

# Financial Penalties as an Alternative Criminal Sanction: Evidence from Panel Data

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*This paper explores whether financial penalties can be a viable alternative to traditional sanction methods. Given that the annual cost of operating jails and prisons is approximately \$40 billion in the U.S., any increase in the efficiency of the criminal justice system will lead to substantial savings. Using a panel model to control for jurisdictional heterogeneity, results indicate that financial penalties provide a significant deterrent effect similar to those provided by other sanctions. As such, policy makers should reconsider alternative sanctions as part of a larger sentencing policy. While financial penalties are not options in all cases, the large number of nonviolent offenders currently incarcerated suggests that opportunities exist for financial punishment to reduce criminal justice expenditures. (JEL K42, D12) Atlantic Econ. J., 29(4): pp. 450-458, Dec. 01. ©All Rights Reserved*

## Introduction

The U.S., along with most Western nations, adopted policies of greater incarceration when confronted with the rising crime rates of the 1970s. The shift toward greater incarceration involved longer prison sentences and increased imprisonment of nonviolent offenders. For example, Switzerland experienced a 50 percent increase in average prison sentences through the 1980s. During this same period, the U.S. prison population increasingly included nonviolent offenders, with such offenders currently accounting for more than 60 percent of the total prison population compared to 40 percent in 1980 [Kuhn, 1993; U.S. Dept. of Justice, 1997]. The impacts on the criminal justice system have been significant, with incarceration rates reaching all-time highs and expenditures shifting away from enforcement towards incarceration. For instance, the incarceration rate in the U.S. has increased more than 220 percent since 1980, resulting in the largest incarceration complex in the industrialized world.<sup>1</sup> And consequently, funding for law enforcement has been crowded out in relative numbers, with the share of annual criminal justice expenditures for enforcement falling from 53 to 44 percent during the 1980s and the share for incarceration increasing from 25 to 34 percent [U.S. Dept. of Justice, 1998].

In contrast, Germany turned to alternative sanctions as a response to the rising crime rates of the 1970s.<sup>2</sup> A key element of Germany's penal reform replaced short-term imprisonment with financial penalties—short-term being defined as six months or less. The use of financial penalties increased from 63 percent of court decisions to more than 80 percent, and the use of short-term sentences decreased by 90 percent. As a result, Germany decreased criminal

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justice expenditures without adversely affecting crime rates [Gillespie, 1980]. The potential savings from replacing short-term sentences with alternative sanctions emerge from the large number of inmates serving such sentences. Short-term prison sentences account for 83 percent of sentences in Switzerland [Kuhn, 1993] and 93 percent of the sentences in Quebec. In Quebec's case, inmates serving short-term sentences occupy half of the prison capacity [Landerville, 1988].

Given that criminal justice expenditures account for a substantial portion of public spending, any increased efficiency regarding sanction methods will result in significant savings. This is especially true at the state and local levels where 85 percent of total outlays occur. Alternative sanctions such as financial penalties provide a possible method to increase efficiencies in the criminal justice system. This study empirically investigates the deterrent effect of financial penalties while controlling for important jurisdictional heterogeneity with a panel model. While such empirical support exists for traditional sanctions, the limited evidence found in the literature concerning financial penalties is subject to significant heterogeneity bias. Results indicate that financial penalties provide a significant deterrent effect and are cost-effective alternatives to traditional sanction methods.

### **Financial Sanction Literature**

While the literature provides a plethora of theoretical and empirical support for traditional sanctions, financial penalties have only received significant attention from theoretical efforts.<sup>3</sup> Initial work by Becker [1968] suggested imposing a fine equal to the offender's wealth, but subsequent studies found that optimal fines may be less than wealth levels while still being preferred to incarceration [Polinsky and Shavell, 1979, 1984, 1991]. Related work indicates an optimal sanction may involve a combination of financial penalties and incarceration because the two approaches are not perfect substitutes [Chu and Jiang, 1993]. Research also suggests that the imprecise nature of determining the offender's wealth level justifies the use of incarceration over financial penalties [Levitt, 1997].

Although theory clearly suggests financial penalties provide a deterrent effect, empirical evidence has been slow to follow. Some empirical support for financial penalties can be found in Wolpin's [1978] examination of property crimes in the United Kingdom and the study of antitrust violations by Block et al. [1981]. Other studies suggest that financial penalties are effective in deterring lesser offenses such as illegal parking, not picking up dog droppings [Webley and Siviter, 2000], and being late in picking up children from day care [Gneezy and Rustichini, 2000]. This study improves upon the existing limited evidence by examining the deterrent effect of financial penalties on U.S. index crimes with a panel model that controls for unobserved heterogeneity which otherwise may lead to biased estimates.

### **Data and the Model**

The economic model of crime proposes that individuals participating in criminal activity can be thought of as rational economic beings acting under uncertainty. Therefore, to curb criminal activity, the theory suggests decreasing its expected return. Given that marginal utility of income is positive, the certainty and severity of sanctions are inversely related to expected utility and, thus, criminal activity [Becker, 1968]. Therefore, at the aggregate level,

the number of offenses can be stated as a function of the probability and cost of apprehension.

Table 1 provides the definitions and sources of the variables used in the analysis. Given the tremendous cost of producing a sufficient random sample of individual data, estimation of the economic model of crime generally uses aggregate data. To minimize aggregation issues, this study uses the relatively low aggregation of North Carolina counties.<sup>4</sup> A panel consisting of 90 North Carolina counties for 1981 to 1987 allows the use of estimation techniques that control for any heterogeneity across time and jurisdictions [Cherry, 1999; Cherry and Kunce, 2001].<sup>5</sup>

**TABLE 1**  
**Definitions of County-Level Variables**

Variables	Definitions
Index Crime Rate*	Index crime offenses per 1,000 residents
Probability of Arrest*	Ratio of index arrests to index crime offenses
Probability of Conviction**	Ratio of convictions to index arrests
Fines and Forfeitures***	Ratio of total fines collected and property seized to index arrests
Sentence Length**	Average imposed prison sentence for felony convictions in months
Police*	Full-time law enforcement employees per 1,000 residents
Income <sup>†</sup>	Income per capita
Population <sup>‡</sup>	Total population
Young Males	Percent of population that is 15 to 24 years old and male
Minority	Percent of population that is nonwhite

Sources: \* denotes *Uniform Crime Reports*; \*\* denotes North Carolina Dept. of Corrections; \*\*\* denotes *North Carolina Courts Annual Report of the Administrative Office of the Courts*; <sup>†</sup> denotes *Statistical Abstract of North Carolina Counties*; <sup>‡</sup> denotes U.S. Census.

With the key exception of including financial sanctions, the specification and measures employed in the analysis follow previous studies. The level of criminal activity is measured by the jurisdiction's index crime rate. This index measure includes seven major crimes: murder, rape, robbery, assault, burglary, larceny, and auto theft.<sup>6</sup> Deterrent effects arise from the certainty and severity of sanctions. The probability of arrest and probability of conviction measure the certainty of sanctions and the average sentence length measures the severity of punishment. Beyond the traditional specification, this analysis incorporates an additional measure of sanction severity to examine the impact of financial sanctions—the average dollar amount of fines and forfeitures. As with traditional sanctions, an inverse relationship between

finances and forfeitures and index crime rates indicates a deterrent effect from financial sanctions. The shortcomings of the traditional data are well documented and certainly apply to this analysis.<sup>7</sup> Note that the construction of average fines and forfeitures is similar to that of average sentence length. Therefore, the data issues concerning this new sanction variable follow those of the average sentence length variable used throughout literature.<sup>8</sup>

The following crime equation is estimated using panel data:

$$C_{it} = \beta' D_{it} + \psi' X_{it} + \varphi_i + \delta_t + \varepsilon_{it}; \quad i = 1, 2, \dots, N, \quad t = 1, 2, \dots, T, \quad (1)$$

where  $C_{it}$  denotes the crime rate of municipality  $i$  at time  $t$ ;  $D_{it}$  is a vector of deterrent variables; and  $X_{it}$  is a vector of related labor market and socioeconomic variables. Unobserved municipality and time effects are captured by  $\varphi_i$  and  $\delta_t$ . The disturbance terms follow a normal distribution with zero mean and constant variance.

## Results

Unobserved heterogeneity can be problematic when estimating the economic model of crime. If such heterogeneity is not controlled for in the estimation process, results can indicate that sanctions provide a deterrent effect when no actual effect exists. The present analysis extends previous efforts to uncover a deterrent effect from financial sanctions by controlling for this heterogeneity bias. As expected, tests indicate this is important by finding significant heterogeneity across jurisdictions ( $F = 18.86$  and  $p\text{-value} < 0.0001$ ) and years ( $F = 13.64$  and  $p\text{-value} < 0.0001$ ). Therefore, the analysis employs a two-way fixed-effects specification when estimating equation (1). In the presence of heterogeneity, the fixed-effects approach yields unbiased and consistent estimates and the pooled model provides biased and inconsistent estimates. The fixed-effects specification specifically controls for all time-invariant jurisdiction attributes such as resident and police reporting practices.

In addition to the standard fixed-effects specification, a two-stage least squares (2SLS) fixed-effects approach is also used to disentangle possible simultaneous relationships while estimating equation (1). The possibility of simultaneity arises because criminal activity may depend on law enforcement levels and law enforcement levels depend on criminal activity. Given such a relationship, a simultaneous technique must be employed for consistent estimates. The model, however, must be correctly identified to achieve consistency. The enigma of identification arises from the difficulty in finding solid identifying variables—variables that theoretically and empirically explain law enforcement levels but not crime rates. Numerous research efforts have succeeded in using instruments that empirically meet the requirement but the instruments typically fail on theoretical grounds. Presented with such an identification problem, both fixed-effects and 2SLS fixed-effects results are reported for completeness.

Given two endogenous variables (crime rate and police), identification of the crime function requires at least one identifying variable. Following previous work [Cornwell and Trumbull, 1994], the instrumental variable used herein is per capita tax revenue. It follows that jurisdictions demanding greater police protection will take on the higher tax burden while such demand for police may not be directly related to the crime rate. Statistically, tax

revenue does not directly affect the total crime rate ( $F = 1.83$ ;  $p\text{-value} = 0.1768$ ) while impacting the demand for police protection ( $F = 59.45$ ;  $p\text{-value} < 0.0001$ ).

Table 2 provides the results for the estimated crime model where the specification is log linear and the coefficients are estimated elasticities. The models are highly significant in explaining crime rates with adjusted  $R^2$  values of .9631 and .9604. In both models, the certainty of sanction variables have highly significant inverse relationships with crime rates. As in previous studies, estimated elasticities indicate that probability of arrest has a greater deterrent effect than probability of conviction. The fixed-effects estimates suggest that a 10 percent increase in probability of arrest and probability of conviction will decrease the property crime rate by 6.765 percent and 2.569 percent, respectively. Estimates from the 2SLS fixed-effects model indicate similar deterrent effects from the certainty of sanction measures.

**TABLE 2**  
**Results for Log-Linear Crime Equations**

Variables	Fixed Effects		2SLS Fixed Effects	
Probability of Arrest	-0.6765*	(0.0332)	-0.6647*	(0.0632)
Probability of Conviction	-0.2569*	(0.0201)	-0.2578*	(0.0212)
Fines and Forfeitures	-0.3322*	(0.0212)	-0.3384*	(0.0351)
Sentence Length	-0.0137	(0.0289)	-0.0104	(0.0334)
Police	0.0157	(0.0314)	-0.1799	(0.8783)
Income	-0.0357	(0.2452)	-0.0991	(0.3819)
Population	-0.6478**	(0.3147)	-0.6538**	(0.3273)
Young Males	0.4848***	(0.2920)	0.5412	(0.3943)
Minority	-0.7736**	(0.3272)	-0.7522**	(0.3525)
Observations	630		630	
Adjusted $R^2$	.9631		.9604	
F-statistic	159.07		148.11	
p-value	.0000		.0000	

Notes: \*, \*\*, and \*\*\* denote significance at the 1, 5, and 10 percent levels. Standard errors are in parentheses.

Estimated deterrent effects from the sanction severity measures, fines and forfeitures and sentence length, yield mixed results. Sentence length carries the expected inverse relationship with crime rates but fails to be significant in either model. While previous work has found similar results [Cornwell and Trumbull, 1994], the lack of a deterrent effect from sentence length contradicts many previous efforts. The result likely arises in part because the aggregate measure of average sentence length is misrepresented by the significant growth in

incarcerating nonviolent offenders during this period who typically receive shorter sentences.<sup>9</sup> Previous studies reporting a significant deterrent effect from sentence length generally report estimated elasticities ranging from  $-0.15$  to  $-0.35$ .<sup>10</sup>

Contrary to sentence length, fines and forfeitures provides a significant deterrent effect on criminal activity in both models. The results provide the first empirical evidence from a panel model that financial punishment provides a general deterrent effect. Results from the fixed-effects and 2SLS fixed-effects specifications indicate that a 10 percent increase in fines and forfeitures will lower the property crime rate by approximately 3.322 and 3.384 percent, respectively. The estimates suggest that fines and forfeitures generally provide a greater deterrent effect than those associated with the certainty of sanction measures, probability of conviction and probability of arrest, and those typically reported in the literature for average sentence length.

As in previous studies, police estimates from the fixed-effects model indicate an insignificant positive relationship with crime rates. Assuming that police do not cause crime, the sign indicates a simultaneous relationship of increased law enforcement being a response to higher crime rates. The 2SLS fixed-effects procedure appears effective in disentangling the simultaneous relationships, yielding an inverse relationship between police and crime rates, though it remains statistically insignificant. Accounting for time and jurisdiction, heterogeneity captures much of the variation in crime rates across counties, thereby diminishing the strength of the results associated with the remaining explanatory variables.

## Discussion

Considering the costs associated with each sanction, financial penalties appear to be a cost-effective alternative to traditional methods for some crime types. Longer incarceration carries a significant cost, with the annual costs of incarcerating an inmate approaching \$30,000 in most cases. Financial penalties, however, entail little or no costs beyond administrative burdens, which would likely be present regardless of the imposed sanction. Further, the criminal justice literature provides numerous applied studies suggesting other benefits of financial penalties. First, recidivism studies generally find that offenders receiving financial penalties are substantially less likely to become repeat offenders relative to those receiving incarceration, even when controlling for the severity of the crime [Gordon and Glaser, 1990; McCord, 1985]. Second, case studies reveal that day fines can be an effective alternative for jurisdictions. Day fines are financial penalties that account for the daily income of the offender and are the most significant alternative sanction to short-term prison sentences in Austria, Germany, and Finland [Junger-Tas, 1994]. The day-fine approach to financial penalties addresses the two main reasons judges fail to use financial penalties: the poor do not have sufficient funds to pay a fixed fine, and the rich have ample funds to buy their freedom [Morris and Tonry, 1990; Hillsman and Greene, 1988]. Findings suggest that implementing day fines as an alternative to short-term prison sentences can decrease costs without adversely affecting crime rates [Hillsman and Greene, 1988; Winterfield and Hillsman, 1993].

Caveats certainly raise questions regarding these and previous results arising from aggregated data. While empirical techniques can at least partially address issues such as heterogeneity and simultaneity, remaining aggregation issues leave open any conclusive

interpretation of results [Nagin, 1978]. Even when facing such limitations, many policy makers and academics have not resisted in using the results to advance increased incarceration. Herein, results challenge the policy of greater incarceration within a previously accommodating framework. Financial penalties appear to provide cost-effective deterrent effects relative to incarceration. Deterrence, however, is not the only consideration when determining the best combination of sanctions. Incapacitation effects, the reduction in crime due to separating the criminal from society, may be a central concern in some cases. Financial punishment certainly fails to provide such effects, but electing to use financial sanctions does avoid the negative impacts of incarceration, such as higher recidivism rates [Gordon and Glaser, 1990] and reduced household and economic productivity [Lott, 1992]. An additional concern beyond deterrence may be psychological benefits. Society may prefer a more expensive or less effective sanction due to the psychological benefits of providing rehabilitation to some offenders (youth) and reprisal to others (murderers). Therefore, financial sanctions may be best suited as an alternative to incarceration when incapacitation effects and psychological benefits are less important, such as nonviolent offenders serving short-term sentences.

### **Conclusion**

The U.S. spent approximately \$40 billion on jails and prisons in 2000, with more than half of that cost covering nonviolent offenders. In California and New York, the policy of increased incarceration had policy makers spending more on incarceration than higher education during the 1990s. However, as the U.S. and other Western countries turned to greater incarceration, Germany opted for alternative sanctions and, in particular, financial sanctions. Using Germany's experience as motivation, this paper examines whether financial penalties are viable alternative sanctions for the U.S. While theoretical and anecdotal studies support such penal reform, the issue lacks any substantive empirical evidence. Results herein address this issue by suggesting that fines and forfeitures provide a significant deterrent effect. Although the nominal effect is not always higher relative to other sanctions, financial punishment appears to be a cost-effective alternative in many cases. As in previous work examining traditional sanctions, data concerns do not allow a definite answer to the deterrence question, but these results provide insights regarding an alternative sanction within the traditional framework cited by policy makers and academics. Clearly, financial penalties are not options in all cases, but the large number of nonviolent offenders currently incarcerated suggests that opportunities may exist for financial sanctions to reduce criminal justice expenditures.

### **Footnotes**

1. The current U.S. prison population exceeds every industrialized nation in absolute terms and is second only to Russia when accounting for population.
2. Finland and Austria also opted for alternative sanctions rather than the trend of greater incarceration.
3. While no studies examine major offenses (for example, index crimes), researchers have explored the impact of fines on lesser offenses.

4. Numerous crime studies have used the relatively low aggregation of North Carolina county data. North Carolina is the fourth smallest in land area per county and the second smallest for states with 100 or more counties. North Carolina also possesses significant variation due to the distinct attributes of the mountain and coastal regions and urban and rural areas.
5. Data limitation eliminated 10 counties from the sample.
6. The Federal Bureau of Investigation also includes arson as an index crime, but this offense is generally omitted from such analyses due to the sparse data.
7. See Nagin [1978] for a thorough review.
8. For example, just as one year of incarceration will impact some individuals more than others (for example, those with higher opportunity costs [Lott, 1992]), a level of financial punishment will impact some individuals more than others (for example, those with lower income levels). In addition, as with sentence length, the severity of fines and forfeitures will impact some crime types more than others but the inclusion of both will be an improvement to previous work. Regarding the construction of the two average measures, neither is exactly linked to the index crimes that measure criminal activity. For example, one in four prisoners in the U.S. are serving time for drug offenses which are not included as index offenses.
9. The relative increase in nonviolent offenders will inherently lower the average sentence length, *ceteris paribus*, thereby muting any deterrent effects associated with increased sentence lengths.
10. Examples include -0.15 in Trumbull [1989], -0.35 in Phillips and Votey [1975], -0.23 in Carr-Hill and Stern [1973], and -0.21 in Sjoquist [1973].

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