10
Asian	Percent of population that is Asian	3.13	3.72	.45	24.75
Black	Percent of population that is Black/African American	12.75	9.81	.47	43.11
Hispanic	Percent of population that is Hispanic	12.16	15.81	.72	85.26
R1 (Northeast)	MSAs located in the Northeast region	.25	.43	0	1
R2 (Midwest)	MSAs located in the Midwest region	.21	.41	0	1
R3 (South)	MSAs located in the South region	.34	.47	0	1
R4 (West)	MSAs located in the West region	.18	.39	0	1
Weighted population density	Population density of a MSA weighted by subregion	4132.8	3733.16	1158.66	31683.61
25+ with at least BA	Percent of population 25 years or older with at least a Bachelor's degree	28.71	6.22	14.4	46.1
Management employees	Percent of management employees	5.72	1.08	3.57	8.25
Business employees	Percent of business employees	3.87	1.05	1.90	7.12
Computer and mathematical employees	Percent of computer & mathematical employees	2.35	1.32	.45	8.24
Architecture employees	Percent of architecture employees	2.03	.87	.49	6.69
Life and physical employees	Percent of life & physical employees	.81	.39	.13	2.88
Community and social employees	Percent of community and social employees	1.21	.37	.53	2.17
Legal employees	Percent of legal employees	.75	.27	.29	1.91
Education employees	Percent of education employees	5.76	1.42	1.58	11.57
Arts employees	Percent of arts employees	1.16	.43	.50	2.92
Healthcare practitioner employees	Percent of healthcare practitioner employees	4.95	.84	3.11	6.89
Healthcare support employees	Percent of healthcare support employees	2.41	.55	1.13	3.69
Protective service employees	Percent of protective service employees	2.28	.55	1.13	3.69
Food prep employees	Percent of food preparation employees	7.68	1.08	5.46	12.60
Building cleaning employees	Percent of building cleaning employees	3.24	.47	2.54	6.07
Personal care employees	Percent of personal care employees	2.13	.73	1.25	6.71
Sales employees	Percent of Sales employees	10.47	.87	7.94	13.26
Office and admin employees	Percent of office and administration employees	18.16	1.60	14.23	22.15
Installation employees	Percent of installation employees	4.09	.49	3.06	5.59
Production employees	Percent of production employees	8.38	3.17	2.75	17.97

Appendix B

Table 2: *Description and Source of Variables* 2007

Variable	Description	Mean	Standard Dev.	Minimum	Maximum
Ln Recovery	Logarithm of number of months it takes for MSA to recover from recession	4.61	.15	4.27	4.91
Unemployment Rate	Initial unemployment rate for MSAs	4.84	1.23	2.7	9.3
Ln income	Logarithm of the income per capita for MSAs	10.57	.19	9.87	11.42
Asian	Percent of population that is Asian	4.33	4.69	.58	32.38
Black	Percent of population that is Black/African American	13.46	10.25	.63	46.46
Hispanic	Percent of population that is Hispanic	16.53	18.02	1.27	98.17
White	Percent of population that is White	73.95	11.33	45.68	95.30
R1 (Northeast)	MSAs located in the Northeast region	.23	.42	0	1
R2 (Midwest)	MSAs located in the Midwest region	.21	.41	0	1
R3 (South)	MSAs located in the South region	.34	.47	0	1
R4 (West)	MSAs located in the West region	.19	.39	0	1
Weighted population density	Population density of a MSA weighted by subregion	3874.59	3577.51	1098.64	31252.44
25+ with at least BA	Percent of population 25 years or older with at least a Bachelor's degree	28.86	6.57	14.9	47.6
Management employees	Percent of management employees	4.58	1.12	2.60	8.08
Business employees	Percent of business employees	4.63	1.24	2.08	8.60
Computer and mathematical employees	Percent of computer & mathematical employees	2.50	1.33	.44	8.07
Architecture employees	Percent of architecture employees	1.94	.83	.51	6.11
Life and physical employees	Percent of life & physical employees	.90	.46	.22	3.13
Community and social employees	Percent of community and social employees	1.35	.41	.55	2.39
Legal employees	Percent of legal employees	.75	.31	.19	2.61
Education employees	Percent of education employees	5.96	1.36	1.74	10.89
Arts employees	Percent of arts employees	1.27	.43	.16	3.15
Healthcare practitioner employees	Percent of healthcare practitioner employees	5.25	.91	3.17	7.55
Healthcare support employees	Percent of healthcare support employees	2.68	.60	1.45	4.25
Protective service employees	Percent of protective service employees	2.20	.51	1.06	3.89
Food prep employees	Percent of food preparation employees	8.36	1.06	6.12	14.16
Building cleaning employees	Percent of building cleaning employees	3.17	.46	2.41	6.15
Personal care employees	Percent of personal care employees	2.51	1.17	1.11	9.90
Sales employees	Percent of Sales employees	10.63	.89	8.16	13.31
Office and admin employees	Percent of office and administration employees	17.64	1.41	13.22	20.90
Installation employees	Percent of installation employees	3.98	.55	2.70	5.42
Production employees	Percent of production employees	7.10	2.49	2.18	13.73

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