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JOÃO M. P. DE MELLO
Pontifical Catholic University of Rio de Janeiro (PUC-Rio)

Does Drug Illegality Beget Violence? Evidence from the Crack-Cocaine Wave in São Paulo

ABSTRACT Mimicking the so-called great American crime decline, violent crime in the state of São Paulo dropped sharply in the 2000s after rising steadily throughout the 1980s and 1990s. This paper evaluates the role of crack cocaine in explaining the aggregate dynamics in violence. Four facts are established. First, the aggregate data show a tight comovement between the prevalence of crack cocaine and homicides. Second, using city-level apprehension and possession data, I find a strong elasticity of violent crime with respect to crack cocaine after controlling for year fixed effects, city effects, and many time-varying covariates. I use the estimated elasticity to compute the contribution of crack cocaine to aggregate violence. Crack explains 30 percent of time series variation in the data. Third, only drug trafficking—not drug possession—has an impact on homicides. Finally, I find no impact on property crimes, a weaker impact on attempted murder, and, interestingly, a weak negative impact on aggravated assault. The theory suggests that both facts—only trafficking matters and crack affects only homicides, not property crime—can be rationalized only if drug-induced crime is driven by systemic violence induced by illegality itself. These results are important for policy because they suggest that violence will not follow the legalization of both the possession and trade of powdered cocaine or crack cocaine.

JEL Classification: I18, K42, L13

Keywords: Crack epidemic; violence; panel data

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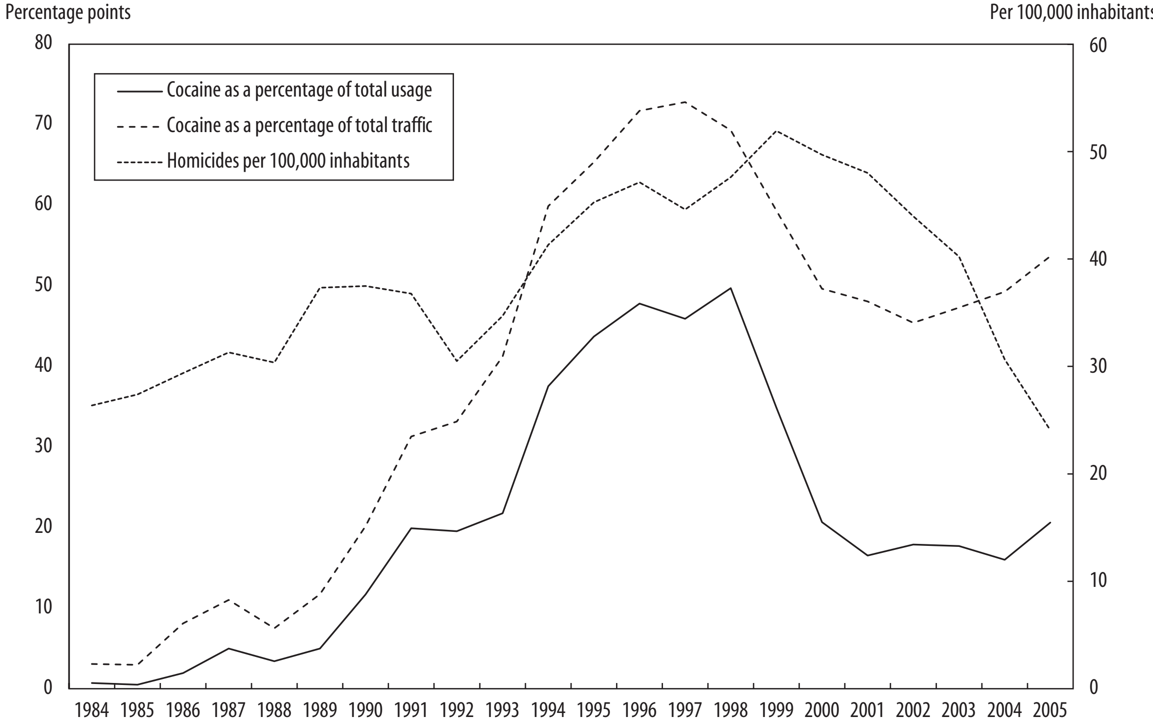
The São Paulo Metropolitan Area (SPMA) has received significant attention in the domestic and international media for its sharp swings in homicides in the 1990s and 2000s.[1] Homicides increased steadily over the 1990s, but they fell sharply in the 2000s. There were twenty-four homicides per 100,000 inhabitants in 2005 in the SPMA, down from the peak of fifty-two in 1999 and 20 percent *less* than the level in the early 1990s. In this paper, I investigate the role of a crack cocaine epidemic in explaining the swings in violent crime.

Figure 1 depicts three series: homicides per 100,000 inhabitants from 1984 through 2005; powdered cocaine and crack cocaine as a percentage of drug trafficking violations; and powdered cocaine and crack cocaine as a percentage of drug usage/possession charges.[2] Two facts emerge from the figure. First, trafficking and possession correlate strongly, with a correlation coefficient of 0.93. Whenever cocaine increases as a percentage of total trafficking, so does its usage, suggesting that local market conditions drive drug consumption. A weak comovement of traffic and usage would suggest that São Paulo was the distribution center for other markets. The second fact is the comovement

1. For example, the British weekly newspaper *The Economist* reported twice on the murder trends in São Paulo in the mid-2000s ("Protecting Citizens from Themselves," 20, October 2005; "Not as Violent as You Thought," 21, August 2008).

2. The weight of the amount confiscated distinguishes traffic from possession. Small quantities are normally associated with personal consumption, not trafficking.

FIGURE 1. Homicides and Cocaine Penetration: São Paulo Metropolitan Area, 1984 to 2005[a]



Source: State Secretariat for Public Security for the state of São Paulo.

a. Left axis: percent of total cocaine usage/traffic; right axis: homicides per 100,000 inhabitants. Cocaine includes both crack and powdered cocaine.

of homicides and the penetration of crack and cocaine as the drug of choice. Furthermore, all three series grow unabated in the 1990s, peak in the late 1990s, and drop in the 2000s, although cocaine and crack penetration increases slightly in the last two years of the series. Thus, the raw correlations with aggregate data from the SPMA suggest a relationship between the penetration of cocaine and crack and violent crime. The reminder of the paper explores the causality of these correlations.

Figure 2 depicts the series of possession charges of cocaine and crack versus marijuana in levels (kilos). The figure shows only possession because the levels are subject to less contamination by police activity, especially for cocaine and crack. If constant enforcement is assumed, drug usage did not increase across the board in the 1990s; there was a dramatic increase in cocaine and crack usage, but a slight reduction in marijuana usage. In the mid- to late 1990s, the trends started to reverse. Cocaine and crack usage dropped, and marijuana usage increased sharply. Drug usage thus has two waves: the crack cocaine epidemic in the 1990s, followed by the marijuana age in the 2000s.[3]

This paper is organized as follows. The next section introduces the hypothesis that crack cocaine contributed to the sharp spike in violent crime in the late 1980s in the United States. It also includes a partial review of the literature on drug use and crime. The paper briefly provides background on crime and law enforcement in Brazil, with an emphasis on drug-fighting policies and enforcement. A subsequent section describes the data sources used in the empirical analysis and presents the identification strategy and results. I then discuss the results in light of the drug hypothesis in the literature. The final section provides the conclusion.

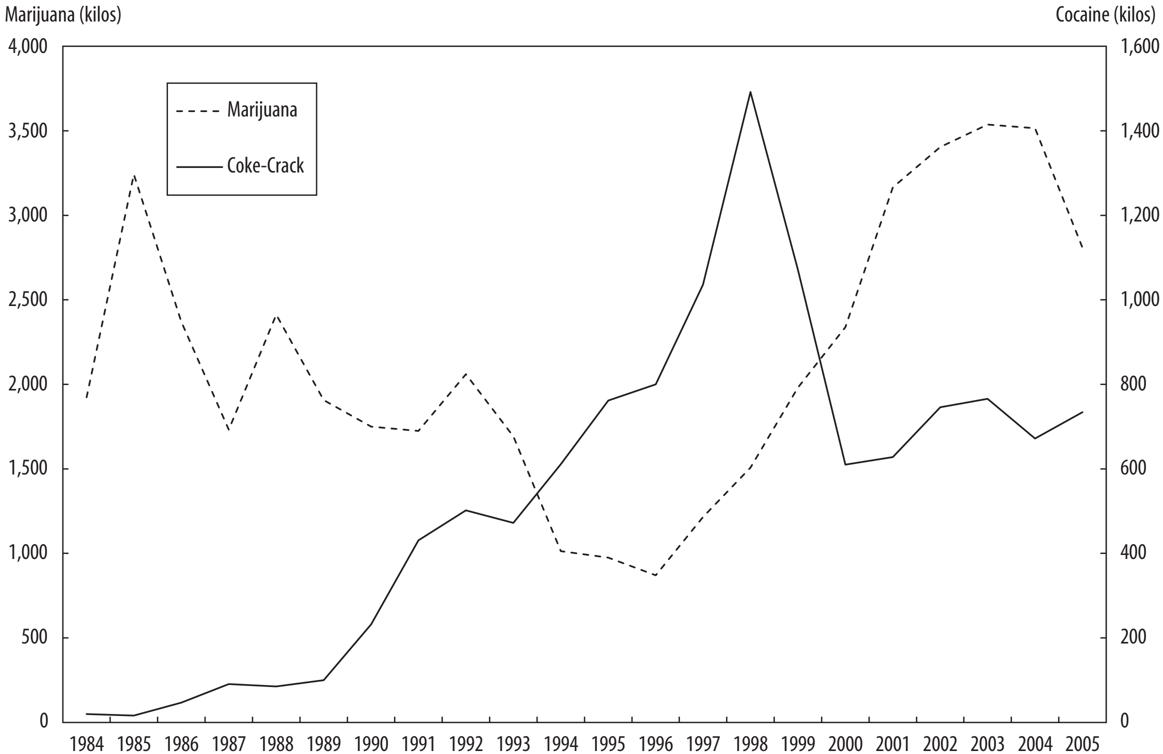
The Crack Hypothesis and Related Literature

Goldstein lists three channels through which the drug-violence nexus operates.[4] First, there is a pharmacological relationship. Consumption of psychotropic substances affects behavior, sometimes exacerbating aggressiveness.

3. Again, the levels of confiscation reflect both consumption and police enforcement efforts. It may be that police effort varied for different drugs over time. In particular, there is anecdotal evidence that the police relaxed the enforcement of possession of light drugs such as marijuana in the mid-2000s, which would explain the large drop in marijuana possession in 2005. Nevertheless, it is hard to rationalize the trends in figure 2 with changes in enforcement, unless enforcement of marijuana was relaxed in the 1990s and then toughened in the 2000s, while the opposite was true for cocaine and crack, which is rather far-fetched.

4. Goldstein (1985).

FIGURE 2. Possession of Cocaine and Marijuana: São Paulo Metropolitan Area, 1984 to 2005[a]



Source: State Secretariat for Public Security for the state of São Paulo.

a. Cocaine includes both crack and powdered cocaine. Possession statistics are based on total apprehensions.

For example, McClelland and others, in their classic *The Drinking Man,* compare the fantasies of sober and intoxicated men and find that intoxicated men are more likely than sober men to have fantasies involving power and domination.[5] An extensive literature documents the causal impact of alcohol consumption on violent behavior in different settings.[6] The second channel is an economic relationship: drugs produce crime because users commit crimes to support their habits. The third channel—the systemic channel—posits that the illegality of the drug trade and usage causes criminal behavior. Several mechanisms are operative. Directly, confrontation between traffickers and the police causes violence. Illegality prevents contracts from being enforced through the normal judicial system, thus increasing the value of violence as an enforcing mechanism.[7] Lastly, prohibition may change the competitive dynamics of the industry. For example, the fact that drug trafficking is illegal makes the use of violence relatively attractive as a means to acquire market share. If a person is engaged in one type of criminal activity (such as drug trafficking), the marginal cost of the person's engaging in further criminal behavior (killing, for instance) is reduced. In fact, drug cartels and gangs compete mostly through violence—not through prices, as lawful industries do.

The three channels have different implications for how the drug-violence nexus operates for different drugs. For example, the first two channels—pharmacological and economic—apply to all psychotropic substances, but the systemic violence is specific to illicit drugs. Differences in pharmacology cause different impacts on behavior. Marijuana and heroin, for example, are depressants, thus abating aggressive behavior. Cocaine and crack, on the other hand, are stimulants that induce aggressiveness.[8] This suggests that, at least theoretically, crack and cocaine have a stronger impact on violence.

Substances also differ in their inducement of economically motivated violence. Different social classes may consume different drugs, for example. In addition, some substances may more severely impair a person's ability to make a living. For example, crack cocaine, because of its extreme addictiveness, is considered to be particularly detrimental to a normal working life.[9]

5. McClelland and others (1972).

6. See, for example, Carpenter (2007); Biderman, De Mello, and Schneider (2010); Gorman and others (1998); Lipsey and others (1997).

7. Miron and Zwiebel (1995).

8. Johnson, Golub, and Dunlap (2000).

9. Johnson, Golub, and Dunlap (2000).

Within the systemic channel, the industrial organization of drug distribution differs across illicit substances in ways that make crack more conducive to violence. Entry costs and market structure differ for different drugs. In particular, the number of firms supported in equilibrium determines not only the level of competitiveness in the market, but also the level of violence if gangs and cartels use violence as one dimension of competition, as anecdotal evidence suggests. Demand elasticities also differ among drugs. Crack is the most addictive of hard drugs. Johnson, Golub, and Dunlap show that this addictiveness manifests itself in "runs" of large amounts of crack consumption.[10] Demand elasticity could then be relatively low, increasing profits and, ceteris paribus, inducing more entry. Supply conditions for production, wholesale distribution, and retail distribution also differ. The marginal cost of producing crack rocks out of cocaine paste is very low, and margins were very high when crack was introduced in New York City. Johnson, Golub, and Dunlap talk about the "crazy money" involved in selling crack: "Crack sales were so lucrative that by 1988 the entire labor force of the illicit drug distribution industry was attracted to it."[11] Large-scale entry into the retail distribution market induced more competition and, consequently, more violence. On the other hand, marijuana, possibly because it is less addictive, had lower margins induced by more elastic demand. In addition, its distribution involved access to a wholesale distributor, which increased entry costs.[12] Heroin retail distribution was also highly concentrated in New York City.[13] All of these factors suggest a more competitive retail market for crack than for marijuana and heroin. Insofar as competitiveness implies violence, one should expect more violence associated with crack and cocaine than with heroin and marijuana.

When demand is inelastic, gangs may choose to compete for turf, which is mainly competition in the violence dimension. Because drug distribution is illegal, the marginal cost of exerting violence is much lower than it is in lawful businesses. Thus, a crucial issue in the industrial organization of drug-induced violence is the own-price elasticity of demand.[14] Although short-term demand for addictive goods should be inelastic, long-run elasticity should be higher.[15] Estimates vary considerably, but the empirical literature suggests

10. Johnson, Golub, and Dunlap (2000).
11. Johnson, Golub, and Dunlap (2000).
12. Johnson, Golub, and Dunlap (2000).
13. Johnson, Golub, and Dunlap (2000).
14. The ambiguity of the empirical results is not surprising. Besides the normal difficulty in solving simultaneity problems with aggregate data, additional challenges arise when measuring the prices of illegal substances.
15. Becker and Murphy (1988).

two things. First, demand for different drugs has different elasticities. Second, demand for cocaine seems less elastic than demand for other drugs. DiNardo, for example, finds no effect of cocaine prices on drug usage among high school seniors in the United States.[16] Saffer and Chaloupka find higher elasticities than previously thought, but the demand for cocaine is still inelastic.[17] Based on individual-level data, participation price elasticity for cocaine is around –0.45, and price elasticity is around –0.90. Heroin has much higher price elasticities (–0.70 and –1.70, respectively). Unfortunately, no estimates are available for crack cocaine, but given its lower price and extreme addictiveness, it is reasonable to expect the own-price elasticity of crack cocaine to be lower than that of powdered cocaine.[18]

Finally, depending on which channel is operative, the drug-violence nexus operates through drug use, traffic, or possibly both. The pharmacological channel works exclusively through drug use. Even in a city in which all drugs are bought outside the city and brought in for consumption only, violence could arise for pharmacological reasons. Economically induced violence should also operate through drug use because these crimes are committed to support use. Systemic causes arise because the trade is illegal. Thus, the systemic channel operates through traffic.

The empirical model tests the following two hypotheses: the penetration of crack/cocaine traffic has an impact on both violent and property crime; and the penetration of crack/cocaine use has an impact on both violent and property crime. Testing these two hypotheses allows me, first, to test whether the penetration of crack explains violent crime in São Paulo and, second, to distinguish between the three noncompeting mechanisms.

Literature Review

This study most closely relates to the extensive literature that explores the nexus between youth gangs, drugs, and violence. It is beyond the scope of this work to survey this literature exhaustively, but I present the main results of the literature to position my contribution relative to the literature.[19] The literature has produced mixed results on the effect of drugs on violence. Corman and Mocan, for example, find only a weak link between drug usage and property

16. DiNardo (1993).

17. Saffer and Chaloupka (1995).

18. Johnson, Golub, and Dunlap (1990). See Rhodes and others (2002) for an extensive survey of this a relatively large body of literature.

19. Howell and Decker (1999) provide an excellent and exhaustive survey of the literature on the connection between youth gangs, drugs, and violence.

crime.[20] The relationship between gang violence and drug use or trafficking is also weak. Fagan finds that drug dealing occurs in gangs with both high and low engagement in violent behavior.[21] On the other hand, Hutson and others find that as of the mid-1990s, 43 percent of all homicides in Los Angeles County were gang-related, although the authors cannot attribute gang violence to drug use or trafficking.[22] Scholars find that many adult criminal organizations were formed to distribute crack cocaine in the 1980s in the United States.[23] Taylor shows evidence that violence ensued after the introduction of crack cocaine, and this association is apparently linked to the competition for market share in the retail distribution.[24] In summary, the literature using U.S. data provides some weak evidence for the link between drug distribution and gang violence. The introduction of crack cocaine seems to strengthen this link. This is in line with the results presented in this paper, although the link is not strong and there is also evidence to the contrary.[25]

Regarding Goldstein's three channels, the empirical literature is a little more assertive. Johnson, Golub, and Dunlap summarize the available evidence.[26] They find that pharmacology is at best a second-order channel, while some evidence supports the economic channel. Little is known about the systemic channel, although it is likely to be a first-order mechanism by exclusion because the economic channel explains little of the overall relationship between drugs and violence.

In this context, I offer several contributions. First, I document the impact of a crack epidemic in a context outside the United States. Second, I show that the type of drug that is currently in fashion matters—that is, crack traffic has an impact on crime, but aggregate drug traffic does not. Third, I document the mechanism behind the drug-violence nexus. The three channels have different implications for different types of crime and different types of drug violation. Through the pharmacological and economic channels, crack usage causes violence; under these mechanisms, traffic would affect violence only insofar as it contributes to usage. In contrast, traffic per se can only affect violence through the systemic channel. According to my findings, only traffic causes violence, whereas usage does not, which suggests that the relevant channel is

20. Corman and Mocan (2000).
21. Fagan (1989).
22. Hutson and others (1995).
23. See Taylor (1990); Fagan (1996); Johnson, Golub, and Dunlap (2000).
24. Taylor (1989); Fagan (1996).
25. Huff (1996).
26. Johnson, Golub, and Dunlap (2000).

the systemic one. Another source of variation is the type of crime. The economic channel implies that drug consumption causes property crime. I find no such result using data from the state of São Paulo. In summary, this paper provides evidence on the channel through which drugs influence violence. Data from the state of São Paulo favor Goldstein's systemic channel.

This paper's final contribution is in terms of identification. As I explain in detail below, I adopt a novel way to measure the dynamics of drug possession and trafficking. Police report data are contaminated by police activity. Without properly controlling for enforcement, estimates derived from regressing crime on drug trafficking or possession are bound to be biased. I circumvent the problem by measuring crack and powdered cocaine not in levels but as a proportion of all drug trafficking and possession violations—a strategy not previously used in the literature.

Crime and Law Enforcement in Brazil

Brazil is a federal republic with three layers of government: federal, state, and municipal.[27] Law enforcement is primarily the responsibility of state governments. Executive and administrative authority rests in the state-level secretariats of public security (*Secretarias Estaduais de Segurança Pública*), which respond directly to the governor, who allocates the budget for the secretariat. The administrative and strategic decisions are made by the state security secretary, who is appointed by the governor. Some strategic decisions are determined by law. For example, by constitutional mandate, the number of policemen in the state of São Paulo must be roughly constant in per capita terms across cities. Enforcement is shared between two organizations that answer to the secretary: the military police, responsible for patrolling and crime prevention; and the civil police, an investigative agency. The commanders of the two police forces are also appointed by the governor. Unlike the United States, sheriffs in Brazil are not elected, but are appointed from among career officers. The institutional structure of the state-level police is determined by the federal constitution.

The federal and municipal levels participate in law enforcement, but to a lesser degree. Suppression of drug trafficking is shared between the federal police force—the *Polícia Federal,* equivalent to the U.S. Federal Bureau of Investigation (FBI)—and the state-level secretariats. Like the FBI, the federal

27. The president, governor, and mayor are elected by direct ballot.

police are responsible for dealing with cross-state and international traffic.[28] The state-level police forces work within state borders. Finally, the municipal police forces (*Guardas Municipais*) are not mandated by federal law, but rather each municipality makes the choice of whether to establish a local police force. As of 2006, 28 percent of municipalities in São Paulo state had a municipal police force. Of those police forces, 52 percent carry firearms and are involved in street-level policing.[29]

The institutional features of police enforcement make it somewhat unlikely that enforcement will respond promptly to city-level changes in drug use and traffic. Decisions are made by state and federal authorities, not at the city level. Of course, state authorities may respond to new trends, but the deployment of the police force is limited by the constitutional mandate that the number of police officers must be constant across cities in per capita terms.

Empirical Strategy and Results

The main source of data for this study is the State Secretariat for Public Security for the state of São Paulo.[30] There are two different data sets. One data set (DS1) is longer, with annual city-level data from 1984 through 2005 for the thirty-nine cities in the São Paulo Metropolitan Area (SPMA). It includes data on several different types of property and violent crimes. Drug information is based on the number of bookings for drug trafficking and usage. Unfortunately, the information on crack cocaine is bundled with powdered cocaine. Data on basic demographics (population, urban population, and age distribution) are from Fundação Seade, a state-level government-sponsored think tank. The second data set (DS2) covers all 643 cities in the state of São Paulo from 2001 through 2008. In addition to its wider geographical coverage, DS2 has much richer information at the city level. It includes a wider range of crime types (for example, illegal gun possession), the number of arrests, and the number of stolen vehicles recovered, which support the construction of a measure of police efficiency. In addition, it provides information on both powdered and crack cocaine. Unfortunately, no information on drug possession charges is available.

28. Other responsibilities include suppressing smuggling, white-collar crime, and corruption.

29. When municipal police forces do not carry firearms, they normally focus on vehicular traffic control duties.

30. *Secretaria de Segurança Pública do Estado de São Paulo.*

Identification Strategy

The strategy consists of estimating different versions of the following model:

$$\text{CRIME}_{it} = \beta_0 + \beta_1\text{TRAFFIC}_{it} + \beta_2\text{POSSESSION}_{it} + \text{Controls}_{it}$$
$$+\sum_{t=1}^{T}\tau_t\text{YEAR}_t + \sum_{i=1}^{I}\iota_i\text{CITY}_i + \varepsilon_{it},$$

where CRIME_{it} is the number of occurrences of a certain type of crime per 100,000 inhabitants in city *i* at time *t;* TRAFFIC_{it} (POSSESSION_{it}) is the share of crack and cocaine in total drug trafficking (possession) violations when using DS1 and the share of crack in total drug trafficking violations when using DS2; YEAR is a set of year (period) dummy variables; and CITY is a set of city fixed effects. The inclusion of controls depends on the data set. Demographics, available in both DS1 and DS2, include the population, the percentage of urban population, and the percentage of males aged fifteen to twenty-four years.

I take several actions to account for unobserved factors that may affect both crime and crack consumption or trafficking. Identification of the causal effect of crack on crime hinges on these actions. First, the inclusion of city fixed effects accounts for all time-invariant heterogeneity across cities. This is important because drug consumption and trading may vary systematically with factors that cause crime, such as the availability of firearms. Second, aggregate homicides and the penetration of crack cocaine show a strong comovement (figure 1), but the relationship may be spurious. I therefore include a year-specific effect to discard all pure time-series variation. The focus of enforcement may change over time, prioritizing some drugs over others. Controlling for year fixed effects accounts for changes in the enforcement focus as long as it is a statewide strategy. When year and city dummy variables are included, the remaining variation for estimating the causal impact is how crack cocaine penetration varied differently across cities.

Third, the cross-city variation in the speed of crack penetration is not randomly determined. Regardless of the inclusion of year and city fixed effects, time-varying unobserved heterogeneity is a threat to identification. I mitigate this threat as much as possible by including a wide range of time-varying controls. One important control is the age structure, measured by the percentage of males in the fifteen to twenty-four-year age bracket. De Mello and Schneider show that the presence of a large cohort of youth explains 70 percent of the rise in violence in the 1990s and 50 percent of the decline in the 2000s.[31] Furthermore, time-varying heterogeneity exists at the city-level age structure. Thus, if preferences for drugs are age-specific, the omission of the age structure would be a serious impediment to causal interpretation. I also include income when using data from the whole state (DS2). Low income, which causes crime, may change the drug consumption pattern. The remaining demographic controls are population and the percentage of urban population. Finally, I include motor vehicle theft and robbery per 100,000 inhabitants as a control when using both DS1 and DS2.[32] I do not believe that vehicle theft or robbery causes homicide per se. However, it is a good proxy for changes in crime patterns across cities over time. I chose vehicle theft and robbery because it is the only crime variable besides homicide that suffers little from underreporting.

Fourth, after controls and year and city fixed effects are included, there is still one obstacle to identification: police enforcement. With DS2, I can include several measures of enforcement: illegal guns apprehended, number of arrests, income per capita, and police efficiency measured as the rate of recovered stolen vehicles. However, these measures are only indirectly related to enforcement and, arguably, capture its intensity rather imperfectly. This is a problem because I do not observe the amount of drugs consumed or trafficked, but only the amount of apprehensions (possession and trafficking), which are contaminated with enforcement. Better policing may both reduce homicides and increase apprehensions. The threat posed by enforcement motivates the main identification tactic. Instead of levels, I use crack cocaine as a *proportion* of all drug possession and trafficking violations. Enforcement may still contaminate this variable, but it must be that enforcement not only changes differently across cities but also changes differently for different substances in different cities. It is possible, even likely, that the police focus more on substances when they gain market share. It is far-fetched, however, that this enforcement would change differently for different drugs in different cities, because enforcement is done at the state level by military police, whose decisionmaking process is top-down.

In summary, the source of identifying variation is the difference across cities in the speed of crack cocaine penetration in the 1990s and the difference in the speed of retraction in the 2000s. Crack cocaine penetrated larger cities earlier in the 1990s, but there is no previous differential trend in crime

31. De Mello and Schneider (2010).

32. The Brazilian Penal Code defines robbery as a situation in which property is stolen with violence or the threat of violence; theft is defined as a situation in which property is stolen without violence or the threat of violence.

between large and small cities.[33] This, in addition to the fact that enforcement is not a serious threat to the strategy, increases the confidence that the variation is as close as it gets to random without a natural experiment.

Finally, I also estimate the model in levels. I find the same outcome qualitatively, but the results are much less significant, both practically and statistically.[34] It is not obvious how to interpret the results in levels. As argued, drug violations depend on enforcement, which is not observed here. The sign of the bias is not obvious. For the same level of illegal drug activity, more enforcement yields more violations and fewer homicides, biasing the results toward zero. This is compatible with the finding that the results in levels are smaller than the results in percentages. However, illegal drug activity responds to enforcement. Differences across cities in the changes over time in the *amount* of crack cocaine are not as good a source of identifying variation because levels are more contaminated with enforcement than percentages.

The observations are weighted by population. Homicides are a rare occurrence, and observations from small cities have a much higher variance than those from larger cities. Thus, variation from smaller cities should be discounted. To avoid giving more weight to observations in the later part of the sample, the weight is the average population over the sample period. The observations are also clustered at the city level. Thus, all estimated standard errors are robust to within-city correlation, an important feature in light of the results of Bertrand and others.[35]

Summary Statistics

Table 1 contains descriptive statistics on DS1 and DS2. Several facts arise from the table. As expected, the São Paulo Metropolitan Area is much more violent than the whole state, even after observations are weighted by population.[36] Again not surprisingly, drug trafficking happens more often in the SPMA than in the whole state. Crack and powdered cocaine represent a large fraction of drug traffic, especially in the SPMA. The share of crack and cocaine in possession is lower than in trafficking. In summary, the descriptive statistics suggest that violent crime and drug dealing are similar yet different phenomena in the whole state versus the SPMA. This is important for my

33. De Mello and Schneider (2010).
34. I do not report the results in levels. They are available on request.
35. Bertrand, Duflo, and Mullainathan (2004).
36. The sample periods are different. If I compute the summary statistics using DS1 but restricting the sample to the years 2001 through 2005, the figures are similar.

TABLE 1. Descriptive Statistics

	Mean		*Standard deviation*		*Median*	
Variable	*SPMA 1984–2005*	*Whole state 2001–2008*	*SPMA 1984–2005*	*Whole state 2001–2008*	*SPMA 1984–2005*	*Whole state 2001–2008*
Homicides per 100,000 inhabitants	38.27	20.27	13.34	15.81	35.80	15.37
Vehicle robbery and theft per 100,000 inhabitants	604.63	446.17	328.57	363.65	542.14	361.89
Robbery and theft per 100,000 inhabitants	1,898.33	2,189.94	585.74	865.04	1,820.81	2,239.59
Aggravated assaults per 100,000 inhabitants	323.42	431.70	74.06	196.18	308.90	369.66
Attempted murder per 100,000 inhabitants	19.84	19.62	9.82	11.90	17.77	19.60
Robbery followed by murder per 100,000 inhabitants	2.18	0.92	1.04	1.25	2.12	0.62
Drug trafficking per 100,000 inhabitants	12.19	30.31	6.88	22.03	11.07	21.41
Crack-cocaine trafficking	0.39	0.05	0.26	0.11	0.45	0.05
Crack-cocaine possession	0.21		0.18		0.17	

Source: State Secretariat for Public Security for the state of São Paulo.

a. SPMA 1984–2005: city-level annual observations for the São Paulo Metropolitan Area from 1984 to 2005 (669 observations). Whole state 2001–2008: city-level annual observations for the whole state of São Paulo from 2001 to 2008 (5,088 observations). For the whole state, crack means only crack cocaine, while for the SPMA, it includes both crack and powered cocaine. Robbery and theft excludes vehicle robbery and theft. All summary statistics were computed using the average city population over the period as a weight.

TABLE 2. Estimates for the São Paulo Metropolitan Area, 1984–2005[a]

Explanatory variable	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*
Drug trafficking per 100,000 inhabitants	–0.46	–0.40	–0.08	–0.08	–0.03
	(0.16)***	(0.11)***	(0.19)	(0.17)	(0.16)
Crack and cocaine/total drug trafficking	24.70	23.23	3.18	4.29	5.81
	(7.26)***	(7.25)***	(2.45)	(2.60)*	(2.60)**
Crack and cocaine/total drug possession	3.32	4.51	–0.79	–0.70	1.82
	(5.96)	(5.57)	(3.46)	(3.65)	(3.61)
Summary statistic					
City fixed effects	No	Yes	Yes	Yes	Yes
Year fixed effects	No	No	Yes	Yes	Yes
Demographics[b]	No	No	No	Yes	Yes
Vehicle robbery and theft	No	No	No	No	Yes
R squared	0.21	0.57	0.76	0.77	0.77
No. observations	669	669	669	669	669

Source: State Secretariat for Public Security for the state of São Paulo and Fundação SEADE.
*Statistically significant at the 10 percent level.
**Statistically significant at the 5 percent level.
***Statistically significant at the 1 percent level.
a. The dependent variable is the number of homicides per 100,000 inhabitants. In all specifications, observations are weighted by population. Standard errors (in parentheses) are clustered at the city level. The period of analysis is 1984–2005, unless otherwise noted.
b. Covariates: population, the percentage of males aged fifteen to twenty-four years, and the share of urban population.

purposes because it implies that the one data set contains information above and beyond the other data set.

Results for the SPMA from 1984 through 2005 (DS1)

Table 2 shows the first set of estimates using DS1, which contains data for the SPMA from 1984 through 2005. The model in the first column includes no controls. Drug trafficking violations seem negatively related to violent crime—that is, contrary to expectations, places with more trafficking are less violent. Causal interpretation is not warranted because the measure of drug trafficking is contaminated with the strength of enforcement and may well capture better policing. The coefficients associated with the percentage of drug trafficking and possession involving crack and cocaine suggest, in both cases, that crack and cocaine are associated with more homicides. However, only crack and cocaine trafficking is statistically significant. In terms of practical significance, the standard deviation of homicides per 100,000 inhabitants is 13.34, and the standard deviations of the share of cocaine and crack in trafficking are 0.26 and 0.18, respectively (see table 1). Thus, according to the estimates in column 1, an increase of one standard deviation in the penetration of cocaine/crack traffic is associated with an increase of 6.42 homicides per

100,000 inhabitants—nearly half the standard deviation of homicides. The impact of an increase of one standard deviation in cocaine and crack possession is not only statistically insignificant, but also much weaker in practice: about 0.80 homicides per 100,000 inhabitants, or 6 percent of a standard deviation.

The preferences for cocaine or crack could be systematically related to city characteristics, and this may be driving results in column 1. In column 2, I control for all time-invariant unobserved heterogeneity among cities by including city dummy variables. The results are unchanged, which suggests that cocaine and crack penetration are not systematically related to city characteristics.

Column 3 includes year dummy variables. This is quite important because crack and cocaine may, by sheer coincidence, have penetrated (retracted) in a period of rising (declining) homicides. In other words, the common component among cities may be spurious. Indeed, the results change significantly when year dummy variables are included. First, traffic in levels is no longer significant. Second, penetration of cocaine/crack possession no longer has any impact on homicides statistically or practically. Third, the coefficient on the penetration of cocaine/crack traffic is significantly reduced: although marginally significant in practice (one homicide per 100,000 inhabitants), it is no longer statistically significant at standard levels. One comment is warranted. The inclusion of year dummy variables discards all pure time-series variation that is common among cities. If the penetration of cocaine and crack in fact causes homicides, the common component is legitimate causal variation. Thus, estimates that discard pure time-series variation are the most conservative possible.

Columns 4 and 5 include demographics and vehicle theft to control for general trends in crime. Traffic in levels and the penetration of cocaine/crack possession are still not significant statistically or practically. Interestingly, when the model controls for time-varying heterogeneity among cities, the coefficient on the penetration of cocaine/crack traffic is larger than in column 3, and it is now statistically significant at the 10 percent level. Using the estimated coefficient in column 5, I find that a one-standard-deviation increase in the penetration of cocaine/crack traffic causes an increase of 1.51 homicides per 100,000 inhabitants, which is 11 percent of the standard deviation in homicides. This is a small but non-negligible effect.

Table 3 contains some robustness exercises using DS1. Figure 1 suggests that the rate of increase in homicides accelerates in the late 1980s. I therefore discard the early and mid-eighties from the sample. Because of the weighting

TABLE 3. Robustness Tests for the São Paulo Metropolitan Area[a]

Explanatory variable	*City-specific trends*[b] *(1)*	*Year > 1988* *(2)*	*Excluding São Paulo* *(3)*	*Excluding São Paulo and Guarulhos* *(4)*	*Controls in levels* *(5)*
Drug trafficking per 100,000 inhabitants	–0.13	–0.10	–0.04	–0.04	–0.05
	(0.24)	(0.18)	(0.18)	(0.19)	(0.20)
Crack and cocaine/total drug trafficking	5.95	7.08	5.18	5.69	5.48
	(3.56)*	(2.90)**	(2.82)*	(2.75)**	(2.80)*
Crack and cocaine/total drug possession	0.95	–0.18	1.37	0.73	1.69
	(3.65)	(3.65)	(3.76)	(3.92)	(3.34)
Summary statistic					
City fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Demographics[c]	Yes	Yes	Yes	Yes	Yes
Vehicle robbery and theft	Yes	Yes	Yes	Yes	Yes
R squared	0.81	0.78	0.71	0.73	0.78
No. observations	669	542	647	625	669

Source: State Secretariat for Public Security for the state of São Paulo and Fundação SEADE.
*Statistically significant at the 10 percent level.
**Statistically significant at the 5 percent level.
***Statistically significant at the 1 percent level.
a. The dependent variable is the number of homicides per 100,000 inhabitants. In all specifications, observations are weighted by population. Standard errors (in parentheses) are clustered at the city level. The period of analysis is 1984–2005, unless otherwise noted.
b. One linear time trend per city.
c. Covariates: population, the percentage of males aged fifteen to twenty-four years, and the share of urban population.

scheme, the city of São Paulo has a disproportionately large importance (10 million out of São Paulo state's 43 million inhabitants live in São Paulo). When I exclude the city of São Paulo from the sample, the results are, if anything, stronger (column 2). I then exclude Guarulhos, the second-largest city in the state, with 1.1 million inhabitants (column 3). Finally, crime regressions are normally specified with demographic controls as a percentage of the population, a procedure followed throughout except in column 4, which uses the total male population between fifteen and twenty-four years of age and the total urban population (instead of the share of the total population). In all four exercises, the results are very similar to results in table 2. The impact of cocaine traffic is, if anything, stronger. Possession and total traffic have no impact on homicides.

In summary, averaging the estimated coefficients, we conclude that an increase of one standard deviation in the penetration of cocaine/crack in traffic (0.26) increases the homicide rate by 1.30 ($\cong 0.26 \times 5$), which represents 9.7 percent of a standard deviation. Again, I find a small but non-negligible impact.

TABLE 4. Estimates for the Whole State[a]

Explanatory variables	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Drug trafficking per 100,000 inhabitants	−0.16	−0.22	0.02	0.00	0.00	0.00
	(0.06)***	(0.08)***	(0.02)	(0.01)	(0.01)	(0.01)
Crack cocaine/total drug trafficking	−24.42	−2.00	11.68	5.52	4.92	4.58
	(4.04)***	(2.68)	(3.27)***	(1.73)***	(1.68)***	(1.69)***
Summary statistic						
City fixed effects	No	Yes	Yes	Yes	Yes	Yes
Year fixed effects	No	No	Yes	Yes	Yes	Yes
Demographics[b]	No	No	No	Yes	Yes	Yes
Vehicle robbery and theft	No	No	No	No	Yes	Yes
Additional controls[c]	No	No	No	No	No	Yes
R squared	0.09	0.48	0.76	0.83	0.83	0.84
No. observations	5,088	5,088	5,088	5,088	5,088	5,088

Source: State Secretariat for Public Security for the state of São Paulo and Fundação SEADE.
*Statistically significant at the 10 percent level.
**Statistically significant at the 5 percent level.
***Statistically significant at the 1 percent level.
a. The dependent variable is the number of homicides per 100,000 inhabitants. In all specifications, observations are weighted by population. Standard errors (in parentheses) are clustered at the city level. The period of analysis is 2001–08, unless otherwise noted.
b. Covariates: population, the percentage of males aged fifteen to twenty-four years, and the share of urban population.
c. Additional controls: police efficiency (vehicles recovered/vehicle robbery and theft), guns apprehended per 100,000 inhabitants, gun possession per 100,000 inhabitants, and income per capita.

Results for the Whole State from 2001 through 2008 (DS2)

Table 4 contains the main estimates using the data set of all cities in the state of São Paulo from 2001 through 2008 (DS2). Although this data set is richer in general, it contains no information on possession, only trafficking. On the other hand, it separates crack and powdered cocaine. The model in column 1 includes neither city nor year fixed effects. The penetration of crack in drug trafficking seems to *reduce* homicide (column 1). Similar to table 2, overall traffic seems to reduce homicides. When city fixed effects are included, crack penetration is no longer significant, but overall traffic is still associated with a reduction in homicides (column 2). When both time and city fixed effects are included, the estimates are more similar to table 2, although the impact of crack is much stronger now, at 11.68. When the model includes demographics and vehicle theft and robbery per 100,000 inhabitants (columns 3 and 4), the estimates are very similar to those in table 2. The inclusion of additional controls that are not available in DS1 does not change the results meaningfully (column 5). Averaging the most credible estimates (columns 3 through 5) shows that that an increase of one standard deviation in the penetration of crack in drug traffic (0.11) causes an additional 0.55 homicides per 100,000

TABLE 5. Estimates from the Whole State[a]

Explanatory variables	*Excluding São Paulo (1)*	*Excluding São Paulo and Campinas (2)*	*Controls in levels (3)*
Drug trafficking per 100,000 inhabitants	–0.02	–0.01	0.02
	(0.02)	(0.01)	(0.02)
Crack cocaine/total drug trafficking	4.60	4.08	4.77
	(1.74)**	(1.66)**	(1.72)***
Summary statistic			
City fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Demographics[b]	Yes	Yes	Yes
Vehicle robbery and theft	Yes	Yes	Yes
Additional controls[c]	Yes	Yes	Yes
R squared	0.78	0.78	0.85
No. observations	5,080	5,072	5,088

Source: State Secretariat for Public Security for the state of São Paulo and Fundação SEADE.
*Statistically significant at the 10 percent level.
**Statistically significant at the 5 percent level.
***Statistically significant at the 1 percent level.
a. The dependent variable is the number of homicides per 100,000 inhabitants. In all specifications, observations are weighted by population. Standard errors (in parentheses) are clustered at the city level. The period of analysis is 2001–08, unless otherwise noted.
b. Covariates: population, the percentage of males aged fifteen to twenty-four years, the share of urban population in total population, and GDP per capita, unless otherwise noted.
c. Additional controls: police efficiency (vehicles recovered/vehicle robbery and theft), guns apprehended per 100,000 inhabitants, gun possession per 100,000 inhabitants, and income per capita.

inhabitants (5.05 × 0.11), which in the case of DS2 represents 3.7 percent of the standard deviation of homicides per 100,000 inhabitants. Thus, the impact is similar to the one estimated using data from the SPMA for 1984–2005.

Table 5 contains robustness checks similar to those in table 3. Again, all results are robust to excluding the largest cities or including demographics in levels.[37]

Other Crimes

I now present the impact of crack penetration on other crime categories. These categories serve two purposes: not only may they serve as a falsification test, but they are also informative regarding the mechanisms that drive the relationship between crack cocaine and crime. Several authors argue that the crack epidemic in the late 1980s and its abatement in the 1990s cannot explain

37. In the case of the whole state, I exclude the Campinas Metropolitan Region, not Guarulhos, because the Campinas Metropolitan Area is the second-largest in the state.

the breadth of the crime increase and decline.[38] Zimring offers the following reason:

> One problem is that the crack/gun violence influence should not cause all varieties of crime to go up and then decline. Thus, Rosenfeld concludes that the crack hypothesis "says nothing about the drop in property crime rates or the long-term decline in violence among adults" (2004, p. 87). Rosenfeld is making a limited but important point—that there are many elements of the 1990s decline that the proliferation and the abatement of drug markets in big cities did not cause. What, after all, should be the impact of variations in crack cocaine markets on rates of auto theft, rape, or robbery?[39]

If one accepts this theoretical assertion, then crack should have no impact on property crime, for example.

There are, however, theoretical reasons to believe that drugs in general and crack in particular could have an impact "on rates of auto theft, rape or robbery." The pharmacological channel suggests that mental impairment from drug use may lead to all types of violent behavior, including rape.[40] Previous empirical research establishes a relationship between alcohol consumption and violent behavior.[41] In fact, pharmacological misbehavior is one of the main justifications for the illegality of drugs. Through the economic channel, drug use should increase property crime to support the addiction.[42] Whether the pharmacological and economic channels are relevant in practice is an empirical question, and measuring the impact of crack cocaine on different crime categories is informative about which channel is operative.

Tables 6 and 7 contain estimates of the effect of trafficking and crack penetration on other crimes using data from the SPMA and the whole state, respectively. The general message is that neither traffic nor penetration has a consistent impact on any other crime category. Traffic has a statistically significant and positive impact only on assaults (column 1) and only using data from the SPMA. Point estimates indicate that crack penetration reduces assaults, which could suggest an increase in lethality. The impact is statistically significant only when data for the whole state are used (table 7, column 1). In

38. Zimring (2007); Rosenfeld (2004).
39. Zimring (2007, p. 84).
40. Goldstein (1985).
41. Carpenter (2007); Biderman, De Mello, and Schneider (2010); Gorman and others (1998); Lipsey and others (1997).
42. Goldstein (1985).

TABLE 6. Other Crimes in the São Paulo Metropolitan Area, 1984 to 2005[a]

Explanatory variable	*Aggravated assault (1)*	*Attempted murder (2)*	*Property crime*[b] *(3)*	*Vehicle robbery and theft (4)*	*Robbery followed by murder (5)*
Drug trafficking per 100,000 inhabitants	2.61	0.11	2.40	–4.85	0.02
	(1.16)**	(0.08)	(2.92)	(2.91)	(0.01)*
Crack and cocaine/total drug trafficking	–27.92	2.39	–40.98	–40.90	0.46
	(20.31)	(2.96)	(50.62)	(47.49)	(0.40)
Crack and cocaine/total drug possession	–25.84	0.20	35.75	–25.76	–0.52
	(23.89)	(3.63)	(56.20)	(34.87)	(0.39)
Summary statistic					
City fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Demographics[c]	Yes	Yes	Yes	Yes	Yes
Crime control[d]	Yes	Yes	Yes	Yes	Yes
R squared	0.66	0.72	0.95	0.93	0.49
No. observations	669	669	669	669	669

Source: State Secretariat for Public Security for the state of São Paulo and Fundação SEADE.
*Statistically significant at the 10 percent level.
**Statistically significant at the 5 percent level.
***Statistically significant at the 1 percent level.
a. The dependent variable is the number of homicides per 100,000 inhabitants. In all specifications, observations are weighted by population. Standard errors (in parentheses) are clustered at the city level. The period of analysis is 1984–2005, unless otherwise noted.
b. Excludes vehicle robbery and theft.
c. Covariates: population, the percentage of males aged fifteen to twenty-four years, and the share of urban population.
d. Vehicle robberies and thefts per 100,000 inhabitants, except when vehicle robbery and theft is the dependent variable, in which case it is property crime excluding vehicle robbery and theft per 100,000 inhabitants.

both cases, the impact is not significant in practice.[43] When using DS1, crack penetration *reduces* vehicle theft and robbery, but the effect is not significant in practice. The category in which one gets closest to finding an impact is attempted murder. When using DS2, I find a significant effect of crack penetration on attempted murder, which is in line with the effect on homicides (column 2). Multiplying the estimate coefficient (3.67) by the standard deviation of crack penetration (0.11) yields 0.40, which is roughly 4 percent of the

43. I consider the case of DS2 because the estimated coefficient on assaults per 100,000 inhabitants is statistically significant. The standard deviation of crack penetration is 0.05. Multiplying this figure by the estimated coefficient on assaults (–30.50) yields a reduction of –1.52 assaults per 100,000 inhabitants (see table 7). The standard deviation of assaults per 100,000 inhabitants when using DS2 is 196.18. Thus, the impact of an increase of one standard deviation in crack penetration reduces assaults per 100,000 inhabitants by less than 0.8 percent of its standard deviation.

TABLE 7. Other Crime in the Whole State, 2001 through 2008[a]

Explanatory variable	*Aggravated assault* (1)	*Attempted murder* (2)	*Property crime*[b] (3)	*Vehicle robbery and theft* (4)	*Robbery followed by murder* (5)
Drug trafficking per 100,000 inhabitants	−0.13	−0.03	−0.68	0.06	0.00
	(0.18)	(0.02)	(0.78)	(0.11)	(0.01)
Crack cocaine/total drug trafficking	−30.50	3.67	122.89	14.53	0.64
	(14.99)**	(0.001)***	(63.48)*	(8.97)	(0.73)
Summary statistic					
City fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Demographics[c]	Yes	Yes	Yes	Yes	Yes
Crime control[d]	Yes	Yes	Yes	Yes	Yes
Additional controls[b]	Yes	Yes	Yes	Yes	Yes
R squared	89	69	93	99	29
No. observations	5,088	5,088	5,088	5,088	5,088

Source: State Secretariat for Public Security for the state of São Paulo and Fundação SEADE.
*Statistically significant at the 10 percent level.
**Statistically significant at the 5 percent level.
***Statistically significant at the 1 percent level.
a. The dependent variable is the number of homicides per 100,000 inhabitants. In all specifications, observations are weighted by population. Standard errors (in parentheses) are clustered at the city level. The period of analysis is 2001–08, unless otherwise noted.
b. Excludes vehicle robbery and theft.
c. Covariates: population, the percentage of males aged fifteen to twenty-four years, and the share of urban population.
d. Vehicle robbery and theft per 100,000 inhabitants, except when vehicle robbery and theft is the dependent variable, in which case it is property crime excluding vehicle robbery and theft per 100,000 inhabitants.

standard deviation of attempted murder per 100,000 inhabitants, a small but non-negligible impact (see table 1). I also find an impact on property crime when using DS2. However, the effect is smaller than the impact on homicides. A one-standard-deviation increase in crack penetration causes 31.72 additional property crimes (122.89 × 0.26). This represents less than 4 percent of the standard deviation of property crimes. I find no impact on the remaining crime categories (vehicle theft and robbery in column 4; robbery followed by murder in column 5).

Discussion

The results show three things. First, for violent crime, the specific psychotropic substance matters more than the drug traffic itself. The amount of drug trafficking has no robust impact on homicides. Second, the penetration of crack (or crack and powdered cocaine) increases homicides and, to lesser extent, attempted homicides. No systematic effect is found on assault and property crime (general crime, vehicle theft and robbery, or robbery followed by murder). Third, the main mechanism is trafficking, not possession.

For the longer-term dynamics of violence in the São Paulo Metropolitan Area, I use the estimates to assess how much the increase and subsequent reduction in homicides result from the crack cocaine epidemic. From 1984 to its peak in 1997–98, the penetration of crack cocaine increased steadily from 3 percent to 72 percent of total drug traffic. My main estimates (table 2, column 5), when multiplied by the 69 percent increase, predict that homicides should increase by four homicides per 100,000 inhabitants. In fact, they increased by much more: from twenty-seven to fifty-two homicides per 100,000 inhabitants. As for the reduction, crack also matches the trend, but explains it less quantitatively. In summary, the crack cocaine epidemic did, in fact, contribute to the aggregate large changes in violence in the SPMA, but the contribution is small. Thus, it was a contributing factor to the perfect storm of the 1990s and to the tranquility of the 2000s. This pattern is in line with the results found by Johnson, Golub, and Dunlap for New York City in the 1980–90 period.[44]

The estimates of the impact of crack penetration on homicides should be viewed as a lower boundary of the real impact. The reason stems from the inclusion of year dummy variables, which are necessary to ensure that spurious, nonstationary time-series variation does not drive the results (see below). However, including year dummy variables requires discarding the component of crack penetration that is common among cities in the state of São Paulo. If crack indeed causes homicides, as I argue, then at least part of the common component is legitimate variation for estimating the causal impact of crack on homicides. What is unknown is which part. Thus, the safe route involves excluding all pure time-series variation.

The results suggest that of Goldstein's three channels through which drugs cause violence, the systemic channel is the most prominent.[45] First, the absence of any systematic impact on categories other than property crime suggests that the economic channel is not of first-order importance. More importantly, if the psychopharmacological and economic channels were operative, I would find an impact of crack possession on homicides. Using data from the SPMA, I can distinguish the impact of crack/cocaine use from crack/cocaine traffic.

44. Johnson, Golub, and Dunlap (2000).
45. Goldstein (1985).

Only traffic has a systematic impact on homicides. The absence of any effect of drug usage on crime is in line with previous literature.[46]

Rates of incidence of some crime categories are notoriously unstable, so the failure to establish some connections may result from noise. However, homicides—where I find a systematic impact—are not the less noisy category. Using the standard deviation/mean ratio, the least noisy category is assaults, followed by general robberies and theft and vehicle robberies and theft. Thus, it is unlikely that the lack of results in other categories results purely from noise.

Do the estimates establish a causal relationship? An unequivocal affirmative answer demands experimental data. In this setting, experiments are unfeasible, so credibility must be judged by the nonexperimental data yardstick. There are three major obstacles. First, time-series variation resulting from nonstationarity series may produce spurious results (see figure 1). Second, enforcement affects the measure of drug prevalence and violence. Third, unobserved factors may affect both the incidence of crack and homicides. The first of these challenges—nonstationarity—is fully dealt with by the inclusion of year dummy variables. The second challenge plagues most studies that use police report data. The literature relating the possession of firearms and violence is illustrative because arms apprehended are contaminated by enforcement.[47] The literature normally addresses this problem by finding a good proxy for the variable of interest. For example, Duggan uses the circulation of specialized gun magazines.[48] I use a strategy that is novel in the literature. Instead of searching for creative proxies, I use the penetration of crack (or crack and powdered cocaine)—that is, crack as a share of total violations. This measure considerably mitigates the enforcement problem because enforcement necessarily changes differently in different cities for different drugs in a way that coincides with movements in homicides. In other words, this is possible but far-fetched. In addition, I must emphasize that the inclusion of at least three different measures of the intensity of enforcement helps mitigate the problem.[49]

The third problem is inherent in nonexperimental data. Researchers cannot be completely confident that they have accounted for all potential factors that

46. For example, Corman and Mocan (2000).

47. See Lott and Mustard (1997); Ludwig (1998); Donohue and Levitt (1998).

48. Duggan (2001).

49. When using DS2, I include the number of prisons and the number of guns apprehended (both per 100,000 inhabitants), which proxy for the intensity of enforcement. In addition, vehicles recovered as a share of vehicles stolen provide a proxy for police efficiency.

may affect both drug consumption and homicides. My strategy is simply to include as many controls as possible. Chief among them are city dummy variables, which control for all time-invariant unobserved heterogeneity across cities. Other time-varying covariates are income per capita, the percentage of males aged fifteen to twenty-four, total population, the percentage of urban population, enforcement variables (see footnote 49), and vehicle theft and robbery per 100,000 inhabitants. This last variable is quite important because it controls for general city-specific trends in criminality.

Conclusion

Crack cocaine plays a role in explaining the dynamics of homicides in São Paulo over the 1990s and 2000s. The crack epidemic matches movements in homicides qualitatively. Using the lower bound of the impact, crack cocaine explains about 20 percent of the increase in homicides in the 1990s and about 15 percent of the reduction in the 2000s. Thus, there is a crack-violence nexus, although the impact of crack trafficking on violence is small.

More importantly, estimates indicate that the most important channel is the systemic channel. This result has important implications for policy. In the case of São Paulo, violence is derived from illegality itself, not from mental impairment or the necessity of sustaining habitual drug use. My results suggest that a large spike in violent crime should not be expected after legalization, even if consumption rises; illegal possession (for consumption) is not associated with an increase in violence. In this case, legalization becomes, ceteris paribus, a more attractive option.

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