SPATIAL COMPETITION IN ILLICIT DRUG MARKETS: THE CONSEQUENCES OF INCREASED DRUG LAW ENFORCEMENT

David W. Rasmussen, Bruce L. Benson, and David L. Sollars*

Abstract—This paper explores the impact of increasing drug enforcement on the violent crime rate in the context of spatial competition in illicit drug markets. Violence is an important aspect of competition in illicit markets because disputes cannot be resolved in the courts. A model of spatial competition suggests higher drug enforcement in one jurisdiction will increase the size of the drug market in an adjoining jurisdiction, resulting in a higher violent crime rate. Data from Florida jurisdictions suggest that geographic spillovers of violent crime result from law enforcement differentials and imply that they are much larger than those found in studies of property crime.

I. THE CONSEQUENCES OF INCREASED DRUG LAW ENFORCEMENT

President Reagan declared war on drugs in October 1982, but the first assaults by local law enforcement did not occur until 1984. Between 1984 and 1989, the war on drugs escalated dramatically, resulting in an increasing proportion of law enforcement resources being allocated to drug enforcement. This increasing emphasis on drug crime is reflected in the fact that U.S. drug arrests relative to arrests for reported crimes against persons and property rose from .30 in 1984 to a 1989 level of .46.1 Put differently, for each drug arrest, there were 3.3 arrests for these reported offenses in 1984 but only 2.1 in 1989. Justification for this reallocation of police resources rests in part on the proposition that drug offenders are responsible for most other crimes, thus implying that increasing drug enforcement should reduce other crimes. The war on drugs, from this perspective, is a positive sum game in which combatting drug abuse simultaneously reduces crimes against persons and property.

While there is ample evidence that many persons arrested for property and violent offenses also abuse drugs (Gropper 1985; Johnson et al. 1985; Ball et al. 1983; O’Neil and Wish 1989), there is also strong support for the notion that most drug offenders engage in neither violent crime nor property offenses (Chaiken and Chaiken 1990; Fagan 1990). Since drug offenders only partially overlap with the set of property and violent offenders, increasing drug enforcement might lead to

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an outcome very different from the positive sum game expectation. Increasing drug enforcement might draw scarce police resources away from the control of other offenses, leading to fewer arrests for these crimes and less deterrence. If fewer police resources are allocated to controlling property crimes, the lower probability of arrest makes these crimes less risky, resulting in a higher expected return and an increased crime rate. Thus, the war on drugs might be associated with a higher crime rate, rather than the lower one anticipated by the positive sum game view of the drug war. Indeed, empirical evidence that a rising property crime rate is an unintended consequence of increasing drug enforcement is provided by Benson and Rasmussen (1991), Benson et al. (1992a), and Sollars et al. (1991).

In this paper, we explore the impact of increasing drug enforcement on the violent crime rate in the context of spatial competition in illicit drug markets. Viewing drug market competition in its spatial context suggests that the drug war may generate unintended consequences with respect to violent crime just as previous research has suggested these effects for property crime. Spatial competition in illicit drug markets is described in Section II. An empirical model of violent crime and its relationship to the spatially competitive drug market is specified and tested in Section III, and concluding comments are presented in the last section.

II. SPATIAL COMPETITION IN ILLICIT DRUG MARKETS

In legal markets, consumers' decisions to shop at a particular location depend on the price differential between that location and others in the vicinity and on transportation costs to the various locations. Producers are governed by spatial differences in demand and cost of sales in alternative locations. Conflict between producers, or spatial competition, like the models of orthodox price theory, is based on differentials in price, quality, and service. Predatory actions in spatial markets that might be "unfair" can be challenged in the courts under federal or state antitrust laws or under common law precedent (Greenhut and Benson 1989). Contract and other disputes arising in legal markets are adjudicated through the legal system, with financial compensation or other relief being offered to plaintiffs when they prevail. The availability of adjudication means that violent forms of conflict or dispute resolution need not arise.

Competition in illicit drug markets is similarly based on price, quality, and service, but resolution of disequilibria arising from differentials in these crucial variables are not necessarily erased by movements in these variables. New entrants into an illicit drug market may take predatory actions, cutting price or quality to gain a larger share of the market. Existing firms may respond with price
cuts of their own, but they do not have access to legal adjudication services to resolve disputes over "unfair" predation. Thus, the only viable alternative to predatory competition may be physical elimination of the competition through threats, intimidation, and violence. Violence plays a relatively important role in the utility and profit maximizing calculations of drug market entrepreneurs because nonviolent sources of conflict resolution are not available. As noted in a U.S. Department of Justice report on drug trafficking, "The normal commercial concept of contracts, in which disputes are adjudicated by an impartial judiciary and restitution is almost always of a financial nature, is twisted, in the world of drug trafficking, into a system where the rule of law is replaced by the threat of violence . . ." (1989, 16).²

Assume that an illicit drug market is in spatial equilibrium in a world consisting of two policing jurisdictions in which drug sellers have a common wholesale supplier of the illicit drug and the jurisdictions have separate police forces but share a judicial and penal system. A common supplier implies similar input costs for operations of an identical scale (assumption of a highly competitive wholesale drug market and perfect information would yield similar results). A common judicial and penal system (e.g., within a state) means identical penalty costs of business given arrest, such as the probability of conviction once arrested and the severity of expected penalty. The probability of arrest for drug offenses can vary between jurisdictions, however, because of independent police forces. Thus, spatial competition in the illicit drug market is based on the seller's pricing practices, quality differentials generated by adulteration of the product, expected costs imposed by differences in drug enforcement, and the threat and practice of violent retaliation.

With an even distribution of consumers and identical costs of production at each potential seller location, the equilibrium location pattern in spatial competition is characterized by dispersed sellers, each with identically sized marketing areas and identical prices (Novshek 1980). If either the costs of production or the distribution of consumers varies over space, however, equilibrium prices can vary, and market sizes will not be identical, as some low-cost or high-demand areas are attractive enough to sustain more densely packed sellers than high-cost or low-demand areas (Greenhut 1956, chap. 3). Given the assumptions made above, illicit drug sellers’ costs should vary geographically only if policing efforts against drug markets vary (e.g., only if the probability of arrest varies). Demand conditions do appear to vary over space, however. Densely populated urban centers support more drug sellers than less densely populated suburbs and rural communities. Therefore, particularly within an urban area, there are likely to be many drug sellers within one policing jurisdiction.
We wish to focus on the consequences of a jurisdiction-specific change in the policing effort against drug market activity. Thus, assume that a spatially competitive equilibrium has been established. That is, drug sellers are dispersed over the market, and marketing territories have been established such that each seller is covering his opportunity costs and perceives the potential costs of market expansion (the violent confrontation with other established sellers) to exceed the potential benefits of such an expansionary effort. Similarly, each buyer has an established relationship with a specific seller and cannot get the product at a lower full price (money price plus transport costs from a more distant seller). In other words, a spatial equilibrium in this context implies that neither buyers nor sellers of drugs have an incentive to change the location of their activity in this market. Now assume one jurisdiction disrupts this spatial equilibrium by increasing drug enforcement. First consider the effects of this enforcement differential on drug suppliers. This change in police behavior, ceteris paribus, translates into a higher probability of arrest and greater expected costs in the form of legal defense fees and time served in prison for drug sales. Suppliers within this jurisdiction, facing these higher costs of production, have, on the margin, an incentive to shift their operations toward the adjacent, now lower cost, jurisdiction. Relocation and the resulting entry into this jurisdiction’s market disrupts the spatial equilibrium, however. In order to establish a niche in this geographic area, the new entrants must necessarily tread on the turf of existing sellers. In legal markets, price and location adjustments follow as competition intensifies (e.g., as in Hotelling [1929] and the large literature on locational interdependence that has built on his work). Some spatially competitive actions may be illegal under antitrust and fair trade laws (Greenhut and Benson 1989), so conflicts may also find their way into the courts. However, in an illegal market, seller’s options are different. In this case, existing sellers and new entrants can choose between predatory methods of price, location, and quality competition, as well as the use of violence, to secure (or protect) a share of the market. This violence is a potential cost of relocating or expanding. This potential cost existed prior to the increased cost imposed by the police, but in the initial equilibrium, this cost deterred such actions. With the increased cost of producing in the now more aggressive policing jurisdiction, however, some sellers are likely to relocate at least part of their operation. As these sellers move, revenues for those remaining in the jurisdiction rise, thereby offsetting the higher expected costs generated by the police.

The risk of violence is a cost that ameliorates the prospective gains from shifting operations away from the jurisdiction with relatively greater drug enforcement, particularly for those sellers with a relatively secure position in their existing marketing area and rising revenues that occur as rivals relocate. Furthermore, to the extent the demand for drugs is not perfectly elastic, the costs
of rising enforcement can be shared with consumers, thereby ameliorating the pressure to change locations. This suggests that marginal suppliers are the most likely to move because their costs of market entry, particularly the likelihood of encountering violent competition, does not vary much between jurisdictions. The net effect on intramarginal firm location is uncertain and depends on the relative elasticities of expected profit with respect to these subjective risks of incarceration and physical victimization, the number of marginal firms who move, and other factors. In aggregate, however, rising drug enforcement in one jurisdiction will raise competitive pressures in the other as some illicit drug sellers move. As competition intensifies and predatory practices are employed to establish market share, the probability of violent confrontations increases. Therefore, it is hypothesized that violent crime will increase in one jurisdiction as a consequence of more intense drug enforcement in neighboring jurisdictions.

Consumers also face a higher risk of arrest and conviction in the jurisdiction that is getting tougher on drugs. They have an incentive to buy their drugs in the place with now relatively less diligent enforcement. The resulting increase in demand reinforces the rising supply of drugs to increase the size of the drug market in the jurisdiction that allocates relatively few police resources to drug enforcement. If demand increases as fast as supply, then the potential for violent confrontation between rival sellers may be mitigated, but the larger drug market also leads to other sources of violence. A larger market means there will be more street dealers, who usually sell drugs on consignment. Goldstein (1989, 34) reports that a common "norm violation" in the drug trade is "messing with the money" that the dealer owes to superiors. Since violence is used to enforce these intrafirm arrangements, a larger drug market is likely to generate a higher violent crime rate (i.e., violent crime per capita). Furthermore, neighborhoods in which drugs are regularly sold, particularly low-income areas, experience a relatively high rate of violent robbery because drug users and sellers are carrying either cash or drugs, and when victimized they are not prone to report the theft to the police (Goldstein 1989, 35). The robbery is likely to become a crime statistic only if it involves sufficient violence to require medical treatment, in which case it will probably be characterized as an assault. Thus, a growing drug market is likely to generate an increase in violent crime independent of that caused by competitors fighting over market share.

Spatial competition in an illicit drug market will necessarily entail trade-offs involving geographic variations in cost of sales, market price, and risks of violence. Market adjustments to greater enforcement in one jurisdiction are likely to offset some of the ex-ante advantages of the alternative locations, but these competitive effects indicate a jurisdiction will experience more violent crime when neighboring jurisdictions become relatively more diligent in their drug en-
Forcement efforts. The interseller violence may be relatively short lived, as some sellers are eliminated or truces are made. After all, violence is a very costly form of dispute resolution, so cooperation (cartelization) is relatively attractive (Benson 1990). However, the violence associated with enforcing discipline within drug supply organizations and a larger population of drug market participants who are attractive robbery targets can persist in the long run. Thus, spatial variation in drug enforcement that tends to make some market segments larger than others in terms of demand (and number of suppliers) implies that the high-demand areas will be high violent crime areas in spatial equilibrium.

III. MODEL SPECIFICATION AND DATA

Data for 1989 from all of Florida's policing jurisdictions were obtained in order to test the hypothesis that spatial variations in law enforcement efforts against drugs create geographic spillovers in the form of increased violent crime in areas located near policing jurisdictions that make relatively strong efforts against illicit drug markets. By using data from jurisdictions in a single state, we avoid cross-state variations in state-level drug policy initiatives, differences in prison conditions, and so on, that might not be measurable, but which could affect the perceived severity of punishment. Furthermore, Florida Sentencing Guidelines mean that interjurisdictional variations in the severity of punishment within the state will be relatively small, so we can focus on interjurisdictional variations in policing efforts.

The generic econometric model of crime consists of a set of equations using the crime rate, the probability of arrest, and a measure of police resources as the dependent variables (Cameron 1988). This type of model is predicated on the idea that the crime rate affects the resources available to the police, which in turn affect the crime rate via the deterrence effects of the probability of arrest. Because simultaneity bias can occur, many studies have employed simultaneous equation estimation techniques. However, two factors suggest that use of simultaneous equations is not appropriate for a model of violent crime. First, there is little evidence of a connection between violent crime rates and police resources. Police get more resources as the property crime rises, but most studies ignore violent crimes as a significant determinant of police resources (Hakim et al. 1979; Avio and Clark 1976; Benson et al. 1992a; Sollars et al. 1991). Benson et al. (1992b) provide direct evidence of this in a study of the determinants of police noncapital expenditures in Florida, reporting that these outlays are significantly and positively correlated with the property crime rate (with an estimated elasticity ranging from +.46 to +.61). The effect of the violent crime rate on police expenditures, in
contrast, is generally not significant and has an estimated elasticity between \(-.04\) and \(+.003\). Second, a common finding in these models is that a higher probability of arrest has a deterrent value, but that the marginal increments in police resources do not produce a higher probability of arrest (Cameron 1988). This result should not be surprising if police act in a way that is analogous to other public bureaucratic agencies. The correlation between incremental police expenditures and any particular measure of output (such as arrests) will be weak if police administrators are motivated to maximize output but instead are engaged in budget maximizing (Niskanen 1971), utility maximizing (Niskanen 1975), or slack maximizing (Wyckoff 1990) within the constraints imposed by voter preferences and sponsor oversight (Breton and Wintrobe 1975, 1982; Miller 1977; Toma and Toma 1980; Eavey and Miller 1984; Benson 1990). After all, as Milakovich and Weis (1975, 10) noted, police have a vested interest in keeping crime rates relatively high: if crime rates drop too much, then support for more police and larger budgets declines, and like all bureaucracies, criminal justice agencies can hardly be expected to implement policies that would diminish their importance. Thus, two of the three links required for a simultaneous model of violent crime are very weak or nonexistent; police apparently do not get greater budgets with higher violent crime rates, and police discretion reduces the output effects of marginal increments to police resources. Undermining the rationale for simultaneous equations in economic models of violent crime, this perspective suggests the use of a single equation model in this study.

The economics of crime literature suggests the determinants of reported violent crime (murder, manslaughter, and aggravated assault) in a jurisdiction will be related to the probability of arrest (PA) in the community, the severity of punishment (SP), the opportunity costs resulting from legal economic opportunities (OC), and the control variables reflecting relevant community characteristics (CC). The preceding discussion of the impact of greater police drug enforcement on spatial equilibria in illicit drug markets suggests that differences in drug enforcement among neighboring jurisdictions can also affect the spatial distribution of violent crime. Differentials in drug enforcement among neighboring jurisdictions (ED) are therefore included in our model. The stylized equation for the determinants of violent crime (VC) is:

$$VC = f(PA, SP, OC, CC, ED)$$ (1)

Precise measurement of many variables is not possible, so proxy variables must be used. The dependent variable is the reported violent crime rate (VC) and includes murder, manslaughter, and aggravated assault, a choice required by the fact that we do not have a victimization survey for each of these jurisdictions. The
probability of arrest (PA) is proxied by arrests for violent crimes divided by the number of reported violent crimes.\textsuperscript{7} Severity of punishment is not included in this model because it is not available. However, systematic spatial variations in punishment should be minimized under Florida’s sentencing guidelines. Under this system, judges have the discretion to give sentences outside the recommended range, but there is no evidence that this discretion results in systematic variations in sentencing practices for violent crimes among the 20 circuit courts. Variations in the severity of punishment among jurisdictions in Florida should be relatively small under these circumstances.

Estimating the opportunity cost of potential violent offenders in jurisdictions is necessarily crude. This is especially so since the structure of economic opportunity in the labor market is more relevant than those apparent in the jurisdiction of residence. Recognizing this problem, we assign to each jurisdiction proxy measures of opportunity cost that are available at the county level of aggregation and include wealth measured by assessed property value per capita adjusted for county cost-of-living differences (PVALUE), real average wage and salary earnings per job (WAGES), and the county unemployment rate (UNEMPLOY).\textsuperscript{8} Wealth, as measured by PVALUE, should be greater in jurisdictions whose residents have a high opportunity cost of crime, suggesting this variable should have a negative coefficient. Since economic distress is likely to be positively correlated with violent behavior, we expect the WAGES coefficient to be negative and the UNEMPLOY coefficient to be positive. Two demographic variables that may be correlated with opportunity cost augment these summary measures of labor market conditions: the percent of the county population that is black (%BLACK) and the percentage of the county population that is between the ages 15 and 24 (POP 15-24). Since many studies show blacks earn less than whites in the same location, even though they have similar measured characteristics, %BLACK is a control variable that provides a measure of the proportion of the population that is likely to have a relatively low income due to unmeasured factors, among which is discrimination. The crime rate is expected to be positively correlated with the %BLACK. Since earnings typically rise with age, the opportunity cost of violent crime should rise as one gets older. Thus, more people between the ages 15 and 24 (POP 15-24) should be associated with a higher crime rate.\textsuperscript{9}

The relative anonymity and crowding of densely populated urban areas may be associated with a greater violent crime rate, although the economics of crime literature does not suggest a predicted sign for this coefficient (Trumbull 1989). To control for this factor, population per square mile (DENSITY) is included as an independent variable.

Drug arrests per 100,000 population (DRUGRATE) is included to control for a complex relationship between active drug markets, political pressures on police
to combat drug crime, and violent competition in these markets. Violent crime should be positively correlated with DRUGRATE for two reasons. First, jurisdictions with a highly competitive drug market should have relatively more violent crime the existence of which could lead the police to increase the drug arrest rate (DRUGRATE). Second, since the police action against drugs disrupts these markets, they may therefore cause violent crime as drug dealers and traffickers compete for the relatively safe locations within the jurisdiction. Processes of spatial competition described above will operate within jurisdictions as well as between jurisdictions. For both of these reasons, we anticipate a positive coefficient for the drug arrest rate variable.

The hypothesized positive relationship between drug enforcement in one jurisdiction and violent crime in another is evaluated via a measure of differential drug enforcement among communities. Assuming that sellers of illicit drugs respond to incentives, an increase in drug enforcement in one jurisdiction, ceteris paribus, will, on the margin, increase drug selling and buying activity in nearby communities in which enforcement activity is relatively lower. As some sellers attempt to find a drug market niche in adjacent jurisdictions, the spatial equilibrium in these markets is disrupted by these new competitive pressures. Violence, one of the principal methods of competing for market share and of enforcing contracts in illicit markets, is expected to increase in jurisdictions adjacent to communities that have a higher level of drug enforcement. Spillovers of violent crime due to differences in enforcement are assumed to be limited to adjacent jurisdictions and to those whose boundaries are within a five-mile radius from the center of the jurisdiction under consideration. The differential drug enforcement (DRUG DIF) is calculated as follows:

$$ DRUG\ DIF_i = \frac{\sum_{j=1}^{n} (DA_j/TA_j)/n_j}{(DA_i/TA_i)} $$

As a higher proportion of police resources in adjacent jurisdictions are used for drug enforcement, the costs of drug selling rise relative to the home jurisdiction. A positive DRUG DIF coefficient is consistent with the process of spatial competition described here.

The model presented above is tested using 1989 data from 279 jurisdictions in Florida. County sheriffs account for 66 of the observations, with the remaining
213 being municipal police departments. We assume that the sheriff's jurisdiction is the area within the county that is not covered by a municipal police department. Definitions of the variables, summary statistics, and data sources are shown in Table 1. Results of the OLS estimation when all the variables are logged are reported in Table 2. All the essential hypotheses are confirmed by the results. Violent crimes are negatively related to the arrest/offense ratio, a finding that is consistent with other studies (for example, Ehrlich 1977; Avio 1988). Only two of the five proxy variables for opportunity cost in jurisdictions are statistically significant. A higher county unemployment rate (UNEMPLOY) is expected to be associated with a higher violent crime rate, a hypothesis supported by the coefficient reported in Table 2. Wealthier communities, measured by real assessed property value per capita (PVALUE), have the expected lower violent crime rate, which is reflected in the negative coefficient that is significant at the .01 level. The control variable, DENSITY, is not significant.

The variables most relevant to this inquiry into spatial competition in the illicit drug market are the drug enforcement variables: the drug arrest rate in the jurisdiction (DRUGRATE) and the drug enforcement rate in surrounding jurisdictions relative to the jurisdiction under observation (DRUG DIF). The jurisdiction's own drug arrest rate is positively associated with violent crime and is highly significant. The elasticity of violent crime with respect to DRUG DIF is .37, a figure that is much larger than the spillover effects estimated in studies of property crime (Sollars et al. 1991; Mehay 1977; Kennett 1982; McPheters and Strong 1981). The most convincing support for the spatial competition hypothesis comes from the highly significant positive DRUG DIF coefficient; as surrounding communities allocate a greater proportion of their police resources to drug enforcement relative to reported violent and property offenses, drug sellers apparently spill over into lower cost jurisdictions where enforcement against drugs is relatively less severe. Increased competition for market share and the effects of a bigger drug market in these jurisdictions with relatively less pressure from the police result in a greater incidence of violent crime.

IV. CONCLUSIONS

Previous research (Benson and Rasmussen 1991; Benson et al. 1992a; Sollars et al. 1991) has shown that deterrence of property crimes can be compromised as a greater proportion of scarce police resources are allocated to drug enforcement; that is, increased drug enforcement leads to increased property crime. The results reported here are consistent with the view that drug enforcement policy has significant unintended consequences, i.e., rising drug enforce-
### TABLE 1
Variable Definitions and Summary Statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Standard Deviation</th>
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</thead>
<tbody>
<tr>
<td>VIOL</td>
<td>588.76</td>
<td>515.34</td>
</tr>
<tr>
<td>PA</td>
<td>.68</td>
<td>.62</td>
</tr>
<tr>
<td>WAGES</td>
<td>19,655.90</td>
<td>4,447.28</td>
</tr>
<tr>
<td>UNEMPLOY</td>
<td>5.97</td>
<td>1.41</td>
</tr>
<tr>
<td>%BLACK</td>
<td>14.07</td>
<td>8.46</td>
</tr>
<tr>
<td>POP 15-24</td>
<td>13.09</td>
<td>2.79</td>
</tr>
<tr>
<td>PVALUE</td>
<td>33,384.30</td>
<td>45,296.91</td>
</tr>
<tr>
<td>DENSITY</td>
<td>2,101.84</td>
<td>2,930.02</td>
</tr>
<tr>
<td>DRUGRATE</td>
<td>731.65</td>
<td>793.08</td>
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<tr>
<td>DRUG DIF</td>
<td>2.44</td>
<td>4.91</td>
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<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>VIOL</td>
<td>Murder, manslaughter, aggravated assault per 100,000 population</td>
<td>1</td>
</tr>
<tr>
<td>PA</td>
<td>Arrest/offenses for murder, manslaughter, and aggravated assault</td>
<td>1</td>
</tr>
<tr>
<td>WAGES</td>
<td>Average earnings in wage and salary jobs adjusted for county cost-of-living variations</td>
<td>2</td>
</tr>
<tr>
<td>UNEMPLOY</td>
<td>County unemployment rate</td>
<td>2</td>
</tr>
<tr>
<td>%BLACK</td>
<td>Percent of county population that is black</td>
<td>4</td>
</tr>
<tr>
<td>POP 15-24</td>
<td>Percent of county population between ages 15 and 24</td>
<td>4</td>
</tr>
<tr>
<td>PVALUE</td>
<td>Assessed property value per capita</td>
<td>2,3</td>
</tr>
<tr>
<td>DENSITY</td>
<td>Population divided by jurisdiction’s land area</td>
<td>2,5</td>
</tr>
<tr>
<td>DRUGRATE</td>
<td>Drug arrests per 100,000 population</td>
<td>1</td>
</tr>
<tr>
<td>DRUG DIF</td>
<td>Drug arrest/total arrest differential</td>
<td>1,5</td>
</tr>
</tbody>
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Sources:
1. Florida Department of Law Enforcement, Statistical Analysis Center Data Base, Uniform Crime Reports.
TABLE 2
The Determinants of Violent Crime Among Florida Jurisdictions, 1989

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>T-value</th>
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<tbody>
<tr>
<td>Constant</td>
<td>6.098</td>
<td>3.00*</td>
</tr>
<tr>
<td>Probability of arrest (PA)</td>
<td>-.662</td>
<td>-10.06*</td>
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<tr>
<td>Opportunity cost</td>
<td></td>
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<tr>
<td>WAGE</td>
<td>-.144</td>
<td>-.69</td>
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<tr>
<td>UNEMPLOY</td>
<td>.343</td>
<td>1.79</td>
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<tr>
<td>%BLACK</td>
<td>.109</td>
<td>1.19</td>
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<tr>
<td>POP 15-24</td>
<td>-.076</td>
<td>-.29</td>
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<tr>
<td>PVALUE</td>
<td>-.310</td>
<td>-4.65*</td>
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<tr>
<td>Control</td>
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<tr>
<td>DENSITY</td>
<td>-.026</td>
<td>-.86</td>
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<tr>
<td>Drug enforcement</td>
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<tr>
<td>DRUGRATE</td>
<td>.566</td>
<td>10.65*</td>
</tr>
<tr>
<td>DRUG DIF</td>
<td>.369</td>
<td>7.05*</td>
</tr>
<tr>
<td>Adj R²</td>
<td>.475</td>
<td></td>
</tr>
<tr>
<td>n</td>
<td>279</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>27.13*</td>
<td></td>
</tr>
</tbody>
</table>

*a All variables are transformed into logs.

*Significant at .01 (two-tail test)

ment increases violent crime due to the disruption of spatial equilibria in drug markets. Spatial competition in these illicit drug markets has important implications for proposals that emphasize "local option" enforcement of drug laws. Benjamin and Miller (1991), for example, propose a federalist model of drug enforcement that could allow for considerable local variation in drug policy. Some jurisdictions may be relatively tolerant to drug use, but if neighboring areas become relatively tougher on drug markets, these communities will experience increasing drug activity and a rise in drug-related violence. This suggests that local jurisdictions are in a kind of prisoner's dilemma, forced into being tougher on drugs than they would choose in the absence of the spatial interdependence of these markets. Local option may be the preferred strategy for drug policy, but when many jurisdictions are viable alternative locations for illicit drug activities,
the spillovers of violent crime due to spatial competition in this market will work
to minimize the variation in enforcement practices.

ENDNOTES

1. These are the Index I crimes of murder, manslaughter, aggravated assault,
robbery, burglary, larceny, and auto theft.

2. Reuter et al. (1990) indicate there were substantial risks of violence for
drug dealers in Washington, D.C., during the mid-1980s. They estimate a regular
drug seller, defined as dealing more than one day per week, faced annual risks of
1.4 percent of being killed and 7 percent of being seriously injured. They argue
that drug sellers in Washington, D.C., consider both the costs of violence and in­
carceration, suggesting that the high return to drug dealing is readily explained by
the great risks of the enterprise.

3. Marginal suppliers are those whose hold on their market niche is relative­
ly fragile due to factors such as is experience, small scale, and/or an aversion to
violence. See Cave and Reuter (1988) and Reuter et al. (1988) for a detailed dis­
cussion.

4. There is virtually no evidence to support the frequently stated proposition
that the demand for drugs is inelastic. Even heroin addicts change their use in
response to price (Kaplan 1983). For a summary of the evidence on this point, see
Moore (1990), White and Luksetich (1983), and Benson et al. (1992a).

5. Goldstein (1989) discusses three sources of "systemic" violence in drug
markets: that resulting from competition among sellers; violence committed
during robberies of drug market participants; and violent acts between drug users
resulting from disputes over drugs. The latter is not likely to be affected by chan­
ges in the spatial distribution of drug markets so long as drug users do not change
their place of residence as a result of changing drug prices. Goldstein is skeptical
of the notion that much violence is spawned by the pharmacological affects of
drugs. He also reports there is little research evidence supporting the proposition
that some drug users are compelled by economic necessity to engage in violence
prone property crime, i.e., robbery.

6. Benson et al. (1992a) and Sollars et al. (1991) experimented with various
model specifications that systematically explored the impact of violent crime of
alternative measures of police resources, police expenditures per capita, and the
number of sworn officers per capita. They conclude that property crime, but not
violent crime, significantly affects these measures of police resources.

7. The empirical economics of crime literature has also been plagued by
measurement error caused by the fact that many crimes are not reported to the
police, particularly in the case of property crimes, which are less likely to be reported than violent crimes. Most property crimes are not reported to the police, for example, raising the specter of spurious correlation when investigating the deterrence effect of the probability of arrest, which is usually proxied by the arrest/reported offense ratio. The U.S. Department of Justice estimates that about 37 percent of all crimes against persons and property (Index I crimes) are reported to the police. The severity of under-reporting is underscored by the fact that only 56 percent of violent crimes are reported. Estimates of deterrence effect can be affected by this measurement error, although studies using victim surveys to estimate the probability of arrest find a higher probability of arrest is a deterrent to crime (Myers 1980; Craig 1987). This unavoidable problem is not particularly relevant for this effort, which focuses on the effects of spatial competition in drug markets rather than on the deterrence effects of enforcement.

8. The Florida Price Level Index, created annually for counties by the state of Florida, is used to adjust for geographic cost-of-living differences within the state. County variation in the FPLI is substantial: in 1989 the index ranged from 88.38 to 115.03 compared to the state average of 100.

9. Age actually may affect criminal behavior through many channels. Perceptions of punishment may vary with age, for instance. Youthful offenders receive relatively light sentences in most jurisdictions, a permissiveness that may contribute to relatively high rates of criminality among young people. Furthermore, anticipated punishment may be more highly discounted by young people if they are more myopic than older persons. Severity of punishment may also be a relative, rather than absolute, phenomena: a three-year prison sentence for a 20-year-old who expects to live another 50 years may be less severe than a three-year sentence for a 60-year-old who sees it as a significant portion of his remaining life. Finally, one prominent theory is that preferences for crime actually fall with age, sometimes attributed to criminal burn-out (Hoffman and Beck 1984) and maturity (Gottfredson and Hirschi 1990). From an economic perspective, "maturity" might involve an increase in risk aversion. Thus, while we assume that age is an opportunity cost proxy, it must be recognized that these diverse impacts of age cannot actually be separated, and the relative strengths of the various interpretations cannot be evaluated.

10. An alternative spillover measure would be the relative difference in DRUGRATE calculated in a similar manner as (2). However, given its construction, this variable would be highly correlated with DRUGRATE. Our empirical analysis confirms this result.

11. If rising enforcement in a jurisdiction encourages drug consumers to follow suppliers to low-enforcement jurisdictions, the competitive effects that generate violence in relatively low drug enforcement jurisdictions will be
ameliorated, suggesting the DRUG DIF coefficient has a potential downward bias.

12. Other law enforcement agencies, such as the Florida Highway Patrol, university police, and airport police, are not included in this study.

13. There is no problem with multicollinearity in the model. The highest simple correlation (between DRUGRATE and DRUG DIF) is .65.

14. These estimated coefficients do not vary significantly when alternative specifications are estimated. For example, when insignificant variables are dropped from the regression reported in Table 2, the DRUG DIF coefficient changes from .369 (t= 7.04) to .371 (t= 7.60). An alternative measure of DRUG DIF is similarly robust.

15. An important caveat to this argument is that there is already an enormous variation in state and local drug enforcement efforts, which account for more than 95 percent of all drug cases. Among cities with populations of more than 100,000, the drug arrest rate per 100,000 inhabitants shows enormous variability. For example, Madison (WI) has a rate of 57, Pittsburgh (PA) 723, and Oakland (CA) arrests 3,472 persons for every 100,000 population.

REFERENCES


