Response of Crime to Unemployment: An International Comparison

Paolo Buonanno[1], Francesco Drago[2], and Roberto Galbiati[3]

Abstract
This article studies crime rates' response to economic conditions. Using a longitudinal data set covering about 20 countries over the period 1970-2010, we investigate whether crime rates respond asymmetrically to increases in unemployment and recoveries in economic conditions. We find a positive response of crime rates on variation in unemployment rates, but we do not find compelling evidence of asymmetric responses to positive and negative variations in the economic cycle.

Keywords
crime, unemployment, economic cycle

Introduction

Understanding how crime rates respond to strong variations in economic conditions is an important and interesting task for economists, social scientists, and policy makers alike. Theoretically, several possible linkages between economic conditions and crime exist. On the one hand, during recessions, unemployment increases and wages may fall lowering the opportunity cost of time spent in criminal activity as suggested in the basic economic model of crime (Becker, 1968) and remarked in some of the first empirical papers on the topic (Machin & Meghir, 2004; Raphael & Winter-Ebmer, 2001). On the other hand, during the recession, younger people could migrate abroad, thus reducing the share of the population more prone to crime. Moreover, during

[1]University of Bergamo, Italy
[2]University of Naples Federico II, Italy
[3]OSC-CNRS and Sciences Po, Paris, France

recessions, both the quality of criminal opportunities and the consumption of criminogenic commodities such as alcohol should reduce by lowering crime rates. This nonexhaustive list shows that theory is of little help to formulate clear-cut predictions about the impact of economic downturns on crime. Overall, the impact of economic crises and crime rates remains an empirical question, which is even more interesting in the light of the recent great recession. Researchers during the last decades have looked more systematically for empirical answers. Unfortunately on the empirical side, identifying the impact of economic downturns on crime is perhaps even more challenging than making sound theoretical predictions.

The first empirical challenge reflects the reason why it is interesting to study the link between economic conditions and crime: they might respond to each other. In fact, a positive correlation between economic downturns and crime rates might simply be driven by reverse causality. A second crucial empirical challenge concerns the choice of the relevant variable of interest. One option is focusing on aggregate macroeconomic indicators such as the gross domestic product (GDP). Following this option, we would focus on the main variable defining a recession. Nonetheless, finding plausibly exogenous source of variation allowing us to identify the impact of GDP would be extremely difficult. Moreover, using such a reduced form-macro approach, we could erroneously reach the conclusion that economic conditions do not affect crime if the overall macro-measures are linked to variations of other variables that affect crime rates in different ways, thus compensating each other. A second option would be focusing on other variables that are affected by economic crises, such as unemployment rate, and that in turn have a more direct theoretical link with crime rates. Such an approach has the double advantage of making identification easier and of isolating more clearly some of the possible channels linking economic conditions and crime. In addition, such an exercise would make it easier, linking the econometric analysis to policy recommendations. Thus in this article, we opt for this second approach by focusing on the effect of unemployment on crime. In our exercise, we will take a particular angle of analysis: We will test whether crime rates respond symmetrically or asymmetrically to variations in unemployment. Specifically, we test whether crime rates respond in the same way to changes in unemployment rate during recoveries and recessions or whether the response is asymmetric. Indeed, we may expect that, for example, crime rates are more sensitive to unemployment rate during recessions rather than during recoveries.

Our exercise builds upon the empirical strategy recently proposed by Mocan and Bali (2010). We will use a longitudinal data set covering 18 countries and several types of crimes (total crime, homicide, burglary, and robbery) since 1970. Our panel data structure will let us control for country and time fixed-effects and for county-specific time trends, thus absorbing heterogeneity over different dimensions. Moreover, we will add a set of controls for other potential determinants of crime. As pointed out by Mocan and Bali, there are different reasons why crime might respond asymmetrically to changes in unemployment rates. One has been stressed by Mocan, Naci, Billups, and Overland (2005): If individuals enter criminal markets during economic downturns, their criminal skills improve while the skills that can plausibly be used in legal

markets deteriorate, when the cycle reverts it will then take time to recover the lost skills and this would cause some hysteresis in crime. A second reason why crime rates might not react to unemployment rate growth and reduction in the same way relates to the criminal justice system congestion and general equilibrium effects (Drago & Galbiati, 2012; Galbiati & Zanella, 2012). If crime increases during economic downturn as a response to unemployment and criminal justice system, resources devoted to deterrence do not react fast, the increase in crime rates might induce some congestion in the system, thus reducing its deterrence capacity and implying a further increase in crime rates. When the unemployment cycle reverts, as the criminal justice system keeps on suffering some congestion, crime rates might not show immediate contraction. Thus, for these simple and other possible reasons, it is worth separating unemployment growth from unemployment reduction in the analysis of their link with crime rates.

Our results show that unemployment rates have a substantial effect on crime. For example, in our preferred estimation, a one percentage point increase in unemployment increases total crime by 1.3% and homicide rate by 1.7%. On the other side, a one percentage point decrease in unemployment rate lowers total crime rate by 1.7% and homicide rate by 1.8%. However, we do not find compelling evidence that crime response to unemployment is asymmetric in the way suggested by Mocan and Bali (2010). These estimates are important also in the light of the great recession. In the sample of the countries analyzed in the article, the increase in the unemployment rate from 2009 to 2012 has been of about four percentage points. Using our estimates, the total crime and the homicide rates increased by 5.2% and 6.8%, respectively, due to the increase in the unemployment rate.

This is not the first article focusing on the effect of economic downturn on crime. As we have already pointed out, the closest article to ours is Mocan and Bali (2010), that is the first documenting the asymmetric response of crime to changes in unemployment rates. While we build on Mocan and Bali's empirical strategy, we use a different data set for our empirical exercise. Mocan and Bali resort to within country U.S. data, whereas our article exploits a data set that allows international comparison. Our exercise therefore takes a different macro-perspective. In a previous article, Buonanno, Drago, Galbiati, and Zanella (2011) have analyzed the impact of unemployment on crime using a cross-country longitudinal data set and, without disentangling asymmetric responses, they find no effect of unemployment on aggregate crime rates. This finding remarks the interest of disentangling potential asymmetric effects of unemployment on crime.

Other interesting studies focusing on the effects of unemployment on crime using panel data at the state or regional level are Raphael and Winter-Ebmer (2001); Gould, Weinberg, and Mustard (2002); Oster and Agell (2007); Lin (2008); and Fougère, Kramarz, and Pouget (2009). All these articles seem to reach a consensus that increasing unemployment contributes to rise in property crimes (although the magnitude is not large) and does not significantly affect violent crimes. They are nonetheless unable to provide some information about asymmetries in the responses of crime rates to different stages of the cycles.

More in general, some other articles have focused on the aggregate impact of economic shocks and/or the business cycle on crime. One of the first articles in the field is Cook and Zarkin (1985), finding that property crimes' trends in the United States are countercyclical. While all these articles use contemporary data, recently some articles have resorted to historical data. In particular, Bignon, Caroli, and Galbiati (2011) resort to data on criminal records collected by the French Ministry of Justice starting in the 19th century and use the phylloxera crisis that burst in France in the second half of the 19th century to identify the impact of economic downturns in France. Mehlum, Miguel, and Torvik (2006) instead estimate the impact of poverty on crime in 19th century Bavaria (one of the German states). The authors use rainfall as an instrumental variable for rye prices and show that an increase in rye prices following bad weather conditions induces an increase in property crime and leads to significantly less violent crime. Traxler and Burhop (2010) replicate the exercise by Mehlum et al. for Prussia and find similar results.

Finally, while our article focuses on comparison between developed countries, some recent articles have focused on the impact of economic downturns in developing countries. In particular, Miguel (2005) resorts to survey data on rural Tanzania to show that the killing of "witches" (i.e. old women) increases in times of extreme weather events leading to floods and droughts. Fafchamps and Minten (2006) exploit an exogenous cut in fuel supply in rural Madagascar following a disputed presidential election to identify the effects of a massive increase in poverty and transport costs. Using original survey data collected in 2002, they find that crop theft increases with transitory poverty. Theft thus appears to be used by some of the rural poor as a risk coping strategy.

Empirical Strategy

As discussed in the "Introduction," the impact of unemployment on crime may be asymmetric. The standard empirical analysis assumes a symmetric relationship between job market opportunities (i.e. unemployment rate) and criminal activity. In other words, the effect on criminal activity of an increase in unemployment is equal to the effect on crime of a decrease in unemployment. As in Mocan and Bali (2010), in order to account for asymmetric response of crime to changes in unemployment rates (source: OECD statistics), we construct two variables URate^{+} and URate^{-} defined in equation (1) as follows:

$$\text{URate}_t^{+} = \text{URate}_t \text{ if } \text{URate}_t > \text{URate}_{t-1}$$

$$\text{URate}_t^{+} = 0 \text{ if } \text{URate}_t < \text{URate}_{t-1}$$

$$\text{URate}_t^{-} = 0 \text{ if } \text{URate}_t < \text{URate}_{t-1}$$

$$\text{URate}_t^{-} = 0 \text{ if } \text{URate}_t > \text{URate}_{t-1}$$

We estimate the relationship between labor market opportunities and crime using cross-country annual panel data, focusing on total crime rate and homicide rate.

Nevertheless, we also consider the asymmetric impact of unemployment on other categories of property crimes. Our estimating equation (equation [2]) is as follows:

$$crime_{it} = \beta_0 \mathrm{X}_{it} + \beta_1 \mathrm{URate}^{+}_{it} + \beta_2 \mathrm{URate}^{-}_{it} + \gamma_i + \phi_t + t\chi_i + \varepsilon_{it},$$

where $crime_{it}$ represents crime rate in country i at time t, X_{it} are standard controls for country characteristics. Our list of control variables is likely to be incomplete, as it is impossible to control for all factors affecting crime. Thus, to control for unobserved factors, we exploit the panel structure of our data set and include country-specific effects (γ_i). We also include year dummies (ϕ) in order to control for exogenous shocks in crime rates that are common to all countries. Moreover, as a robustness check, we add to our econometric specification linear specific time trends to control for variation in within-country crime rates due to unobserved country-specific determinants (see Raphael & Winter-Ebmer, 2001). More precisely, in the regression model, t is a linear polynomial in time. Finally, ε_{it} is an error term. We are mainly interested in estimating the coefficients β_1 and β_2.

Data

Measuring crime is a challenging and crucial task, as it is a necessary condition for a correct assessment of crime trends and their determinants. In a cross-country framework, two kinds of issues need to be considered.

First, reported crimes underestimate the true (unobserved) number of committed crimes, which may bias econometric estimates of the effect of those determinants of criminal activity that are correlated with the extent of underreporting. This problem is well known in the crime literature and it is usually dealt with by taking logarithms of crime rates and exploiting the panel structure of data to include fixed effects for geographical areas and time periods; see, for instance, Ehrlich (1996), Levitt (1996), Gould et al. (2002), Oster and Agell (2007), and Fougère et al. (2009). This approach sweeps out measurement errors that are constant within geographical areas (over time) or within periods (across areas). Another issue is that reporting rates differ across countries and vary over time in a non-uniform way, as it is suggested by comparing data from surveys of victims and from reports to the police (see, for instance, Soares, 2004 and van Dijk, van Kesteren, & Smit, 2007). One may wonder whether different and varying reporting rates bias the picture we want to render. This is not a concern when doing inference as far the standard econometric techniques take into account systematic measurement errors (employing country fixed-effects, year fixed-effects, and country-specific trends absorbs the resulting variation). However, a bias could be present when looking at plain sample statistics.[1]

A second important issue in using criminal statistics is related to crime classification. Indeed, the classification of crimes may vary across countries, because of

Table 1. Descriptive Statistics.

Variable	Observations	*M*	*SD*	Minimum	Maximum
$URate^{+}$	697	3.786	4.606	0.000	24.171
$URate^{-}$	697	3.263	4.344	0.000	22.964
Total crime rate	621	6,012.081	3,424.091	1,017.875	51,225.230
Homicide rate	598	1.774	1.771	0.155	10.140
Burglary rate	339	454.909	330.967	14.000	1,670.241
Robbery rate	303	111.781	74.972	5.515	292.951
Density	697	126.435	119.722	2.391	491.580
Males 15-29	697	3.720	0.438	2.813	4.931
GDP growth rate	697	0.026	0.029	−0.106	0.128
Real GDP	697	25,062.310	7,928.599	7,768.610	51,791.630

Note. GDP = gross domestic product.

different criminal codes. For instance, an act that is a property crime in Country A may be classified as a violent crime in Country B. As a consequence, if one wants to work with a homogeneous measure of crime rates across these different countries, it is required to use a measure that is unaffected both by underreporting and classification issues.

For all the above reasons, in this article we will use the total number of homicides reported to the police per 100,000 inhabitants as main measure of criminal activity.[2] This choice is dictated by the fact that homicides suffer much less underreporting and are more uniformly classified across countries. We also employ the total number of crimes (of any kind) recorded by the police that is the measure we use in Buonanno et al. (2011). In addition, we consider also more detailed crime category: burglary and robbery. Unfortunately, homogeneous and reliable data are available for these categories only from 1993.[3]

We collected data on crime and the explanatory variables of interest for EU15 countries (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, Sweden, United Kingdom with the exception of Luxembourg) and Norway, Canada, and the United States from 1970 to 2010. All explanatory variables are also normalized by the size of the population.

Our data set also includes a set of socioeconomic and demographic variables that are likely to be correlated with crime rates and therefore are included in the set of controls. Summary statistics are presented in Table 1. Demographic variables include the share of men aged 15 to 29 years from OECD statistics. Young men are thought to be more prone to engage in criminal activities than the rest of the population (Freeman, 1996; Grogger, 1995). Specifically, it is well known in criminology that young males are statistically more likely to be offenders than any other demographic group. Levitt and Lochner (2001) note that 18-year-old individuals are five times more likely to be arrested for a property crime in the United States than their 35-year-old counterparts. Turning to the socioeconomic variables, we include lagged real GDP per capita, obtained from the Penn World Tables (PWT), and the lagged GDP growth rate, coming from

Table 2. Total Crime.

	(1)	(2)	(3)	(4)
URate^{+}	0.036***	−0.038***	0.013***	0.009***
	(0.003)	(0.006)	(0.004)	(0.003)
URate^{-}	0.044***	−0.036***	0.018***	0.013***
	(0.004)	(0.006)	(0.004)	(0.004)
Density			0.006***	0.009**
			(0.001)	(0.004)
Males 15-29			0.086***	0.034
			(0.026)	(0.027)
Real GDP			0.052	−0.000
			(0.038)	(0.024)
GDP growth rate			0.239	−0.286
			(0.490)	(0.409)
Observations	582	582	582	582
R^2	.827	.307	.883	.945
Country FE	Y	N	Y	Y
Time FE	N	Y	Y	Y
Linear trend	N	N	N	Y
No. of countries	17	17	17	17

Note. All specifications include country fixed-effects and, where specified, year fixed-effects and a linear country-specific time trend. Standard errors in parentheses. GDP = gross domestic product; FE = fixed effect.
Significance levels: *10%. **5%. ***1%.

OECD statistics. These factors proxy for the general level of prosperity in each country and, thus, for legitimate and illegitimate earning opportunities (Ehrlich, 1973). Moreover, both GDP and GDP growth rate allow us to control for the economic cycle. Finally, we include population density. It is well documented that the incidence of crime is higher in densely populated areas than in sparsely populated areas (Glaeser & Sacerdote, 1999). Several reasons may determine this relation: in a dense area, the pool of potential victims is larger, in a dense area criminals could better exploit criminal networks, and finally dense areas may present scale economics crime (e.g., due to lower search costs).

Results

We estimate the model presented in equation (2), where the dependent variables are total crime rate, homicide rate, burglary rate, and robbery rate. As it is standard in the literature, we use the logarithm of these variables. Whereas the measures for unemployment are defined as described in equation (1).

Our empirical findings are presented in Tables 2 to 5. All specifications include country fixed-effects and, where specified, year fixed-effects and a linear country-specific time trend. In column 1 of all tables, we report the results where crime rate is explained by URate^{+} and URate^{-} only (together with country fixed-effects). A one

Table 3. Homicide.

	(1)	(2)	(3)	(4)
URate^{+}	0.027***	−0.009	0.017***	0.007
	(0.004)	(0.008)	(0.005)	(0.004)
URate^{-}	0.029***	0.001	0.018***	0.007
	(0.004)	(0.009)	(0.006)	(0.005)
Density			0.006*	0.010
			(0.003)	(0.006)
Males 15-29			0.123***	0.065*
			(0.027)	(0.034)
Real GDP			−0.026	−0.035
			(0.049)	(0.039)
GDP growth rate			0.496	0.247
			(0.569)	(0.497)
Observations	563	563	563	563
R^2	.845	.120	.871	.916
Country FE	Y	N	Y	Y
Time FE	N	Y	Y	Y
Linear trend	N	N	N	Y
No. of countries	16	16	16	16

Note. All specifications include country fixed-effects and, where specified, year fixed-effects and a linear country-specific time trend. Standard errors in parentheses. GDP = gross domestic product; FE = fixed effect.
Significance levels: *10%. **5%. ***1%.

percentage point increase in unemployment increases total crime by 3.6% and homicide rate by 2.7%, while unemployment does not exert any effect on robbery and burglary rates. On the other side, a one percentage point decrease in the unemployment rate lowers total crime rate by 4.4% and homicide rate by 2.9%. Column 2 is equal to column 1, except for the fact that year fixed-effects instead of country fixed-effects are included. Column 3 includes year and country fixed-effects together with the set of our controls. The inclusion of controls and year dummies determines a substantial reduction of coefficient magnitude for the total crime and homicides, but not for robberies and burglaries. Indeed, a one percentage point increase in unemployment increases total crime by 1.3% and homicide rate by 1.7%, while unemployment does not exert any effect on robbery and burglary rates. On the other side, a one percentage point decrease in unemployment rate lowers total crime and homicide rate by 1.8%. In column 4, where we control for linear country-specific trends, with the exception of total crime rates and robberies, the point estimates are not precisely estimated and smaller in magnitude. However, while this specification is the most robust since it includes country-specific trends, it is quite demanding as also year and

Table 4. Robbery.

	(1)	(2)	(3)	(4)
URate^{+}	0.029**	0.004	0.038***	0.012*
	(0.013)	(0.020)	(0.011)	(0.007)
URate^{-}	0.040***	0.016	0.044***	0.006
	(0.014)	(0.021)	(0.011)	(0.008)
Density			−0.004	−0.018
			(0.005)	(0.014)
Males 15-29			0.217***	−0.177**
			(0.071)	(0.076)
Real GDP			0.078	0.017
			(0.089)	(0.054)
GDP growth rate			−2.396**	−1.428**
			(0.962)	(0.551)
Observations	284	284	284	284
R^2	.860	.140	.908	.978
Country FE	Y	N	Y	Y
Time FE	N	Y	Y	Y
Linear trend	N	N	N	Y
No. of countries	17	17	17	17

Note. All specifications include country fixed-effects and, where specified, year fixed-effects and a linear country-specific time trend. Standard errors in parentheses. GDP = gross domestic product; FE = fixed effect.
Significance levels: *10%. **5%. ***1%.

country effects are included. In fact, genuine variation over time in unemployment rates that was used in the estimations in the previous columns can be absorbed by the state-specific trends.

As for the asymmetric response of crime to unemployment, we do not find any compelling evidence that in fact crime rates react asymmetrically in the way found by Mocan and Bali (2010). If anything, most of the point estimates of the unemployment rates during recoveries are larger than the point estimates during recessions, although the difference is far from being statistically significant. Unfortunately, it is not possible to investigate further the origin of this difference with respect to Mocan and Bali (2010). Admittedly, in their article, a more controlled design with one country and individual level data credibly supports the asymmetric response of crime rates to unemployment.

Table 5. Burglary.

	(1)	(2)	(3)	(4)
URate^{+}	0.032***	−0.063***	0.026**	0.004
	(0.010)	(0.013)	(0.013)	(0.012)
URate^{-}	0.037***	−0.048***	0.028**	0.002
	(0.010)	(0.012)	(0.012)	(0.011)
Density			0.012**	−0.050**
			(0.006)	(0.020)
Males 15-29			0.237***	−0.097
			(0.059)	(0.115)
Real GDP			0.081	−0.013
			(0.087)	(0.055)
GDP growth rate			−0.188	0.575
			(1.517)	(1.224)
Observations	319	319	319	319
R^2	.793	.198	.809	.876
Country FE	Y	N	Y	Y
Time FE	N	Y	Y	Y
Linear trend	N	N	N	Y
No. of countries	17	17	17	17

Note. All specifications include country fixed-effects and, where specified, year fixed-effects and a linear country-specific time trend. Standard errors in parentheses. GDP = gross domestic product; FE = fixed effect.
Significance levels: *10%. **5%. ***1%.

Conclusion

This article contributes to the literature on the effect of economic conditions on crime by exploiting variations in unemployment rates in a longitudinal data set covering the EU15 countries and Norway, Canada, and the United States from 1970 to 2010. Our results show that unemployment rates have a substantial effect on crime. Our cross-country approach has the advantage of allowing interesting comparisons between developed countries but admittedly, using aggregate crime rates, we lose within country variation that is useful for the identification and estimation exercise. The lack of variation might partially explain the reduction in the significance of the coefficients of the unemployment variables on robberies and burglaries that are theoretically the kind of crimes more sensible to variations in unemployment rates. Nonetheless, this exercise is useful to have a first overall picture of the effect of economic conditions in a big set of countries. Ideally, future research could investigate these relations more in depth, exploiting both cross- and within-country spatial variations in both crime rates and economic conditions.

According to our estimates, the four percentage points increase in the average unemployment rate between 2008 and 2012 during the great recession translate in an

average increase in crime rates of 5.2% in the correspondent years. Given the decreasing trend in crime rates (e.g., see Buonanno et al., 2011), we can state that crime would have diminished even more drastically in the absence of the recession. While these estimates are to be taken *cum grano salis* given the methodological limitations, they are useful to assess in a preliminary way the impact of the recent great recession on crime.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Notes

1. See Buonanno, Drago, Galbiati, and Zanella (2011) web appendix (https://sites.google.com/site/crimeeuropeusreversal/) for a detailed analysis of reporting issues.
2. Only Spanish data are drawn from cause of death statistics.
3. http://epp.eurostat.ec.europa.eu/portal/page/portal/crime/data/database

References

Becker, G. (1968). Crime and punishment: An economic approach. *Journal of Political Economy*, *76*, 169-217.

Bignon, V., Caroli, E., & Galbiati, R. (2011). *Stealing to survive: Crime and income shocks in 19th century France* (PSE Working Papers). Retrieved from http://www.cepremap.ens.fr/depot/docweb/docweb1111.pdf

Buonanno, P., Drago, F., Galbiati, R., & Zanella, G. (2011). Crime in Europe and the United States: Dissecting the "reversal of misfortunes." *Economic Policy*, *26*, 347-385.

Cook, P., & Zarkin, G. (1985). Crime and the business cycle. *Journal of Legal Studies*, *14*, 115-128.

Drago, F., & Galbiati, R. (2012). Indirect effects of a policy altering criminal behavior: Evidence from the Italian prison experiment. *American Economic Journal: Applied Economics*, *4*, 199-218.

Ehrlich, I. (1996). Crime, punishment, and the market for offenses. *Journal of Economic Perspectives*, *10*(1), 43-67.

Ehrlich, I. (1973). Participation in illegitimate activities: A theoretical and empirical investigation. *Journal of Political Economy*, *81*, 521-565.

Fafchamps, M., & Minten, B. (2006). Crime, transitory poverty, and isolation: Evidence from Madagascar. *Economic Development and Cultural Change*, *54*, 579-603.

Fougère, D., Kramarz, F., & Pouget, J. (2009). Youth unemployment and crime in France. *Journal of the European Economic Association*, *7*, 909-938.

Freeman, R. (1996). Why do so many young American men commit crimes and what might we do about it? *Journal of Economic Perspectives*, *10*(1), 25-42.

Galbiati, R., & Zanella, G. (2012). The tax evasion social multiplier: Evidence from Italy. *Journal of Public Economics*, *96*, 484-495.

Glaeser, E. L., & Sacerdote, B. (1999). Why is there more crime in Cities? *Journal of Political Economy*, *107*(Suppl. 6), S225-S258.

Gould, E., Weinberg, B., & Mustard, D. (2002). Crime rates and local labor market opportunities in the United States: 1979-1997. *Review of Economics and Statistics*, *84*, 45-61.

Grogger, J. (1995). The effect of arrests on the employment and earnings of young men. *The Quarterly Journal of Economics*, *110*, 51-71.

Levitt, S. D. (1996). The effect of prison population size on crime rates: Evidence from Prison Overcrowding Litigation. *The Quarterly Journal of Economics*, *111*, 319-351.

Levitt, S. D., & Lochner, L. (2001). The determinants of juvenile crime (NBER Chapters). In J. Gruber (Ed.), *Risky behavior among youths: An economic analysis* (pp. 327-374). Cambridge, MA: National Bureau of Economic Research.

Lin, M. (2008). Does unemployment increase crime?: Evidence from U.S. Data 1974–2000. *Journal of Human Resources*, *43*, 413-436.

Machin, S., & Meghir, C. (2004). Crime and economic incentives. *Journal of Human Resources*, *39*, 958-979.

Mehlum, H., Miguel, E., & Torvik, R. (2006). Poverty and crime in 19th century Germany. *Journal of Urban Economics*, *59*, 370-388.

Miguel, E. (2005). Poverty and witch killing. *Review of Economic Studies*, *72*, 1153-1172.

Mocan, H. N., & Bali, T. (2010). Asymmetric crime cycles. *Review of Economics and Statistics*, *92*, 899-911.

Mocan, H. N., Billups, S., & Overland, J. (2005). A dynamic model of differential human capital and criminal activity. *Economica*, *72*, 655-681.

Oster, A., & Agell, J. (2007). Crime and unemployment in turbulent times. *Journal of the European Economic Association*, *5*, 752-775.

Raphael, S., & Winter-Ebmer, R. (2001). Identifying the effect of unemployment on crime. *Journal of Law and Economics*, *44*, 259-283.

Soares, R. (2004). Crime reporting as a measure of institutional development. *Economic Development and Cultural Change*, *52*, 851-871.

Traxler, C., & Burhop, C. (2010, June). *Poverty and crime in 19th century Germany: A reassessment* (Working Paper 2010–35). Bonn, Germany: Max Planck Institute for Research on Collective Goods.

van Dijk, J., van Kesteren, J., & Smit, P. (2007). *Criminal victimisation in international perspective* (Wetenschappelijk Onderzoeken Documentatiecentrum). Meppel, Netherlands: Boom Juridische uitgevers.