New evidence on the importance of gender and asymmetry in the crime-unemployment relationship[†]

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ABSTRACT

The literature examining the crime-unemployment relationship is extended. A novel method is employed to allow analysis of the impact of unemployment on the probability of 'high' or 'low' regimes of criminal activity being observed. Drawing upon notions of opportunity and motivation effects, a number of interesting results are obtained. The importance of gender is apparent with opportunity effects detected when considering female, but not male unemployment. The striking feature of the results presented is that when considering disaggregated crime classifications, gender effects are apparent for violent crimes (rape and assault) but not property crimes, and their observed impact supports theories of victimisation rather than an absence of parental supervision. Consideration of motivation effects provides evidence of significant asymmetries in the response of crime to unemployment.

Key words: Crime; Unemployment; Gender; Asymmetry.

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1.   Introduction

Interest in a potential relationship between criminal activity and unemployment has a long history spanning many disciplines. This is illustrated by consideration and comparison of studies such as those of Ehrlich (1973), Merton (1938), Cloward and Ohlin (1960) and Arvantes and Defina (2006). Whilst the importance of unemployment arises in the first of these works as a result of individuals evaluating the expected net benefits of legitimate and illegitimate activities, it appears in the latter via strain theory and the tensions it can create as individuals struggle to achieve socially determined goals. However, despite these studies suggesting a consensus in the views of the impact of unemployment upon crime, a degree of inconclusiveness has been noted in the associated empirical literature. This is perhaps most famously illustrated by the reference to a 'consensus of doubt' in the survey article of Chiricos (1987), but is recognised also in the studies of, *inter alia*, Freeman (1980), Tarling (1982), Long and Witte (1983) and Box (1987).

An obvious response to the empirical uncertainty concerning the crime-unemployment relationship is to consider possible underlying complexities which existing studies have failed to incorporate. In the present study, three such proposals or developments are considered and combined using a novel empirical method to shed further light on the link between crime and unemployment. The three developments considered relate to (*i*) the isolation of *opportunity* and *motivation* effects underlying criminal activity (see Cantor and Land, 1985), (*ii*) the importance of gender when considering unemployment and (*iii*) asymmetries in the response of crime to unemployment. While these issues are recognised in the literature, their combination within a single framework involving the use of a novel statistical method provides an extension to existing research. Using aggregate data for the United States, the method employed follows a two-step approach in which alternative measures of crime and unemployment are partitioned into 'high' and 'low' regimes. The second step then examines whether the high and low states of unemployment significantly impact upon the probability of high or low crime states being observed.

To achieve its objectives, this paper will proceed as follows. In section [2] the three developments allowing extension of the analysis of the crime-unemployment relationship are discussed. In section [3] the novel method employed to perform the required empirical analysis is presented. The data examined herein are discussed in section [4], with the results obtained from their examination provided in section [5]. Section [6] concludes.

2.   Developments of the crime-unemployment relationship

2.1.   Opportunity and motivation effects

The first development of the crime-unemployment relationship considered herein is provided by the work of Cantor and Land (1985), hereafter referred to as CL. This research proposes that the impact of unemployment on crime has two underlying, and countervailing, components: a pro-cyclical *opportunity effect* and a counter-cyclical *motivation effect*. As a result, consideration of the crime-unemployment relationship can prove confusing if the two counterbalancing effects are not isolated. The arguments underlying the impact of these effects are intuitive. During 'good times', income, and consequently consumption, will increase, which then increases the quality and quantity of criminal opportunity. This is exacerbated by a related decrease in guardianship, as the increased working hours result in poorer supervision of valuables. As a result, the opportunity effect is said to be positively related to the state of the economy. In contrast, the motivation effect finds its basis in the strain theory discussed previously; an approach that can be traced back beyond Merton (1938) to the work of Emile Durkheim. As noted by a number of authors (see, *inter alia*, Agnew 1992; Messner and Rosenfeld 1994; Messner and Rosenfeld 1996), it is the gulf between the actual and desired circumstances of an individual that provides the impetus for criminal activity. As this gulf widens during downturns, the motivation effect is proposed to be negatively related to the state of the economy.

Given the potential insight provided by the opportunity and motivation effects of CL, they will be used to shape the subsequent analysis. This requires use of the 'temporal distinction' introduced by CL. While CL view opportunity effects as relevant to the linkage between *changes* in crime and the *level* of unemployment,

motivation effects are considered to be concerned with the *changes* in crime and *changes* in unemployment. The basis of this distinction is provided by the view that opportunity is a 'within period effect' determined by current situations, while motivation involves a delayed, or lagged, effect. Formally, this results examination of a potential relationship between changes in crime (ΔC) and the level (U) when considering opportunity:

$$(1) \qquad \Delta C = f(U)$$

and examination of the relationship between changes in crime and changes in unemployment as below when considering motivation:

$$(2) \qquad \Delta C = g(\Delta U)$$

where $f(\cdot)$ and $g(\cdot)$ denote general functional relationships.

2.2. Gender effects

In a similar manner to the arguments of CL suggesting that a failure to isolate the impact of opportunity and motivation effects may hinder examination of the crime-unemployment relationship, previous research has proposed that male and female unemployment need to be distinguished. This 'gender effect' is present in studies such as Hale (1999), Kapuscinski *et al.* (1998) and Witt and Witte (1998) which consider the importance of *female*, rather than simply aggregate, employment levels. Such discussion leads naturally to consideration of the issue of parental supervision and its importance in relating female unemployment to crime. Simply put, it has been argued that whilst decreased female unemployment (increased female employment) leads to additional household income, it causes a reduction in direct parental supervision. Such an argument is present in the work of Hoffman (1974) where decreased maternal supervision can increase the tendency of children towards crime in later life. This is supported further by Vandell and Ramanan (1991) where it is concluded that 'latchkey care' is associated with greater behavioural problems.

Aizer (2004) supplements this research by finding that children with less supervision are more likely to consume drugs, to steal and to commit *violent* crime. This explicit link to *violent* crime is particularly interesting as studies such as Bourgois (1996) and Macmillan and Gartner (1999) suggested low female unemployment will *increase* increase violent crime via their impact upon gender identities, with perceived threats to masculinity increasing domestic violence in particular. Therefore reduced parental supervision and gender identity arguments both suggest that female unemployment is negatively related to crime. In contrast to this, hypotheses based upon the worsening socio-economic conditions preventing an escape from violence and crime, propose a positive link between female unemployment and crime (see Kapuscinski *et al*. 1998). This might be referred to as a victimisation effect with limited independence resulting in an inability to overcome violent crime. In summary, 'latchkey care' and 'gender identity' arguments propose a negative relationship between crime and female unemployment, while 'victimisation' effects predict a contrasting negative relationship.

Given the importance of the distinction between male and female levels of unemployment, this gender-based distinction will be incorporate rather than aggregate unemployment being considered.

2.3.   The asymmetric response of crime to unemployment

A final feature used to shape the analysis herein is the issue of asymmetry in the response of crime to unemployment. The need for this to be considered more fully in the literature is apparent in the empirically-driven analyses of Osborn (2000) and Mocan and Bali (2010). To illustrate this, the work of Mocan *et al*. (2005) can be considered where unemployment is viewed as having differential effects on legal and criminal 'human capital', thus provoking the potential for hysteresis in crime effects. As a consequence of this, any decrease in crime generated by economic recovery can be expected to be smaller than the increases caused by downturns. The need for asymmetry to be incorporated is clear in light of numerous studies which fail to allow for its presence (see, *inter alia*, Cook and Zarkin, 1985; Hale 1991; Hale and Sabbagh 1991;

Greenberg 2001). As will be seen, the method employed herein permits differing effects on criminal activity resulting from 'high' or 'low' levels or changes in unemployment.

In summary, this article employs a framework with two crucial, and interrelated, features. First, the analysis seeks to draw upon all of the above extensions by considering alternative classifications of crime and unemployment, decoupling the opportunity and motivation effects and incorporating any potential for asymmetric behaviour. Second, in order to advance upon previous research, a new empirical method is adopted to fulfil the required analysis with the specific intention of providing a more direct examination of the relationship between crime and unemployment.

3. A probabilistic perspective on the crime-unemployment relationship

As discussed above, the intention of this article is to consider whether the probability of 'high' or 'low' unemployment regimes have a significant impact upon the chances of 'high' or 'low' crime regimes being observed.[1] Specifically it is queried whether the probability of 'high' ('low') crime are increased or decreased as a result of 'high' or 'low' unemployment. This results in four possible combinations of crime and unemployment for consideration, with both 'high' and 'low' regimes of one being considered in combination with both high and low regimes of the other. However, this number of combinations is doubled by consideration of both opportunity and motivation effects and then increased further via the use of alternative classifications of crime and unemployment. However, before complicating the analysis by considering these extensions, the method is presented below in a simple format.

3.1. The underlying probabilistic method

To fulfil the proposed analysis, the present study modifies the approach used by Drennan and Lobo (1999); a method originally constructed to analyse income convergence. In essence, this method considers the impact of one variable (U) upon another (C), by examining the difference between the conditional probability $prob(C)$ and the unconditional probability $prob(C|U)$. Denoting the unconditional probability as π and the

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[1] As noted earlier, when considering 'high' or 'low' crime or unemployment reference will be made to 'regimes' as at differ times the levels or changes of variables will be considered. 'Regimes' is then a catch-all term to be used irrespective of whether changes or levels are being considered.

conditional probability as π^c, the resulting test statistic required to assess the significance of their difference is given as:

$$(3) \qquad Z = \frac{\pi^c - \pi}{\sigma}$$

where

$$(4) \qquad \sigma = \sqrt{\frac{\pi(1-\pi)}{T}}$$

and T denotes the sample size employed. Once derived, the significance of the calculated Z statistic can be ascertained via comparison with the standard Normal (Gaussian) distribution.

In the present analysis, the 'events' C and U are replaced by variables. More precisely, high and low regimes of crime and unemployment are considered. To create the required high and low regimes, an obvious method of partitioning the variables is via consideration of the observed values in each year relative to the overall average for the variable across the sample period, with high (above average) and low (below average) regimes denoted use of 'H' and 'L' subscripts. Therefore, C^H and C^L denote high and low regimes of crime. In a similar fashion, high and low unemployment regimes can be denoted as U^H and U^L. To illustrate this simple rule, female unemployment in 1975 is deemed to be high as the rate of 9.3% observed is above the average rate of 6.39% for the whole sample. Similarly, female unemployment is deemed to be 'low' in 2000 as the value of 4% is below the sample average.

As a consequence of extending the analysis to consider high and low states, four combinations of crime and unemployment are now available for examination, these being $\{C^L, U^L\}$, $\{C^L, U^H\}$, $\{C^H, U^L\}$ and $\{C^H, U^H\}$. Via substitution of the $\{C^i, U^j\}$ ($i, j = L, H$) for C and U in the analysis above, test statistics can be derived to explore not only whether unemployment has a statistically significant impact upon crime, but whether there are differences in any relationship according to whether high or low regimes are observed. To formalise this, consider the underlying null hypothesis associated with (3) above:

(5) $\qquad H_0: \pi^c = \pi$

As conditional and unconditional probabilities are now considered for high and low regimes of the crime and unemployment series, the relevant null *hypotheses* can be expressed as:

(6) $\qquad prob(C^i|U^j) = prob(C^i)$

for $i, j = L, H$. Therefore, under the null, unemployment does not have a significant effect upon crime. However, by considering the four above permutations, it is possible to consider whether this does or does not hold for differing combinations of high and low crime and unemployment. Consequently it can be assessed whether an asymmetry exists with, for example, high (low) unemployment influencing crime more than low (high) unemployment. Therefore, the proposed analysis provides a range of results as a consequence of considering alternative combinations of high and low states of crime and unemployment. This is extended further by introducing the opportunity and motivation effects referred to earlier. As a consequence, results in the section 5 for $\{C^i, U^j\}$ will involve use of ΔC and U when examining opportunity effects, while ΔC and ΔU are employed to examine motivation effects. However, the volume of findings presented is extended further by consideration of alternative classifications of both crime and unemployment, with these data series discussed in the following section.

4.   The data

The crime data considered herein have been obtained from the Federal Bureau of Investigation via the *Uniform Crime Reporting Statistics* Website.[2] The initial disaggregated series considered are violent and property crime for the United States of America. However, disaggregates of each of these are available in the form of murder, rape, robbery and aggravated assault for violent crime, and burglary, larceny and motor vehicle theft for property crime. The measures of unemployment considered are more straightforward. To examine gender effects, male and female unemployment are considered, these being obtained from the

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[2] All crime series are expressed in per capita terms, measured per 100,000 inhabitants. The data are available from http://www.ucrdatatool.gov/.

Bureau of Labor Statistics. The need for a consistent sample in this analysis necessitated the employment of annual observations over the period 1970 to 2009, which provides 40 observations and a reasonable sample span.

5.   Results[3]

Given the wealth of results generated by the present analysis, a number of tables is provided to ease interpretation. In Tables One and Two, the more fundamental results are presented with the impact of female and male unemployment upon the broad measures of violent and property crime provided. Considering the findings for opportunity effects reported in Table One, the results obtained are striking for a number of reasons. First, it can be seen that female, but not male, unemployment has a significant effect upon the crime with low p-values observed for the reported test statistics. Second, significant effects of female unemployment on both violent and property crime are observed. Third, the signs of the test statistics are counter to that predicted by CL, but conform with the predictions of the literature considering a hypothesis of victimisation. More precisely, high (low) female unemployment regimes result in a decrease in the probability of low (high) regimes of the criminal activity being observed. Therefore, opportunity effects with regard to female unemployment are counter-cyclical. Fourth, there is a slight asymmetry present with high female unemployment regimes having a greater impact upon reducing (increasing) the probability of low (high) crime than low regimes of female unemployment have in increasing (decreasing) the probability of low (high) crime regimes being observed. Fifth, and finally, the results for violent crime are more significant than those for property crime. To summarise these results, it is apparent that a gender effect and asymmetric response are both present, with the former being more prominent than the latter. In both cases, the results fit what has been argued in the literature. In particular, while the results conflict with the hypotheses concerning 'latchkey care' (see, *inter alia*, Hoffman 1974; Vandell and Ramanan 1991) and 'gender identity', they do conform with the notion of an increase in violent crime as female employment increases as a result of female victimisation (Kapuscinski *et al*. 1998).

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[3] Ahead of discussing the results obtained, it should be noted that by construction the Z-statistics for $C^L U^L$ and $C^H U^L$ will be equal in absolute value, but opposite in sign. This is straightforward to prove. First, the denominator of the Z-statistics are identical as $prob(C^L) = 1 - prob(C^H)$ and hence identical standard errors are returned. Second, considering the numerators of the test statistics, while the Z-statistic for $C^L U^L$ uses $prob(C^L|U^L) - prob(C^L)$, $prob(C^H|U^L) - prob(C^H)$ is used for the Z-statistic for $C^H U^L$. As $prob(C^L|U^L) = 1 - prob(C^H|U^L)$ and $prob(C^L) = 1 - prob(C^H)$ the resulting test statistics will be clearly equal in absolute value but opposite in sign as stated. Similar arguments hold for $C^L U^H$ and $C^H U^H$.

The results presented in Table Two are more straightforward to interpret as there is an absence of a significant effect of female or male unemployment on either violent or property crime. However, while motivation effects may not present when considering the overall measures of violent and property crime, a significant link may exist at a finer level of disaggregation. As a result of this possibility, the analysis proceeds to consider opportunity and motivation effects for female and male unemployment using the four disaggregated measures of violent crime and the three disaggregated measures of property crime. These results are presented in Tables Three and Four.

From inspection of the results in Table Three, gender is again important as it is clear that the only significant evidence of opportunity effects is found for female unemployment. More precisely this is observed for two classifications of crime, namely rape and assault. Again, as previously, the sign of the test statistics support theories linking increased female employment with increased violent crime and also indicate asymmetry with high unemployment having a relatively greater effect than low unemployment. Turning to Table Four, the earlier absence of motivation effects is reversed. Clearly there are a number of interesting features to note. Significant motivation effects are present for three classifications of crime (robbery, burglary and motor vehicle theft) which all share a financial basis or motivation. In addition, the incorporation of potential asymmetry in the response of crime to unemployment is found important and the significant response detected relates to high unemployment states, and given that motivation effects are being considered, this relates to high *changes* in unemployment. However, while asymmetry is an issue, the identical results obtained for female and male unemployment, show that gender is not.

[Tables 1 to 4 about here]

6.   Concluding remarks

The above analysis has revisited the crime-unemployment relationship. Using a novel method, it was possible to assess the impact of high and low regimes of unemployment upon the probabilities of high and low regimes of crime. In combination with the use of female and male measures of unemployment, this allowed gender effects and potential asymmetries in the response of crime to unemployment to be examined. Conducted within a framework shaped by Cantor and Land's (1985) opportunity and motivation effects, numerous interesting findings were derived. Perhaps most strikingly, gender effects were noted, with female unemployment but not male unemployment, exhibiting significant opportunity effects for aggregate

violent crime, aggregate property crime and components of violent crime. Interestingly, the nature of the impact of female unemployment upon crime supported theories of female victimisation (Kapuscinski *et al*. 1998) rather than counter cyclical effects argued by Cantor and Land (1985) and latchkey or parental supervision hypotheses proposed previously in the literature. Evidence of motivation effects were detected also, but for crimes with a financial basis (robbery, burglary and motor vehicle theft) and in an asymmetric, counter cyclical manner (as predicted by Cantor and Land 1985) with high unemployment influencing the probability of low and high crime states. In contrast to opportunity effects, no gender effects were detected as where motivation effects were found, they were present for both female and male unemployment.

The present analysis has therefore extended the existing literature to provide gender effect and asymmetries in the crime-unemployment relationship. While Mocan and Bali (2010) have presented findings previously indicating high unemployment to have a greater impact upon crime than low levels, this research did not consider gender effects, nor did it decouple or consider opportunity and motivation effects underlying the impact of unemployment. In light of the gender effects and asymmetric responses that have been observed, it is apparent that future empirical research should consider the application of data series and statistical methods capable of incorporating such properties. With regard to this later issue, it is apparent that in contrast to the application of standard (implicitly symmetric) regression-based methods, future studies may seek to employ threshold-based method allowing differential responses of crime to unemployment under different circumstances.

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Table One: Assessing Opportunity Effects in Violent and Property Crime

Unemployment Series	C^i, U^j	Female Unemployment		Male Unemployment	
		Violent Crime	Property Crime	Violent Crime	Property Crime
Female	C^L, U^L	2.02 (0.04)	1.73 (0.08)	-0.48 (0.63)	0.27 (0.79)
	C^L, U^H	-2.13 (0.03)	-1.82 (0.07)	0.62 (0.53)	-0.35 (0.73)
	C^H, U^L	-2.02 (0.04)	-1.73 (0.08)	0.48 (0.63)	-0.27 (0.79)
	C^H, U^H	2.13 (0.03)	1.82 (0.07)	-0.62 (0.53)	0.35 (0.73)

Notes: The above tabulated figures are calculated Z-statistics of (4) with associated two-sided p-values in parentheses at or beyond the 10% level.

Table Two: Assessing Motivation Effects in Violent and Property Crime

Unemployment Series	C^i, U^j	Female Unemployment		Male Unemployment	
		Violent Crime	Property Crime	Violent Crime	Property Crime
	C^L, U^L	-0.23 (0.82)	0.32 (0.75)	-0.23 (0.82)	0.32 (0.75)
	C^L, U^H	0.41 (0.68)	-0.56 (0.57)	0.41 (0.68)	-0.56 (0.57)
Female	C^H, U^L	0.23 (0.82)	-0.32 (0.75)	0.23 (0.82)	-0.32 (0.75)
	C^H, U^H	-0.41 (0.68)	0.56 (0.57)	-0.41 (0.68)	0.56 (0.57)

Notes: As Table One.

Table Three: Opportunity Effects and Disaggregated Crime Classifications

(a) Female Unemployment

	Violent Crime				Burglary
	Murder	Rape	Robbery	Assault	
C^L, U^L	0.78 (0.43)	2.97 (0.00)	1.08 (0.28)	2.65 (0.01)	0.45 (0.65)
C^L, U^H	-0.83 (0.41)	-3.13 (0.00)	-1.14 (0.25)	-2.79 (0.01)	-0.48 (0.63)
C^H, U^L	-0.78 (0.43)	-2.97 (0.00)	-1.08 (0.28)	-2.65 (0.01)	-0.45 (0.65)
C^H, U^H	0.83 (0.41)	3.13 (0.00)	1.14 (0.25)	2.79 (0.01)	0.48 (0.63)

(b) Male Unemployment

	Violent Crime				Burglary
	Murder	Rape	Robbery	Assault	
C^L, U^L	-0.98 (0.33)	0.34 (0.74)	-0.81 (0.42)	0.66 (0.51)	-0.81 (0.42)
C^L, U^H	1.26 (0.21)	-0.44 (0.66)	1.04 (0.30)	-0.85 (0.40)	1.04 (0.30)
C^H, U^L	0.98 (0.33)	-0.34 (0.74)	0.81 (0.42)	-0.66 (0.51)	0.81 (0.42)
C^H, U^H	-1.26 (0.21)	0.44 (0.66)	-1.04 (0.30)	0.85 (0.40)	-1.04 (0.30)

Notes: As Table One.

Table Four: Motivation Effects and Disaggregated Crime Classifications

(a) Female Unemployment

	Violent Crime				Burglary
	Murder	Rape	Robbery	Assault	
C^L, U^L	0.41 (0.68)	0.45 (0.65)	0.96 (0.34)	0.27 (0.79)	1.46 (0.14)
C^L, U^H	-0.73 (0.46)	-0.81 (0.42)	-1.71 (0.09)	-0.48 (0.63)	-2.61 (0.01)
C^H, U^L	-0.41 (0.68)	-0.45 (0.65)	-0.96 (0.34)	-0.27 (0.79)	-1.46 (0.14)
C^H, U^H	0.73 (0.46)	0.81 (0.42)	1.71 (0.09)	0.48 (0.63)	2.61 (0.01)

(b) Male Unemployment

	Violent Crime				Burglary
	Murder	Rape	Robbery	Assault	
C^L, U^L	0.41 (0.68)	0.45 (0.65)	0.96 (0.34)	0.27 (0.79)	1.46 (0.14)
C^L, U^H	-0.73 (0.46)	-0.81 (0.42)	-1.71 (0.09)	-0.48 (0.63)	-2.61 (0.01)
C^H, U^L	-0.41 (0.68)	-0.45 (0.65)	-0.96 (0.34)	-0.27 (0.79)	-1.46 (0.14)
C^H, U^H	0.73 (0.46)	0.81 (0.42)	1.71 (0.09)	0.48 (0.63)	2.61 (0.01)

Notes: As Table One.