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Unemployment and Homicides: Evidence from Individual Level U.S. Data

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Abstract

Using state-level data, many studies examine how the homicide rate evolves across the business cycle as measured by the unemployment rate. We consider a different approach and utilize individual level data, allowing us to control for individual characteristics of those who died between 1989 and 2004. We then compare those who died of homicide versus those who died due to some other type of death, analyzing if the incidence of homicides rises disproportionately relative to other types of death during different stages of the business cycle. We do not obtain uniform findings. The probability of homicide relative to natural death rose with state unemployment during the late 1990's but no strong associations were found for preceding or subsequent periods.

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1. Introduction

Despite the abundant literature examining associations between unemployment and homicide rates, there is no general consensus on the outcome. Although many studies find a positive association (Andresen, 2015; Barranco, 2014; Loureiro and Silva, 2012; Phillip, 2006; Lee and Holoviak, 2006), others find a negative (Gonzalez and Quast, 2010; Ruhm, 2000; Britt, 1994; and Cantor and Land, 1985) or little (Yang and Lester, 1995 and Neumayer, 2004) association between the two. Most of these studies regress a homicide rate against the unemployment rate within a panel of U.S. states. We take a different approach and consider individual level data from the U.S. Vital Statistics Multiple Cause of Death Data from 1989 to 2004. This data source records each death and reports the cause of death, the location of death, and various individual characteristics. Using this data, we can better understand if death by homicide becomes more or less prevalent *relative* to deaths from other causes over the business cycle.

A weakness of our approach is that it does not allow us to see how business cycle conditions relate to homicide rates in an *absolute* sense, but we can determine to what extent business cycle conditions relate to homicides disproportionately compared to other types of deaths. That is, we can measure how the responsiveness in the incidence of homicide to changes in the unemployment rate compares to that of other types of death. Using state-level data, one could compare these respective responses by regressing each – the overall mortality rate and the homicide rate – upon the unemployment rate and then comparing the two coefficients on the unemployment rate. However, our approach allows for a more direct comparison since only one estimation is needed in our case instead of two estimations. Furthermore, the coefficient upon unemployment in our approach directly compares the responsiveness of the two to changes in unemployment and is not derived from two separate estimates.

Other advantages also arise that allow our study to complement existing studies in the literature. First, we can control for individual characteristics. The aforementioned studies control for characteristics at the state level such as the percentage of the state that is African-American (in addition to controlling for other ethnic groups) or the percentage of those in various age groups. However, they cannot control for the characteristics of those that actually died. Our approach allows for the inclusion of these individual specific variables. Second, the number of observations is greater in our examination. Where such prodigality can be extremely helpful is in looking at how associations could change across time dimensions of only a few years. We have millions of observations per year, not just fifty, and so can reasonably examine windows where the time dimension is only a few years.

Finally, a large distinction within the literature has arisen as to whether recessions lower mortality. The macro-level studies cited above often suggest that mortality is pro-cyclical. However, many studies using family or individual level data such as Strully (2009), Halliday (2014), Sullivan and von Wachter (2009), Gerdtham and Johannesson (2005) Winkleman and Winkleman (1998), and Burgard et al. (2007) find that job loss can lead to higher mortality due to depression, greater risks of disease, and deviant behaviors. Therefore, trying to reconcile the findings from these two approaches becomes important for better understanding how unemployment can impact health in general and mortality in particular. Although we focus upon homicide, a similar concern could arise in that findings from micro-level and macro-level studies

might not coincide. Our approach presents a "middle-ground" between the two described above, relating a type of mortality – homicide, in this case – at the individual level with business cycle characteristics such as unemployment at the macro-level.

Our results do not suggest an unambiguous association. We find that state unemployment increased the prevalence of death by homicide (relative to dying of natural causes) during the late 1990's but is not strongly associated with homicide during other times. The rest of the paper is organized as follows. Section 2 presents the methodology and section 3 reports results. A conclusion follows.

2. Methodology

We use the U.S. Vital Statistics Multiple Cause of Death Data, originally from the National Center for Health Statistics.[1] This dataset lists all individuals who died in the U.S. Our sample spans the years 1989-2004. Information regarding the location of death was no longer released after 2004.[2] We also incorporate state level data which are obtained from three different sources: the Bureau of Labor Statistics, the U.S. Census Bureau and the *Compact Mortality Files (CMF)* of the Center for Disease Control and Prevention (CDC).

Our dependent variable is binary, equaling one if the person died of homicide and zero if the person died from some other cause. We remove deaths due to unknown causes from the sample. For a robustness check, we will also remove deaths due to accidents and suicides and so only compare homicides to deaths due to natural causes. The main independent variable is the state unemployment rate. Control variables consist of two groups: individual-level controls and state-level controls. Individual-specific controls include marital status (married, divorced, and widowed with single as the control), age, gender (female is the control), race (African-American, American-Indian, Chinese, Japanese, and Others with White as the control group), educational attainment (no high school, some high school, some college, and college degree with high school diploma only as the control group). The state-level controls include the percentage of the population that is white, the percentage of the population that is African-American, the percentage of the population under five, the percentage of the population aged 65 and above, the percentage having a high school diploma, the percentage having a college degree, and the natural log of the state population. The inclusion of the state dummies is important so as to capture time invariant factors that could influence both unemployment and homicide within the state. The coefficient upon *UR* is then driven by the intertemporal variation in state unemployment.[3]

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[1] Data link: http://www.nber.org/data/vital-statistics-mortality-data-multiple-cause-of-death.html

[2] Data, however, is missing for some state-years so we use an unbalanced sample. Labeling Washington D.C. as a "state", we use 45 states (with GA, NY, OK, RI, SD, and WA missing) in 1989; 44 states (missing GA, LA, NY, OK, RI, SD, and WA) in 1990; 46 states (missing GA, OK, RI, SD and WA) in 1991; 47 states (missing GA, OK, RI and SD) from 1992 to 1996; 48 states (missing GA, RI and SD) from 1997 to 2003; and 49 states (missing RI and SD) in 2004.

[3] We also ran 16 separate regressions for each year in our sample. In this case, state dummies cannot be included since the unemployment rate is invariant across deaths within the same state.

We use a logit regression model as it allows us to compute conditional probabilities of mortality conditional on the state's unemployment rate while controlling for individual-specific characteristics, state-specific factors, and both time and state dummies. We also allow for standard errors to be clustered within each state-year group (for example, North Carolina-1991 is one group) as some deaths are related such as a vehicular accident with multiple fatalities.[4]

As stated, it is important to note that the control group comprises people who died but not of homicide. Therefore, the conditional probability of dying from homicide is relative to dying from some other way. Unfortunately, our methodology does not allow us to examine if unemployment raises the prevalence of homicides in an *absolute* sense, but it does allow us to determine if unemployment makes homicides more or less prevalent *relative* to other causes of death. This means that we can still examine whether homicides increase more (or decrease less) than other causes of death across the business cycle. In other words, we can see to what extent homicide becomes more or less responsive to business cycle conditions relative to other types of mortality.

3. Results

Column 1 of Table 1 presents results across the entire sample and the other three columns consider results across three sub-periods. In column 1 the coefficient upon *UR* for the entire sample is positive but not statistically significant. However, one reason for the lack of significance is not that the business cycle is always unimportant for the prevalence of homicide but, rather, that the association is changing over time. This can be seen by dividing the sample into three sub-periods in columns two through four. The period 1989-1994 contains the 1990-91 recession and the period of rising unemployment that continued throughout 1992 and in some states into 1993. The period from 1995 to 1999 comprises the booming economy of the late 1990's when unemployment in many states plummeted and national GDP growth exceeded 4% for three straight years. The third period comprises the 2001 recession and the period of slower growth following the bursting of the dot-com bubble.

For the early 1990's the coefficient upon UR is small with little association between the business cycle and homicide relative to other types of deaths. However, the coefficient upon UR becomes positive and significant for the second half of the 1990's. During the 1990's boom, homicide increased relative to other types of deaths when the unemployment rate rose. Yet, this association did not last as it became negative and insignificant after 2000. Bushway *et al*. (2012) also find that the association between homicide and unemployment qualitatively changes over time

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In these specifications, the coefficient upon UR is always positive. Given the results below, we believe these positive coefficients could stem from state-level unobserved heterogeneity, thereby necessitating the inclusion of state dummies.

[4] In a true panel, clustering at the state-year level cannot be done because there are only (# state)*(# year) observations and so we would only have one observation per state-year pair. But we have thousands of observations for each state-year pair in our approach since thousands of deaths occur each year within a state.

although they employ a different econometric methodology as well as use a longer sample period (1933 to 2007) though one that encompasses our own.

Our results somewhat counter those of Levitt (2004) who argues that the strong economy of the 1990's was not a major factor for the decrease in homicides of the 1990's. Instead, we find that unemployment is most strongly associated with homicide during the late 1990's. The average change in the state unemployment rate was negative between 1995 and 1999 (-0.30) but almost zero for 1989-1994 (0.02) and positive for 2000-2004 (0.33). The fact that associations are strongest for the 1990's boom could suggest some asymmetry between homicide and unemployment where falling unemployment is more strongly associated with homicide than is rising unemployment.

As for the other control variables, the prevalence of homicide is decreasing with age and educational attainment. Members of the control group, whites, are less likely to die of homicide than are those of most other ethnic groups. More surprisingly, married, divorced, and widowed are more likely to die of homicide than are singles. Since we control for age, the higher coefficients on these variables is not because singles tend to be younger. Also of note is that the coefficients on the individual characteristics remain far more stable across the three sub-periods than do the coefficients for the state-level variables, perhaps implying that associations between *macro* level characteristics and homicide are far less stable that are those between individual level characteristics and homicide.

Panel B reruns the specification in Panel A but replaces the unemployment rate with its one-year lag. To save space, only the coefficient upon UR is presented but the control variables remain the same as those in Panel A. The coefficients upon UR generally retain the same magnitudes and significance levels as those in Panel A.

Table 2 considers various subsamples using the same logistic estimation model used in Table 1. Many of the findings from Table 1 hold as little association between unemployment and homicide is found with the exception (albeit not always) of the late 1990's. For whites, the coefficient upon UR during the late 1990's is positive but is not statistically significant due to a high standard error. The association between homicide and the unemployment rate for African-Americans varies, being much stronger during the 1990's when the lag of the unemployment rate (in panel B) replaces the contemporaneous unemployment rate. The last two rows of each panel consider further robustness checks so as to make comparisons between more similar groups. Young people are more likely to die of homicide whereas older people are more likely to die of natural causes. The third row considers only the deaths of the under-45 population so as to consider a sample where homicide is relatively more prevalent. Results now mirror those in Table 1 with positive associations during the 1990's but weaker associations otherwise. In fact, the coefficient upon the unemployment rate in panel A is even greater in magnitude than its counterpart in Table 1. Row 4 removes other types of "external death" such as accidents and suicides and compares homicides versus natural deaths only, but results again hold steady.

Cantor and Land (1985) classify the mechanisms of the unemployment-crime nexus into two segments: motivation effects and opportunity effects. The theory predicts that an increase in unemployment has a lagged positive effect on crime through increased motivation, and a

contemporaneous negative effect on crime through reduced opportunity as more people stay home or close to their property. Our results suggest that the respective magnitudes of these effects could differ over time, at least in regards to homicide, and so alter how the business cycle affects homicide.

Finally, we show how our approach compares to the more common approach of using state-level data for mortality and homicide. Panel A of Table 3 presents the coefficient estimates upon the unemployment rate of regressing the natural log of the state's homicide rate upon the unemployment rate, the state-level controls listed in Table 1, and time and state dummies (i.e. fixed effects). Panel B presents the coefficient estimates upon the unemployment rate when the natural log of the state's homicide rate is replaced by the natural log of the state's mortality rate. To compare with earlier results, we consider similar time windows.

First, the coefficients upon the unemployment rate in panel A are not significant at the 5% level for the three subsamples. One explanation is that the time windows of five to six years are too short to obtain stronger results. One can also compare the coefficients between panels A and B. Of course, the lack of significance precludes reaching any strong conclusions between the two, but we proceed to show how findings from our approach differ from those of more commonly used approaches. The positive coefficient upon UR in panel A for 1989-1994 compared to that in panel B suggests that unemployment raised homicide relative to other types of deaths. Both coefficients are negative for 1995 to 1999. Although the one in panel A is greater in magnitude it is also less precisely estimated than is its counterpart in panel B. Finally, the negative coefficient in panel A for the 2000-04 period suggests that unemployment decreased the homicide rate but increased the overall mortality in panel B. Again, we do not make too much of these results given the insignificance of the coefficients, but we do note how different they are from the results in Table 1, most notably distinctions as to how unemployment influences homicide relative to overall mortality. Findings from our approach does not simply mirror existing ones in this literature.

4. Conclusion

We find that the likelihood of death from homicide relative to death from other causes increased with the state unemployment rate during the late 1990's but no strong association is found during other periods. The estimates in Table 1 provide an interesting nuance to the literature indicating that the association between unemployment and the incidence of homicide differs across the phases of economic expansions and recessions, but have not differed in the same way across the sample period. Most interestingly, we find the strongest association to have occurred during the late 1990's when unemployment generally fell. The lack of association in other periods could then suggest the presence of an asymmetry when changes in homicide are mostly strongly related to unemployment when the latter is falling. Further exploring why these associations differ across subperiods is one avenue of future work. Of course, our sample period ended in 2004 and so we do not claim, especially given the differences in associations within our sample, that the negative coefficient upon unemployment continued to hold after 2004 or during the Great Recession and its aftermath. Our results certainly suggest caution before generalizing or extrapolating findings across different sample periods. Finally, homicide and how it changes over the business cycle is not the only type of death where one might want to focus attention. Suicides, accidents, and

specific types of disease also merit attention. We hope our methodology provides other researchers with an alternative approach to examining these issues.

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Table 1: Pooled Logit Estimates

	(1)	(2)	(3)	(4)
	(1989-2004)	**(1989-1994)**	**(1995-1999)**	**(2000-2004)**
Panel A: Contemporaneous Unemployment Rate				
State UR	0.015	-0.002	0.041**	-0.038
	(0.020)	(0.015)	(0.020)	(0.053)
Age	-0.088***	-0.086***	-0.089***	-0.091***
	(0.001)	(0.001)	(0.001)	(0.002)
No High School	-1.167***	-1.087***	-1.228***	-1.227***
	(0.029)	(0.046)	(0.049)	(0.054)
Some High School	0.202***	0.226***	0.186***	0.173***
	(0.012)	(0.020)	(0.022)	(0.020)
Some College	-0.305***	-0.322***	-0.322***	-0.263***
	(0.014)	(0.019)	(0.019)	(0.031)
College Graduate	-0.369***	-0.538***	-0.463***	-0.104
	(0.106)	(0.032)	(0.023)	(0.252)
Male	0.647***	0.603***	0.639***	0.713***
	(0.013)	(0.023)	(0.022)	(0.023)
African- Americans	1.363***	1.442***	1.309***	1.309***
	(0.027)	(0.039)	(0.042)	(0.059)
Amerindians	0.293***	0.374***	0.270***	0.237***
	(0.038)	(0.068)	(0.067)	(0.060)
Chinese	0.361***	0.374***	0.357***	0.321***
	(0.066)	(0.142)	(0.112)	(0.076)
Japanese	-0.019	0.035	-0.252	0.120
	(0.120)	(0.111)	(0.193)	(0.291)
Others	0.488***	0.589***	0.491***	0.358***
	(0.041)	(0.074)	(0.063)	(0.071)
Married	0.102***	0.151***	0.056**	0.068
	(0.023)	(0.022)	(0.023)	(0.059)
Divorced	0.368***	0.455***	0.340***	0.284***
	(0.017)	(0.028)	(0.027)	(0.033)
Widowed	0.095***	0.110***	0.097***	0.058
	(0.017)	(0.024)	(0.026)	(0.037)
% State White	-0.058	-0.173**	0.031	-0.136
	(0.038)	(0.070)	(0.067)	(0.136)
% State Black	-0.026	-0.182**	0.006	-0.090
	(0.033)	(0.089)	(0.081)	(0.136)

% State Under 5	0.003	-0.098	0.088**	0.356
	(0.041)	(0.069)	(0.043)	(0.348)
% State 65+	0.010	-0.194***	0.042	-0.154
	(0.029)	(0.075)	(0.064)	(0.135)
% State HighSchool	-0.006	0.001	-0.006	-0.051**
	(0.005)	(0.004)	(0.005)	(0.021)
% State Coll. Deg.	0.013***	-0.006	0.011**	0.007
	(0.004)	(0.007)	(0.005)	(0.012)
Ln(State Pop)	-0.701**	-1.187*	-0.107	0.470
	(0.320)	(0.628)	(0.434)	(1.775)
Constant	14.811*	37.774***	-2.540	7.845
	(7.999)	(14.424)	(9.964)	(36.285)
N	32,336,076	10,674,328	10,530,787	11,130,961
Pseudo R Squared	0.37	0.37	0.37	0.36
Panel B: Lagged Unemployment Rate				
State UR	0.009	-0.027	0.033**	0.017
	(0.014)	(0.018)	(0.016)	(0.043)

Notes: The dependent variable takes the value one for a homicide and takes the value zero for other types of death. All regressions contain state and year dummies. Robust standard errors clustered at the state-year level in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 2: Logit Coefficient Estimates on State UR for Subsamples

	(1)	(2)	(3)	(4)
	(1989-2004)	**(1989-1994)**	**(1995-1999)**	**(2000-2004)**
Panel A: Contemporaneous Unemployment Rate				
Whites	0.021	-0.012	0.032	-0.047
	(0.030)	(0.019)	(0.025)	(0.078)
African- Americans	0.008	0.001	0.032	0.004
	(0.012)	(0.019)	(0.027)	(0.023)
Under 45	0.016	-0.005	0.048**	-0.039
	(0.019)	(0.016)	(0.022)	(0.048)
Only Natural Deaths	0.017	-0.000	0.038*	-0.032
	(0.023)	(0.015)	(0.022)	(0.060)
Panel B: Lagged Unemployment Rate				
Whites	0.015	-0.031	-0.004	0.031
	(0.020)	(0.021)	(0.024)	(0.062)
African- Americans	-0.001	-0.024	0.067**	0.005
	(0.011)	(0.021)	(0.027)	(0.022)
Under 45	0.007	-0.031*	0.038**	0.012
	(0.014)	(0.019)	(0.018)	(0.041)
Only Natural Deaths	0.014	-0.026	0.025	0.034
	(0.016)	(0.017)	(0.018)	(0.048)

Notes: The dependent variable takes the value one for a homicide and takes the value zero for other types of death. All regressions contain state and time dummies. Other control variables are not presented but are similar to those in Table 1. Estimation is conducted using a logistic regression methodology. Robust standard errors clustered at the state-year level in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 3: Fixed Effects Estimates Using State Mortality Rate

	(1)	(2)	(3)	(4)
	(1989-2004)	**(1989-1994)**	**(1995-1999)**	**(2000-2004)**
Panel A: Dependent variable is the natural log of the state homicide rate				
State UR	0.0243*	-0.0054	-0.0168	0.0022
	(0.013)	(0.021)	(0.027)	(0.023)
Observations	796	295	250	251
R^2	0.58	0.14	0.47	0.11
Panel B: Dependent variable is the natural log of the state overall mortality rate				
State UR	-0.0017	-0.0030**	0.0040	-0.0061***
	(0.002)	(0.001)	(0.003)	(0.002)
Observations	806	300	251	255
R^2	0.59	0.60	0.51	0.70

Notes: The dependent variable is the state homicide rate. All regressions contain state and time fixed effects and are conducted by regressing the respective mortality rate (homicide or overall) upon the unemployment rate and state-level control variables. These control variables are not presented but are the same as the state-level controls in Table 1. Robust standard errors clustered at the state level in parentheses. *** p<0.01, ** p<0.05, * p<0.1