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Employment Dynamics and the Nashville Tornado

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Abstract. This study examines changes in Nashville's labor market following the April 16, 1998 tornado. Specifically, the study focuses on whether or not employment growth experienced a change in mean around the time of the tornado. A time series intervention model that allows for time-varying variance is used to examine the labor market dynamics associated with the impact of the tornado and the ensuing recovery process. The analysis of employment growth is conducted at the aggregate (overall) level as well as for seven industrial sectors. The empirical findings may be summarized as follows. The aggregate Nashville labor market, along with manufacturing, service, transportation and public utilities, and wholesale, retail trade sectors, experienced a more stable employment growth rate in the post-tornado period. Employment in the construction and mining and government sectors exhibited no evidence of change between the pre- and post-tornado periods. Employment growth in the finance, insurance, and real estate sector was lower in the post-tornado period than in the pre-tornado period, while employment growth in the transportation and public utilities sector significantly increased in the period following the tornado.

1. Introduction

On April 16, 1998 a tornado outbreak hit areas of the Tennessee and Ohio Valley region including downtown Nashville. The latter tornado struck Nashville's downtown business district damaging many large buildings and office complexes. While most of the damage was sustained by the downtown historical buildings, the tornado also caused damage to the construction site of the Tennessee Titans football stadium. When all was said and done, the Nashville tornado caused over $100 million worth of damage to Nashville alone and, according to the Tennessee Department of Commerce

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and Insurance (1998), $175 million in claims were paid out due to the tornado. Fortunately, the tornado only injured a few people.

It is often argued that an event such as a tornado will have an immediate (i.e., short-run) impact on the local economy because it may cause extensive physical damage to commercial and residential property. Communities and particular industries may respond to the destruction of physical capital and technology from tornadoes by reconstructing better facilities and infrastructure, as well as developing mitigation devices. Due to these enhancements and reorganization, it is often purported that the local economy may show signs of economic improvement in the longer-run period following the tornado. Similarly, Guimaraes, Hefner, and Woodward (1993) asserted that the devastation of a hurricane can disrupt the economic activity of a region or city in the short-run, but in the long-run, the disaster may actually provide some economic benefit. This may be true for a local economy after a tornado, and it should be of practical importance to policymakers to understand how the local economy reacts to natural disasters. In particular, knowledge of how various industries or sectors respond to tornado-induced destruction and thus contribute to regional economic development is of vital importance.

The focus of this research is on the dynamics of employment change following the April 16, 1998 Nashville tornado. Nashville is the state capital of Tennessee. The city is also a popular destination for vacationers with numerous museums and parks including the Parthenon-Centennial Park, Belle Meade Plantation, The Hermitage, Belmont Mansion, as well as the home of country music with such historical sites as the Ryman Auditorium, Grand Old Opry, and the Opryland hotel. In addition, Nashville is home to several colleges, universities, and professional sports franchises such as the Tennessee Titans. The choice of an urban area to study the impact of a tornado and the recovery process is particularly informative for a number of reasons. First, there are a number of industries represented that are likely to respond to the event in different ways, perhaps due to their specific characteristics and to variation in the distribution of resources. Second, there is a sufficiently large population base and labor force in which to examine the dynamics of labor market change. In our analysis of this labor market, we focus on Nashville's total employment growth rate, controlling for state and national business cycles and trends. We also examine the growth rates for seven major industries within the Nashville labor market. As the volatility of employment growth may be an important indicator of the state of the labor market, we also examine the conditional variance of employment growth.[2]

[2] In the context of unemployment, Ewing and Kruse (2002) provided an in-depth discussion of how volatility of labor market aggregates may be used as indicators of the state of the labor market. The present study extends the Ewing and Kruse research by utilizing the employment growth rate and its variance as indicators.

2. Labor Market Indicators, Economic Performance, and the Tornado

Standard macroeconomic analysis asserts that employment and production are inherently linked in an economy and potential output can be expressed in terms of employment, capital, and technology (Romer 1996). Employment, or the number of individuals employed, is one way that policymakers describe the economic condition of a particular labor market. For this reason, employment growth is often used as an indicator of economic performance. In fact, a number of studies have examined the effects of shocks on employment and output at the national and regional level (e.g., Caballero, Engel, and Haltiwanger 1997; Clark 1998; Long and Plosser 1987). Local and regional policymakers typically prefer positive employment growth increases over time. Similar to the national economy, a regional economy's growth is constrained by factors such as its existing capital stock, technology, and infrastructure.

An alternative way in which to describe the economic condition of a labor market is to characterize the volatility of that labor market's employment growth rate. A labor market that exhibits low volatility implies a more stable economic environment. One way the volatility of the labor market can be measured is by the variance of employment growth. A less volatile labor market, reflected in a lower variance in employment growth, all else equal, is preferred to an employment growth rate with higher variance. This is because the variance can be thought of as a measure of the risk inherent in successful labor market matches. For example, with high variance it may be more difficult for firms to engage in accurate long-term planning and decision making regarding their labor force. Firms are able to place greater confidence in activities such as employment projections of needs and staffing when there is a low variance in employment growth, all else equal. Generally speaking, a riskier or more volatile labor market may make firms reluctant to locate in the area or to remain in the area as decisions relating to labor force needs are more difficult and more costly. Additionally, a less stable environment may make potential or existing employees reluctant to migrate to the area and cause these labor market participants to be less likely to remain in the area. Moreover, a stable labor market should lead to a steady personal income stream, which may translate into a relatively more stable tax base and revenue stream. Thus, policymakers will generally prefer a less volatile labor market.

Our approach builds on the work of Skidmore and Toya (2002) who examined the relationship between the frequency of natural disasters and long-run aggregate economic growth over a number of countries. Their empirical findings suggested a positive and statistically significant relationship be-

tween disasters and economic growth. Moreover, they find that climatic disasters (e.g., tornadoes, hurricanes) are positively related to human capital accumulation. Their explanation for these findings was based on an endogenous growth theory model. Basically, they argued that in a Solow-type model a natural disaster shock reduces the capital stock and replacement leads to improved productivity. Moreover, disaster risk may lead to a reallocation of resources from physical capital to human capital and thus employment growth relative to capital growth. Our paper differs from theirs in that we focus on the labor market of a *regional* economy and one particularly devastating tornado using time series analysis. Our conclusions complement those of Skidmore and Toya (2002).

3. Employment Data

This study used monthly employment data from January 1980 to December 2002 for seven sector-specific industries for Nashville Metropolitan Statistical Area (MSA) as well as (aggregate) total employment for the MSA.[3] The data was obtained from the Bureau of Labor Statistics' *Employment and Earnings* (various issues). In addition, the respective state employment figures were also obtained. We seasonally adjusted the data and calculated the employment growth rates for Nashville and the different industries, as well as for the state-level data.[4] The seven specific industries used were: construction and mining (CMN); finance, insurance, and real estate (FIR); government (GOV); manufacturing (MFR); mining (MIN); services (SRV); transportation and public utilities (TPU); and wholesale, retail trade (WRT).

The total employment growth rates for Nashville and Tennessee over the entire sample period are shown in Figure 1. The post-tornado period is represented by the shaded area. While the local economy may be influenced by the state business cycle, there are several periods of time in which Nashville's employment growth rate does not mirror the movements of the state's employment growth rate. Descriptive statistics for the Nashville area are provided in Table 1. Interestingly, all seven industries, as well as the total, exhibit a (mean) positive employment growth over this time period. Although, the manufacturing (MFR) industry has the lowest mean employment growth rate of 0.581 and the service industry has the highest mean employment growth rate of 5.492. Both the finance, insurance, and real estate (FIR) and transportation and public utilities (TPU) sectors experienced their highest employment growth rate in just a couple of months following the tornado. In addition, the construction and mining (CMN) industry has the

[3] There are two exceptions: the construction and mining sector date starts on January 1988 and the service sector date starts on January 1983.

[4] We use the ratio-to-moving-average (multiplicative) method available in EViews 4.0. Harvey (1994) provides additional background on seasonal adjustment of time series. Growth rates were calculated as $[(e_t - e_{t-12})/e_{t-12}]*100$, where e represents employment. Besides being easy to interpret, the use of the year-over-year calculation should eliminate any remaining effects of seasonality.

largest standard deviation of all the industries indicating that it is the most volatile sector, and the wholesale, retail trade (WRT) industry is the least volatile with the smallest standard deviation. The descriptive statistics illustrate that these industries differ from one another and, thus, we should not necessarily expect each sector's employment growth rate to behave identically in response to the tornado.

The plots of employment growth rates for each industry, with the shaded area depicting the post-tornado period, are shown in Figure 2. These plots also highlight the relatively high variability in the construction and mining (CMN) industry, as well as the differences in variability among the different industries. To analyze how employment growth may have changed following the tornado, we proceed with a more formal examination of employment growth using modern statistical time series techniques.

4. Empirical Methodology

We estimate a variation of Enders (2004) intervention time series econometric model to characterize changes in the dynamics of employment growth following the April 16, 1998 Nashville tornado. The first step in the analysis involves the construction of the autoregressive moving average (ARMA) models of total employment growth for Nashville and the employment growth rates of the seven sector-specific industries. Standard univariate ARMA models allow for momentum in the employment growth rates through the autoregressive (AR) term, while the moving average (MA) term should capture much of the labor market response to past surprises in employment growth. The ARMA terms are capable of characterizing a temporary or transitory change in the growth rate that may be due to the effects of the tornado and recovery process. Since we further expect the Nashville labor market to be affected by the state and national business cycles, we augment each of the ARMA models with the state's employment growth rate that corresponds to the seven industries and overall or aggregate employment.[5] These business cycle terms are particularly important to include for sectors that may have experienced state/nationwide changes in employment

[5] Payne, Ewing, and George (1999) provided evidence that individual state and national labor markets are linked in the long run. Thus, to avoid the multicollinearity problem, we only include the state growth rates. Nashville is the largest city in Tennessee; therefore, we performed a series of Granger-causality tests to determine whether or not Nashville (overall and by sector) was a significant driver of the respective state employment growth rate. In all but one case, we failed to reject the null hypothesis that Nashville employment growth did not "Granger-cause" Tennessee employment growth. The exception was for the finance, insurance, and real estate (FIR) industry (F-statistic = 3.45, p-value = 0.03). As such, we used the U.S. FIR employment growth in place of Tennessee FIR employment growth and the results were qualitatively unchanged. Plots of the state and local employment growth rates by industry are available on request.

growth. Controlling for these industry-wide movements allows us to attribute changes in the Nashville growth rate(s) to the intervention. In other words, including the state/national industry business cycle variables in the model removes any co-mingling effects.

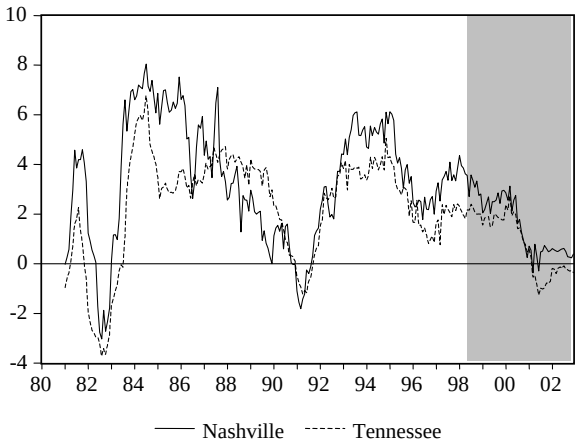


Figure 1. Total Employment Growth for Nashville MSA and Tennessee
Note: The shaded area represents the post-tornado period.

Table 1. Descriptive Statistics of Nashville MSA Employment Growth by Industry

	Mean	Max.	Min.	Std. Dev.
Total Employment	3.002	8.039	-3.035	2.343
Construction and Mining	1.725	18.537	-19.421	7.924
Finance, Insurance, and Real Estate	2.529	10.606	-8.133	3.972
Government	1.563	11.473	-7.164	2.691
Manufacturing	0.581	10.493	-9.452	3.769
Service	5.492	19.300	-1.961	3.056
Transportation and Public Utilities	3.245	15.517	-7.051	3.877
Wholesale, Retail Trade	3.299	10.943	-2.362	2.492

Notes: These growth rates are for the period of January 1981 to December 2002. There are 264 usable observations with the exception of construction and mining (i.e., January 1989-December 2002; 168 observations) and service (i.e., January 1984-December 2002; 228 observations). Data are from the U.S. Bureau of Labor Statistics' *Employment and Earnings* (various issues).

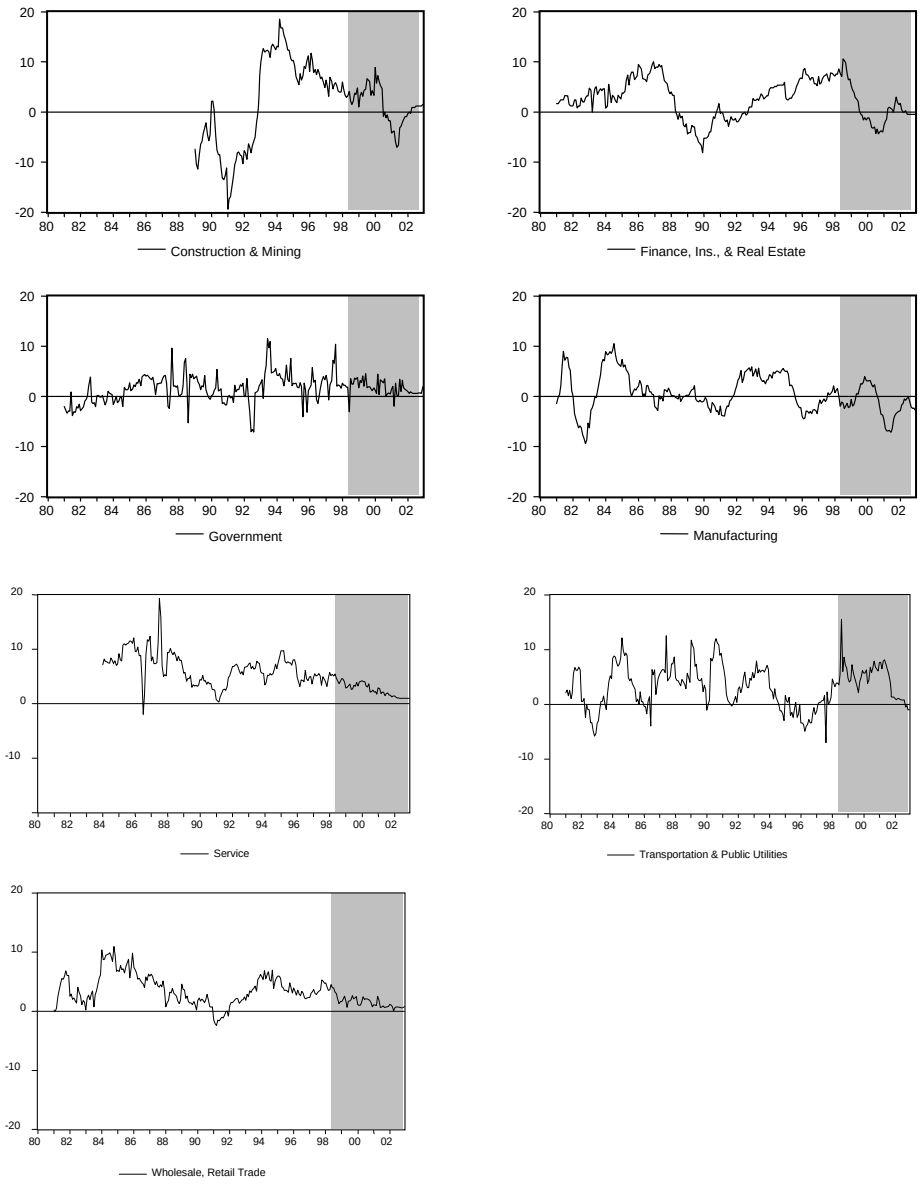


Figure 2. Nashville MSA Employment Growth by Industry Note: The shaded area represents the post-tornado period.

To test for a change in the mean employment growth rate, the ARMA model includes a tornado intervention variable designed to capture the effects of the tornado and ensuing recovery process. The intervention variable denoted π in equation (1) is represented by a jump variable, which equals one from May 1998 to December 2002 and zero otherwise, and is therefore analogous to a technology shock. Specifically, we define the intervention variable as:

$$\pi_t = \begin{cases} 1, & \textit{May } 1998 - \textit{December } 2002 \\ 0, & \textit{otherwise} \end{cases} \tag{1}$$

The ARMA model, augmented with the respective state employment growth rate and tornado intervention variable, is given as:

$$\phi(L)\mu_t = \beta_0 + \beta_1 s_t + \beta_2 \pi_t + \beta_3 T + \theta(L)\varepsilon_t \tag{2}$$

where β_1 is the coefficient on the respective state employment growth rate variable, s; β_2 is the coefficient on the intervention variable, π; and β_3 is the coefficient on the deterministic trend variable, T.[6] $\phi(L)$ and $\theta(L)$ are polynomials in the lag operator. Equation (2) is referred to as the mean equation as it is specifically used to model the employment growth rate.

The best-fitting specification of equation (2) is identified using standard Box-Jenkins techniques.[7] The autoregressive of order one (AR[1]) model was selected in each case, augmented with the (contemporaneous) state employment growth rate and intervention variable.[8]

The conventional model assumes the error process has zero mean and constant variance such that $\varepsilon_t \sim N(0, \sigma^2)$. Ordinary least squares estimation is appropriate for such cases. However, when the error process has a time-varying variance, i.e., $\varepsilon_t \sim N(0, h_t^2)$, alternative estimation methods are needed. We test each of the chosen specifications of equation (2) for ARCH effects using the test described by Engle (1982). If no ARCH effects were detected, we treat equation (2) as a conventional ARMA(1,0) model and estimated accordingly. In the case of time-varying volatility, we estimate equation (2) simultaneously with the (conditional) variance given in equation (3) via the method of maximum likelihood:

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[6] The inclusion of a time trend variable is used to account for possible changes in the potential output of the economy that may be due to such factors as productivity gains and changes in technology (Gordon 2002).

[7] Mills (1999) describes the Box-Jenkins technique for choosing model specification based on goodness-of-fit.

[8] Equivalently, the AR(1) model is a special case of the more general ARMA model and can be described as ARMA(1,0). The absence of significant moving average terms implies that for Nashville employment growth, immediate past surprises are not all that important in determining an expectation of current employment growth. What appears to be an important factor, however, is the immediate past value (i.e., momentum) of the employment growth rate and this is captured in the AR(1) component of the model.

$$h_t^2 = \beta_4 + \beta_5 \varepsilon_{t-1}^2 + \beta_6 \pi_t \quad (3)$$

where β_6 is the coefficient on the intervention variable, π, in the (conditional) variance equation. $V_t\left(\varepsilon_t | \Omega_{t-1}\right) = h_t^2$ is the conditional variance of ε_t with respect to the information set Ω_{t-1}.[9] Equation (3) contains a moving average component known as the ARCH term.[10] Including the intervention variable in the conditional variance equation will capture any change in labor market stability over the sample period. Lastrapes (1989) has shown that ignoring regime changes in variance leads to an overestimate of volatility persistence as the model would be mis-specified.

The (mean) equation (2) exhibited evidence of autoregressive conditional heteroscedasticity for several industries in Nashville. Estimation of the ARCH-class model is appropriate for the government (GOV), manufacturing (MFR), service (SRV), transportation and public utilities (TPU), and wholesale, retail trade (WRT) industries, as well as for total employment growth. The nature of this time-varying volatility property implies that the inherent risk in labor market matches and activity is not constant over time. In contrast, the construction and mining (CMN) and finance, insurance, and real estate (FIR) labor markets appeared to have a more steady, constant risk pattern. The next section discusses the empirical findings.

5. Empirical Results and Discussion

The empirical results from estimating equations (2) and (3) are presented in Table 2.[11] We find that that the coefficient on the autoregressive term in equation (2) is positive and significant in all industries as well as for total employment. This finding has several implications. First, there is momentum in employment growth rates. If employment growth was positive (negative) last month, then there is a tendency for growth to be positive (negative) in the current month, also. This might be the case when current demand for goods and services is rising and firms expect future demand to

[9] We computed the quasi-maximum likelihood covariances and standard errors as described in Bollerslev and Wooldridge (1992). The model is estimated under the assumption that the errors are conditionally, normally distributed.

[10] Equation (3) may contain up to q ARCH terms; however, we found q=1 sufficient to capture all ARCH effects.

[11] The U.S. economy experienced a recession in 2001, which certainly could have an effect on the Nashville labor markets. In order to address this concern, we re-estimated the models with a control variable for the recession (equal to one for March 2001 to November 2001 and zero otherwise as determined by NBER). The results and conclusion were unaffected by the inclusion of this control variable. In addition, the coefficient of the recession variable was insignificant at the 5 percent level for total employment and all industries except wholesale, retail trade industry (estimated coefficient = 0.40, p-value = 0.02).

remain strong and, thus, increase their labor force. In particular, this momentum effect ranges from a low of 0.60 (GOV) to a high of 0.89 (SRV). This indicates that a one percentage point change in employment growth last period contributes between over one-half to almost all of one percentage point change in current growth. Second, controlling for state business cycles and the intervention, unanticipated changes in employment growth (i.e., shocks) are only temporary (or transitory) as the employment growth rate will return to its unconditional mean. In this sense, it may be said that the growth rate returns to its trend rate of growth following shocks; therefore, policymakers need to be aware of these employment dynamics before implementing any kind of policy since labor market shocks are only temporary. This is in line with standard growth theory models in which there are diminishing returns to factor inputs (Romer 1996). A shock is most persistent in the service (SRV) sector as measured by the time it takes for employment to return to its long-run equilibrium growth rate. The results also indicate that the state business cycle, as measured by the respective industry or total state (contemporaneous) employment growth rate, is a major factor in determining labor market activity in Nashville. Further, we find that only two industries (i.e., TPU and WRT) have a statistically significant deterministic trend suggesting that they may have experienced changes in their potential output growth over time.

Table 2. Results of the Employment Growth Models

Mean Equation	TOT	CMN	FIR	GOV	MFR	SRV	TPU	WRT
Constant (β_0)	0.270[b]	-1.211	-0.155	0.056	0.264[c]	-0.326	0.519	0.516[a]
EG(t-1)	0.819[a]	0.752[a]	0.880[a]	0.603[a]	0.824[a]	0.894[a]	0.814[a]	0.746[a]
State EG (β_1)	0.164[a]	0.428[a]	0.147[a]	0.250[a]	0.172[a]	0.172[a]	0.167[a]	0.231[a]
Tornado (β_2)	-0.066	0.194	-0.517[b]	-0.411	0.101	0.074	1.222[a]	0.155
Trend (β_3)	-0.000	0.006	0.002	0.003	-0.001	-0.000	-0.006[b]	-0.002[c]
Variance Equation								
Constant (β_4)	0.370[a]	- - -	- - -	1.768[a]	1.085[a]	1.027[a]	3.461[a]	0.805[a]
ARCH (β_5)	0.286[a]	- - -	- - -	0.838[a]	0.052	0.660[a]	0.178[a]	0.111[c]
Tornado (β_6)	-0.254[a]	- - -	- - -	-0.290	-0.379[c]	-0.893[a]	-0.867[a]	-0.573[a]
Log Likelihood	-245.3	-312.3	-375.9	-528.5	-378.5	-320.3	-547.4	-323.1
ARCH LM	0.002	0.067	1.604	0.831	0.000	0.052	1.704	0.074
F-statistic	417.1[a]	983.2[a]	932.2[a]	28.0[a]	450.4[a]	119.4[a]	93.5[a]	256.5[a]

Notes: Superscripts a, b, c denote significance at the 1%, 5% and 10% levels, respectively. These growth rates are for the period of January 1981 to December 2002. There are 264 usable observations with the exception of construction and mining (i.e., January 1989-December 2002; 168 observations) and service (i.e., January 1984-December 2002; 228 observations). Data are from the U.S. Bureau of Labor Statistics' *Employment and Earnings* (various issues).

In addition, the aggregate Nashville labor market changed following the April 1998 tornado, conditional upon the recovery policies that followed. While the total employment growth rate appears to be unaffected by the tornado and recovery process, there was a significant change in labor market volatility. The variance of the employment growth rate dropped in the post-

tornado period (estimated coefficient = -0.25, probability value < 0.01). This result indicates that the labor market became more stable following the tornado. It may not be the case, however, that each and every sector that comprises the total MSA labor market became more stable. In fact, given the differences highlighted in Table 1 and Figure 2, it is likely that individual sectors responded differently to the tornado.

To better understand the impact of the Nashville tornado and recovery process, we examined the pre- and post- tornado employment growth time series patterns of each of the seven industries that comprise the total labor market. Generally speaking, the intervention effect of the Nashville tornado and recovery process on employment growth varied by industry. Some industries experienced both significant positive and negative effects in their labor markets in the period following the tornado, while others did not.

The Nashville tornado and recovery was associated with an increase in employment growth in the transportation and public utilities (TPU) industry (estimated coefficient = 1.22, probability value = 0.01). In addition, the coefficient on the intervention variable in the variance equation was negative and significant (estimated coefficient = -0.87, probability value = 0.01). The transportation and public utilities (TPU) sector experienced both a significant increase in the employment growth rate, as well as a significant decline in labor market volatility. This is consistent with the idea that this industry provides transportation for gas, sanitary services, postage, and other essentials necessary for the rebuilding process.

The coefficient on the intervention variable was insignificant in the mean equation for employment growth in the manufacturing (MFR), service (SRV), and wholesale, retail trade (WRT) industries. While these industries provide many of the goods and services following a tornado that are necessary for recovery, they tend to be very volatile industries. The coefficient on the intervention variable in the variance equation was found to be negative and significant for the manufacturing (MFR), service (SRV), and wholesale, retail trade (WRT) sectors (estimated coefficients = -0.38, -0.89, -0.57 and probability values = 0.05, <0.01, <0.01, respectively). This indicates that the variance of the employment growth rate fell in the post-tornado period for each of these industries. These sectors became more stable following the tornado, a finding that is consistent with these industries providing a variety of goods and services including food, furnishings, plastics, equipment, hotel and lodging services, repairs, entertainment, health and legal services that are necessary in the rebuilding and recovery process.

The finance, insurance, and real estate (FIR) industry was actually worse off in the post-tornado period than it was in the pre-tornado period. The coefficient on the tornado intervention variable in the mean growth rate equation for finance, insurance, and real estate (FIR) was negative and significant (estimated coefficient = -0.52, probability value = 0.02). The finance,

insurance, and real estate (FIR) industry is comprised of depository institutions, insurance carriers, and other investment offices that are skilled in pooling and managing risk, including many types of downside risk. While insurance carriers settled claims and banks suffered losses as some businesses and homeowners may have defaulted on loans or become delinquent on payment, the devastation and rebuilding likely benefited these companies as new structures and equipment required financing and insurance. Of course, many new and rebuilt structures would presumably be of better quality than their predecessors resulting in higher property values. Given that we found a lower employment growth rate in the post-tornado period, it may be that the negative employment growth effects associated with the tornado more than offset any positive effects from the rebuilding process. This negative result should be viewed with some caution. Note that FIR entered a downturn around the time of the 1987 stock market correction and also prior to the tornado in 1998, around the time of several other well-known financial crises (see Figure 2). It may be that the adverse labor market effect that our model is picking up could, in fact, be partially attributed to this latter downturn even though we are controlling for momentum (AR term), deterministic trends, and the state-level industry business cycle.

Employment in the construction and mining (CMN) and government (GOV) sectors exhibited no evidence of change between the pre- and post-tornado periods. The coefficients on the tornado intervention variable in the mean equations were insignificant. Construction may have been limited in the post-tornado period due to delays and time lags inherent in the rebuilding process; however, the estimated coefficient is positive as would be expected. The lack of significance on the tornado coefficient may also be attributed to the inclusion of the mining sector. Our results also indicated that the government sector employment growth rate exhibits significant ARCH effects. In fact, of all the growth series examined, the government (GOV) sector had the largest coefficient on the ARCH term indicating that shocks to the variance of employment growth are the most persistent in this sector; however, the coefficient on the tornado intervention variable in the variance equation was insignificant. Thus, no change in the time series pattern of the variance was detected.

6. Concluding Remarks

This research examined how the Nashville labor market changed following the April 16, 1998 tornado. The time series intervention analysis revealed several important insights into the effects the tornado and recovery process had on the mean and variance of the employment growth rate in this local economy. Generally speaking, the different industrial sectors of the Nashville economy exhibited a variety of time series responses to the intervention. When designing policy to combat and mitigate the effects of tornadoes, policymakers should take into account how different industries react to this type

of natural disaster and the recovery processes that were in place. The empirical findings for the January 1980 to December 2002 sample period may be summarized as follows. The aggregate Nashville labor market, along with manufacturing, service, transportation and public utilities, and wholesale, retail trade sectors, experienced a more stable employment growth rate in the post-tornado period. Employment in the construction and mining and government sectors exhibited no evidence of change between the pre- and post-tornado periods. Employment growth in the finance, insurance, and real estate sector was lower in the post-tornado period than in the pre-tornado period, while employment growth in the transportation and public utilities sector significantly increased in the period following the tornado. To the extent that increased labor market stability is considered to be an economic improvement, then our findings are generally in agreement with the findings of Skidmore and Toya (2002).

These results may not generalize to other MSAs due to the specific characteristics of different regions and local labor markets. Future work should be geared at investigating the economic impact of other tornadoes. Comparisons can be made to determine if patterns emerge in the response of local labor markets to tornadoes, perhaps by industry or by the nature and atmospheric characteristics of the tornado. This avenue for future research may prove especially useful in constructing mitigation strategies and policy.

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