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Peter Reuter and Mark A. R. Kleiman

Risks and Prices: An Economic Analysis of Drug Enforcement

ABSTRACT

Marijuana and cocaine, two mass-market drugs, have been the object of a major campaign by the federal government over the past five years. That campaign apparently has not led to a significant tightening in the availability of the two drugs, though the relatively high prices of these drugs historically are a consequence of enforcement. The reason for this lack of response to recent law enforcement pressures may lie in structural characteristics of these markets rather than in a failure of tactics or of coordination of law enforcement efforts. The federal effort aims at importation and high-level distribution, which account for a modest share of the retail prices of these drugs. Increasing the risks to importers or high-level distributors is thus likely to have modest effects on the retail price and is unlikely to have any other effect on the conditions of use. Street-level enforcement is hindered by the sheer scale of the two markets and because so few of the final purchases occur in public settings. Many of the risks associated with drug trafficking come from the actions of other participants in the trades themselves, and this also limits the ability of law enforcement agencies to act in ways that will cause prices to increase or alter market conditions. Law enforcement efforts directed at heroin have been much more effective at restricting drug use.

Marijuana and cocaine are used by large numbers of Americans on a regular basis. The most recent national estimates (Miller et al. 1982) put

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the numbers using these drugs at least once per month at 20 million for marijuana and 5 million for cocaine. It is generally, though not universally, thought that this is a significant social problem. The primary response to the problem has been, particularly since 1981, greatly to increase efforts at reducing the supply of these two drugs.

Despite the increased enforcement effort, which has yielded substantial results in terms of drug and asset seizures, arrests, and lengthy prison sentences, it appears that both marijuana and cocaine are still readily available. Indeed, the street price of cocaine, the best single short-run indicator of the efficacy of enforcement, has declined since the enforcement effort intensified. Cocaine consumption may have increased. Marijuana prices have risen slightly in real dollars, and there is some evidence of decreased consumption; however, that decline is more plausibly accounted for by changes in adolescent attitudes toward the health consequences of marijuana use than to intensified enforcement.

This essay attempts to account for the apparent lack of response of cocaine and marijuana consumption to the increased federal enforcement effort. We make frequent comparisons between these trades and the heroin trade, in which enforcement has led to dramatically tighter market conditions. Heroin is an appropriate comparison drug because, like the others, it starts as an agricultural product overseas, a fact which is of considerable significance for enforcement strategies. The essay also considers, albeit more briefly, the consequences of possible increases in local law enforcement efforts against retail markets in marijuana and cocaine.

Our results are simply stated. Federal enforcement efforts have great difficulty in imposing significant costs on mass-market drugs. The sheer size of the markets forces a concentration on crops in the field, export-import transactions, and high-level domestic dealing. However, these components of the production-distribution process account for a modest share of the final retail price of the drugs; about one-quarter for marijuana and one-tenth for cocaine. Thus, even if the federal effort were to succeed in raising the kilogram-level price of cocaine or the ton-level price of marijuana (those being roughly the units in which the drugs are sold in their first domestic transaction), this would have limited effect on the retail price. Since the federal efforts can do little except change prices, that is, they cannot much alter the other social and cultural conditions that affect use, they can only modestly reduce total consumption.

Intensified enforcement by local police against retail markets for cocaine and marijuana is not likely to be much more effective than the federal enforcement effort. Again, it is the already massive scale of these markets, together with the middle-class character of so many of the users, that lowers the efficacy of such enforcement. For heroin, by contrast, with a much smaller and more exposed consumer base, there is evidence that increased stringency might be effective in still further reducing consumption.

Some caveats to this analysis should be mentioned. We focus on the consequences of enforcement for price because that is the only element of the markets that is much affected by most of the enforcement activities with which we are concerned. It may well be that there are other general effects, particularly in terms of the display of social disapprobation coming from arrests, seizures, trials, and so on, which operate to lower use or keep levels of use from increasing. We do not deal with these, simply because there is no empirical basis for doing so. That is not to say that they do not exist.

We do not claim to have a complete model of the marijuana and cocaine markets. Our explanations of historic changes in the price of cocaine are tentative and point to important gaps in the research on these markets. We try to ensure that these limits in our model are made clear to the reader.

Given the length of this essay, we venture two other introductory comments. First, we believe that the specific policy conclusions are less important than is the framework that is provided for considering the evaluation of enforcement against illegal markets generally. To that extent the essay can be viewed as an exercise in industrial organization, focusing on the impact of external changes imposed through the actions of agencies. We work with even more than the average number of assumptions used in economics because the available data on illicit drug markets are so meager.

Second, our pessimistic conclusions about the effect of cocaine and marijuana enforcement on street-level prices are not condemnations of drug enforcement generally. Indeed, one purpose of providing contrasts with heroin is to suggest the conditions under which enforcement can be highly effective. Even if we are correct in our estimate of the relative ineffectiveness of additional federal expenditures on cocaine and marijuana enforcement, that does not imply either that less should be spent for such enforcement or that legalization is appropriate. It

simply points to the limits of what can be achieved with certain instruments aimed at these two markets.

Section I presents certain statistical data that are important to the analysis and is followed in Section II by discussions of how drug enforcement affects illegal markets and the appropriateness of using price as an indicator of the efficacy of supply reduction efforts. Sections III and IV then consider the four instruments of enforcement or supply reduction: source-country control, interdiction, law enforcement aimed at high-level dealers, and law enforcement aimed at low-level dealers. The final section presents some policy conclusions.

I. Markets: Organization and Scale

Heroin, cocaine, and marijuana are all imported, though approximately one-eighth of the marijuana market is supplied from domestic sources. The distribution chain is long and typically involves sales between independent buyers and sellers. Each importer sells to a small number of high-level domestic dealers, each of whom in turn sells to a slightly larger number of middle-level dealers. The length of the chain is a matter of conjecture. For heroin there may be as many as five dealers between the importer and the final user and for marijuana as few as two. The length of the chain is probably variable, even for any one drug. Some importers bring in large shipments; others bring in smaller shipments. It is the size of the initial importation relative to the size of the typical consumer purchase that determines the length of the chain.

The distribution system is affected by the physical characteristics of the drug involved. For example, marijuana is far bulkier per unit value than cocaine. This requires that it be imported in relatively large, dedicated vessels. These are more easily subject to interception than are the vessels used for smuggling the very compact cocaine. Heroin is so compact per unit value that it can be concealed on passengers or in freight. The enforcement environment also makes a difference; the higher penalties levied on convicted heroin dealers make them more discreet than their cocaine and marijuana counterparts and less willing to deal with a large number of intermediate dealers.

A. Prices and Scale

These differences are also reflected in the price structure of the three drugs in 1980, the most recent year for which source-country price data have been published. Table 1 presents official data on the prices for the drugs at different points in the distribution system. Three aspects of

TABLE 1

Structure of Drug Prices, 1980* (per Pure Kilogram)

	Heroin	Cocaine	Marijuana[†]
Farmgate	$350–$1,000[‡]	$1,300–$10,000	$7–$18
Processed	$6,000–$10,000	$3,000–$10,000	$55
Export	$95,000	$7,000–$20,000	$90–$180
Import[§]	$220,000–$240,000	$50,000	$365–$720
Retail	$1.6–$2.2 million	$650,000[‖]	$1,250–$2,090

SOURCE.—Adapted from National Narcotics Intelligence Consumers Committee (1982).

* No more recent data are available for source-country prices. It is not likely that there have been significant changes in the relationship of prices at different points in the distribution system.

[†] Prices are for Colombian-origin marijuana, estimated to account for 75 percent of total U.S. consumption in 1980.

[‡] The price of the 10 kg of opium required to manufacture 1 kg of heroin.

[§] The import price refers to price at first transaction within the United States. Marijuana is purchased roughly in ton lots, cocaine in multikilo lots, and heroin in kilo lots.

[‖] The original data source reported a retail price of $800,000. Other DEA data, such as those reported in U.S. General Accounting Office (1983), consistently indicate prices in the range $600–$650,000 in 1980.

the table deserve mention. First, most of the value added comes in the domestic distribution of the drug, not in its production or export. Second, the price rise within the United States is proportionately much greater for heroin than for marijuana. Third, only for marijuana does the export-import sector account for a significant share of final price.

The estimation of the scale of drug markets has attracted considerable attention. Few newspaper stories or political speeches on drug enforcement fail to mention the official 1980 estimate of $80 billion in gross sales generated by illicit drugs (National Narcotics Intelligence Consumers Committee 1982). Yet the data are so poor that estimates of revenue can vary threefold (*Miami Herald* [June 17, 1985]). Even fewer data are available for estimating the sizes of the dealer populations and the distribution of incomes among dealers.

Table 2 presents some rough estimates of total income and dealer numbers for 1982, the most recent year for which data are available from the National Household Survey (Miller et al. 1982). Details of these calculations are contained in Kleiman (1985) and Reuter (1984*b*). Here we state only the basic principles and sources underlying the calculations. Both income and dealer numbers are based on the user estimates.

TABLE 2

Drug Market Income and Dealer Estimates, 1982

	Marijuana	Cocaine	Heroin
Regular users	20,000,000	4,500,000	450,000
Users per dealer	40	25	10
Dealers	500,000	180,000	45,000
Total consumption (kg)	6,400,000	23,000	4,000
Expenditure ($ million)	4,800	7,800	8,000
Official expenditure estimates ($ million), 1980*	15,480–21,930	19,500–24,180	7,960–9,500

* No more recent data are available.

The number of drug dealers is estimated by dividing the number of users by a very rough estimate of the number of customers with whom a retailer will be willing to transact. Moore (1977) suggests that ten is the right number for heroin retailers, not including "jugglers" or addicts who sell to a small number of addict friends in order to support their own habit. We certainly expect the number to be higher for cocaine than for heroin, given the higher risk that each customer poses to the heroin dealer relative to the cocaine dealer. Simon and Witte (1982) suggest that the number for cocaine is twenty; no source is given for this. We use twenty-five. This produces a smaller number of dealers and thus will raise our estimates of the effect of a given level of enforcement.

Marijuana retailing is still less risky than cocaine or heroin selling. We assume that the average number of customers per seller is consequently even higher. Carlson et al. (1983) used a figure of fifteen. Arbitrarily, we select the number forty. While no data are available, the former number seems too low in light of the modest risks that additional customers pose to a marijuana dealer.

Retailers are not the only participants in the supply network. Others include importers, wholesalers, and their employees. However, given the sharp pyramiding in the distribution system for marijuana and cocaine, where first-level wholesalers might sell to ten or fifteen retailers, higher-level dealers constitute a small fraction of the total number of participants. High-level heroin dealers, precisely because they deal in small physical volumes, need few employees.

Our marijuana and cocaine income estimates are very imprecise.

They are lower than the published official estimates for two principal reasons. First, the official estimates assume all final sales occur at retail price. In fact, as the National Narcotics Intelligence Consumers Committee (1983*a*) now concedes, a significant fraction of total sales is in larger units (e.g., half ounces of cocaine) at prices far below the retail level. Second, the official consumption estimates reflect unrealistic assumptions about frequency of use by regular users and dosage units. The heroin addict estimate, developed without survey data, is probably considerably too high (Reuter 1984*a*) and also raises the consumption and expenditure estimates. No data are available for an alternative estimate, so we use the official figures. If they are upwardly biased, this will exaggerate the differences between heroin and the other two markets.

B. Enforcement and Its Consequences: Some Data

A short version of this essay was prepared in mid-1983 (and appeared as chap. 3 in Polich et al. [1984]) using 1982 data. It asserted that very substantial increases in enforcement activity would have little effect on consumption of cocaine and marijuana. Now that 1984 data are available on the levels of enforcement and on prices (though not on quantities), we can see that there has been at least rough confirmation of this conclusion. The following figures appear to show that a dramatic increase in the level of enforcement activities has not affected the availability of the drugs.

Table 3 provides data on drug arrests by state and local agencies for 1980–84. The majority of these arrests are for simple possession of marijuana. The total number has risen modestly over the period. How-

TABLE 3

Drug Arrests (in Thousands), 1980–84

	1980	1981	1982	1983	1984
Heroin and cocaine (totals)	68	72	113	149	181
Possession	46	49	78	109	133
Sale/distribution	22	23	35	40	48
Marijuana (totals)	406	400	456	407	419
Possession	342	344	388	337	345
Sale/distribution	64	56	68	70	74

SOURCE.—Federal Bureau of Investigation (1981–84).

ever, that modest rise masks very large changes in the composition of arrests, particularly, a substantial increase in the risks faced by dealers as opposed to users. Total heroin and cocaine arrests have risen by more than 150 percent, while arrests for sale or distribution have more than doubled. The number of persons arrested on charges of sale, distribution, or production of marijuana has also risen, though only by 16 percent. Unfortunately, we lack any national data on the disposition of these arrests, but some fragments from California and New York are presented below.

Table 4 gives some data on the federal drug enforcement effort. Federal expenditures on drug enforcement have risen dramatically over the period 1980–84. The rise is even more striking in the context of declining budgets for treatment and prevention of drug abuse (White House 1984). In current dollars, the total expenditure has risen by 70 percent. The measured output of this effort has also risen substantially. The number of persons committed to prison as a result of DEA actions increased substantially between 1980 and 1984. Drug seizures do not show the same consistent pattern year to year. However, for all three drugs, seizures are much higher in 1984 than in 1980.

Despite all this, retail prices for drugs have changed surprisingly little over the last five years, as reported in official data (table 5). The marijuana figures are hard to interpret because of the great variation in the quality of the drug, as measured by THC content. It appears that, as the share of marijuana produced domestically rises, so does the average quality, as measured by THC content. To that extent, the average price for marijuana of a given quality may have actually fallen.

In summary, we start with the following basic facts. The intensity of enforcement against the major drug markets has increased very substantially over the last five years. More people are being arrested on more serious charges and, at least at the federal level, are receiving more severe sanctions. Yet the retail price of the three drugs does not appear to have increased significantly over the same period.

II. Risks and Prices: The Theory

The major objective of drug law enforcement and source control programs is reduced drug consumption. Retail price can be used as a measure of effectiveness, for these programs can reduce use only by making drug dealing, including production and importation, so risky that dealers will require higher compensation for continued participation. Local enforcement against heroin retailers is the only significant

TABLE 4

Some Measures of Federal Drug Enforcement, 1980–84

	1980	1981	1982	1983	1984
Federal seizures:*					
Heroin	268	231	305	495	385
Cocaine	4,797	3,205	9,763	18,027	12,390
Marijuana	1,773,098	3,078,696	3,022,351	1,968,771	2,466,373
Federal incarcerations†	2,547	2,865	3,516	4,150	4,721‡
	(54.5)	(55.5)	(61.4)	(63.8)	(56.0)
Federal enforcement expenditures§	537	707	854	1,076	1,210

SOURCES.—For federal seizures, see U.S. Department of Justice (1984, 1985). For federal incarcerations for 1980–82, see Brown et al. (1984, p. 497), and for 1984, see Drug Enforcement Administration (1985); for federal enforcement expenditures, see White House (1984).

* Pure kilograms.

† The period covered is the 12 months prior to September 30 of the previous year. Average sentence length in months in parentheses.

‡ The 1984 figure includes some persons convicted in state courts after investigations involving federal agents.

§ Figures are for fiscal years in millions of dollars.

TABLE 5

Retail Prices (per Pure Gram), 1980–84

	1980	1981	1982	1983	1984
Heroin	2,210	2,340	2,310	2,500	2,340
Cocaine	710	790	710	330–415	330–400
Marijuana	1.30	1.66	1.10–1.75	1.40–2.25	1.40–2.25

SOURCE.—U.S. Department of Justice (1984, 1985).

exception to this statement and is considered separately below. There will always be as much of a drug physically available at the export point as U.S. customers are willing to purchase at the risk-determined retail price.[1]

There are numerous qualifications associated with use of price as an indicator of the effectiveness of drug enforcement strategies. First, price is determined by both demand and supply. A decline in price may occur either because the demand curve falls or because the supply curve rises. For purposes of evaluating the historic success of drug enforcement efforts, it is impossible to separate out the two kinds of influence. It is clear that there have been shifts in both supply and demand and that we lack a well-specified model of the drug market. However, to consider the effect of hypothetical changes in drug enforcement efforts, the major tool of this analysis, we need only consider the impact these have on price through shifts of the supply curve; we assume the direct demand effects of law enforcement to be negligible, again with the exception of heroin retailing.

The ultimate objective of drug law enforcement is to reduce consumption. Price is merely a surrogate, chosen for its notional simplicity of measurement. In fact, the available price data are poor and scarcely more reliable than consumption estimates.[2] Nonetheless, price ought to be a cheaper and more rapidly ascertainable indicator than any other. Estimates of total consumption require the cooperation of users and involve numerous sampling problems.

However, to extrapolate from price changes to consumption changes requires, at a minimum, an estimate of the price elasticity of demand,

[1] The inefficacy of interdiction and source-control programs in restricting the physical supply is discussed below.

[2] The problem is that federal agencies are poorly placed to collect retail price data and local police agencies are poorly motivated. For a discussion of the weakness of drug price data, see Reuter (1984*a*).

that is, by what percentage a 1 percent increase in price reduces demand. No such elasticity has been empirically estimated for any of the three drugs. We are forced to rely instead on impressions, reflecting knowledge of the characteristics of users and current consumption patterns.

We assume that the demand for marijuana is relatively inelastic around its current price level. The dosage price is modest compared with dosage prices for other recreational drugs, such as alcohol. Currently, it appears that a "joint" costs only about seventy-five cents and probably yields one to two hours of moderate euphoria.[3] To obtain the same effect from alcohol costs perhaps twice as much and has noticeably more unpleasant aftereffects.

Estimates of the pattern of consumption suggest that, even for heavy users, total marijuana expenditures are no more than 10 percent of total expenditures, except for the significant fraction of heavy users who are still full-time students. With the important exception of this latter group, it seems plausible to assume that a 10 percent increase in the price of marijuana would have very modest long- and short-term effects on marijuana consumption.[4]

Cocaine, by contrast, is expensive relative to other recreational drugs and to most other recreations. A session with cocaine may cost $30–$100. For many regular users, indulging three times per week, total cocaine expenditure is likely to be a significant fraction of disposable income. Moreover, cocaine apparently creates psychological dependence in some regular users. This suggests that the short-run price elasticity might be low because it is difficult for current heavy users, who account for most of the total consumption, to reduce their consumption level substantially. But the high cost of regular use suggests that the flow of users into and out of the heavy user category may be very sensitive to the current price, implying at least a modest long-term price elasticity for cocaine.

For heroin we have rather more data, though none of it sufficient for a precise estimate. It has often been assumed that the regular users of heroin, precisely because they are addicted to the drug, have very

[3] There is considerable variation in the potency of marijuana; the THC content, a measure of its potency, ranges from 1 to 12 percent. While high-potency marijuana is more expensive, it is not known whether the price per unit of THC is constant. Hence we can only give a very approximate measure of the cost of an hour of pleasure. See Kleiman (1985, chap. 1).

[4] Kleiman (1985, chap. 1) provides estimates of the annual expenditures by different classes of users and argues (chap. 5) for an elasticity of demand of between 0 and −0.5.

inelastic demand, that is, even very large increases in price would do little to reduce their daily consumption. However, a growing body of research (summarized in Kaplan 1983, chap. 1) suggests that quite the contrary is the case. Heroin takes such a large share of the total budget of many regular users, and they have to be so active criminally to maintain their consumption, that price increases may lead to almost proportional reductions in their intake. The elasticity of demand for heroin may be about -1 for heavy users. In addition, heroin users often cease heroin consumption, with or without medical assistance. Moreover, it is likely that the flow of novice users into the pool of heavy users is quite sensitive to retail prices. As a result, we assume the aggregate demand for heroin may have quite a high elasticity.

It is simply not possible to go beyond such broad statements at this time. We lack adequate data on price or consumption levels. The analysis will assume that the elasticity of demand is moderately high for heroin, a little lower for cocaine, and quite low for marijuana.

Throughout this analysis we assume that drug markets are competitive. The basis for this assumption is the lack of evidence for the alternative, namely, that drug markets are characterized by restrictions on entry or pricing at any level, and moderately plausible theoretical arguments that such restrictions are difficult to maintain in illegal markets without a unitary, corrupt police department (see Reuter 1983, chaps. 5, 6).[5] This assumption is critical to the analysis since the response of markets to a tax is determined by their structure.[6] It is also contrary to the official view of drug markets, though that view is enunciated in vague terms that make it difficult to determine precisely what structure officials believe these markets to have.

In part, the official view may be explained historically. It appears that there was a monopoly, in the hands of the Mafia, on heroin importation in the 1950s (see President's Commission on Law Enforcement and Administration of Justice 1967). The explanation for that monopoly may be found in any or all of three factors. First, the Mafia had considerable influence over the New York Police Department; no other criminal group had access to the corruption of that department. Second, through control of the International Longshoreman's Association,

[5] A ready supply of violent labor in major American cities among dealers, a lack of martial skills among the leaders, and the need to compensate agents for not attempting coups are the essential elements of the argument.

[6] Moore (1977, chap. 1) provides a good discussion of this issue with respect to the heroin market.

the Mafia had command of the docks, so it was able to protect its own shipments of heroin and increase the hazards faced by all other importers. Third, the heroin refiners were located in southern France and Italy, and there were historic and ethnic ties between them and the American Mafia members.

The point of listing these factors is to suggest how specific the circumstances were under which the Mafia was able to attain market power with respect to heroin importation. None of those conditions are any longer relevant. The New York Police Department is no longer so centrally corrupt or powerful, the docks are no longer the locus of importation since air traffic has become so large, and the refining laboratories are now located in many parts of the world. If market power still exists in the heroin importation market, then it must have some other basis.

There is, in fact, little reliable information available on the structure of drug markets at various levels. Each drug is brought in from a multitude of nations, and international collaboration among traffickers to restrict the supply and thus boost profits seems quite implausible. The relatively small share of final price received by exporters is also consistent with the claim that there is no market power at the point of export, though it is certainly not conclusive evidence. At the retail level it is apparently easy to enter the business.

That leaves intermediate distribution levels as possible locations of market power. It might be the case that the wholesale cocaine market in, say, Denver is controlled by a small number of dealers. Their power might be based on the ability to exclude other wholesalers through threats of violence. Alternatively, other Denver market participants might be unable to locate sources of wholesale quantities.

It is impossible to obtain relevant evidence on this matter. There does seem to be some violence at the higher levels of the cocaine and marijuana markets. It is estimated that a large share of all homicides in the Miami area are the result of drug trafficking activities (U.S. Senate 1980). Whether that results from efforts to monopolize or whether it represents contractual disputes or robberies cannot be determined.

A. Two Kinds of Cost

The costs imposed by enforcement on the illicit drug industry are of two kinds: costs of avoidance and costs of losses actually suffered. The first can be as readily calculated in advance, by the dealer, as any other cost of doing business. If he buys a scanner to monitor police communi-

cations, he knows in advance what the scanner costs. Losses actually suffered, on the other hand, are not known in advance.[7] From the viewpoint of enforcement agencies (or researchers), ex post, the reverse is true; incurred (imposed) costs are measurable, while the costs of avoidance can only be guessed at.

Two Meanings of "Risk." One measure of the enforcement threat a given transaction faces is the expected value of incurred enforcement losses, that is, the sum, for each possible kind of enforcement-induced loss, of its value times its probability. If a boatload of marijuana that costs a dealer $1 million faces one chance in ten of being seized by the Coast Guard, then the expected value of incurred enforcement losses in that transaction is $100,000. That one-in-ten chance is one meaning of "risk"; tougher enforcement makes the probability of loss higher and the transaction riskier.

But "risk" can also mean the special costs that go with uncertainty. If five $200,000 transactions were involved, each with a one-in-ten chance of going wrong, rather than one $1 million transaction, the expected value of incurred enforcement losses would be the same (assuming that the only loss is the loss of the marijuana): each of the five smaller transactions would have an expected value of incurred enforcement losses of $20,000 (one-tenth of $200,000) for a total of $100,000. But the transaction would be far less risky because the chances of a catastrophic loss would be much less.

Risk in this second sense—uncertainty—is also costly. A trafficker who is willing to treat a 35 percent probability of a one-year stretch in prison as a cost of doing business, one to be measured against current consumption and the nest egg waiting on release, may find a 5 percent probability of a seven-year stretch daunting (partly because of the potential lapse of years before that nest egg can be enjoyed). Thus entrepreneurs may require larger potential profits and employees higher wages to face the same expected-value time in prison if the time is more unequally distributed.[8]

[7] That is, losses are not known in advance unless a dealer's business consists of so many transactions, and the possible losses on any one transaction are so small, that the enterprise represents a statistical universe. This might be true of a pimp with a string of prostitutes; fines are a stochastic but predictable cost of doing business.

[8] This assertion runs contrary to the conclusion of deterrence studies that high-probability/low-severity regimes deter more than low-probability/high-severity regimes (Cook 1980). The explanation for the difference is that drug dealers, unlike most prisoners, are probably deferring the fruits of crime while in prison; each additional year of prison defers those fruits still further. For most property crimes, the fruits are enjoyed immediately; only the punishment is deferred.

Insurance is one of the many financial services whose unavailability helps distinguish illicit from licit trades. Drug dealers must, in general, bear the financial risks that enforcement imposes (though there is some evidence of quasi-insurance relationships between exporters and importers of marijuana that help spread the risks of marijuana smuggling).

In what follows, we attempt to quantify the costs imposed by enforcement on the illicit drug industry by comparing enforcement statistics—drug and asset seizures and years in prison—with estimated participant numbers and drug volumes. For example, we compute the days spent in prison per year in the marijuana business. It should be remembered, however, that these measures are all of expected-value losses and thus ignore the "risk premiums" due to the uncertain patterns of traffickers' enforcement-related losses. To compensate for this, we assign very high values to time in prison.

B. Costs in the Illicit Drug Trade

The price of any given drug at any given distribution level has five components: cost of drugs purchased, compensation of labor, cost of capital, operational expense, and proprietors' incomes.

Cost of Drugs. The cost of drugs at any level of the trade is influenced by enforcement pressures at higher levels. In addition, an entrepreneur at any given level risks having drugs seized after he has paid for them but before he has been paid for them. If, on average, a dealer loses a fraction p of the drugs he buys as a result of enforcement action, then he will need to buy $1/(1 - p)$ the quantity he sells, and his total cost of drugs purchased will be proportionately higher.

The cost a seizure adds to the drug traffic thus depends on the stage of the traffic at which it occurs as well as the physical volume of drugs involved. Seizing or destroying marijuana in a farmer's field adds to the traffic only the cost of growing more marijuana. This is what makes "street value" calculations so meaningless and lends a false importance to the huge quantities of drugs destroyed in source-country fields.

Compensation of Labor. Employees of drug-dealing organizations need to be compensated for their alternative occupational opportunities (licit or illicit) forgone; for the expected value of the danger of imprisonment (perhaps with a risk premium added); for the dangers from other illicit-market participants, including their employers, colleagues, customers, and competitors; and for forgone leisure time. Some of these elements represent fixed costs of being in the trade, and some are costs that vary with the number and volume of transactions engaged in.

Drug-market participants whose annual incomes, divided by the number of hours actively engaged in dealing drugs, suggest very high hourly wages may not in fact demand very much money to give up an additional hour of leisure because most of their current earnings are compensation simply for the risks of being dealers.[9]

Current employees of a firm are more valuable to the firm than otherwise equivalent new employees because the risks of employing them appear to be less; they are presumably less likely to be informants than are novices. Also, the disadvantages to them of persisting in the trade—in particular, the marginal imprisonment risk—are likely to be less than the costs faced by new entrants because the seasoned employees know that their associates are (relatively) trustworthy. This may allow most drug-market employees and entrepreneurs to reap inframarginal returns (i.e., to be better off than they would be at their best alternative employment), as long as the marginal transaction involves new participants, a likely condition in periods of rapid growth. This may explain why cocaine prices in 1978–82 seemed to be at levels far above those justified by the risks involved and why they subsequently fell, despite increased enforcement pressure; the high returns in the cocaine trade eventually attracted enough new entrants to force prices down.

Raising the level of enforcement pressure increases the risks faced by the employees of dealing firms. In turn this increases the compensation required to attract and keep employees since they now face higher risks from three sources—imprisonment, violence from their employing organization, and violence from other participants.

The increased imprisonment risk is straightforward. The increased risk from the organization is slightly more complicated to analyze. Organizations will vary from each other and over time in the willingness of their proprietors to use violence to silence potential or suspected employee informants and witnesses. Employees will have to be compensated for this risk as for any other. The optimal level of violence from the firm's viewpoint depends on the level of enforcement pressure. When pressure is low, the extra wages paid by high violence firms will put them at a competitive disadvantage. But as the pressure rises, less violent firms will feel it more severely since cases against them will be easier to make. This will force them either to leave the trade or to become more violent.

[9] Of course, there is an income effect: leisure is worth more to a wealthy individual than to a poor individual, even if the wage rate per hour is the same for the two.

Thus increased enforcement pressure will tend to increase the capacities for violence of drug-dealing firms. This increase in firms' violence capacities will in turn increase the risks to all employees from interfirm violence. Drug-market firms can use violence against each other to settle business disputes and enforce contracts in the absence of recourse to courts, to steal drugs or money, or to eliminate competition. The capacities that firms develop for internal violence in response to enforcement pressure will also be available for interfirm warfare and piracy.

Cost of Capital. The cost of capital for drug dealers depends on the capital requirements of the business (determined by turnover rates, wholesale prices, and credit terms), the availability and cost of loan capital on the loan-shark market (or the equivalent), and the danger of capital loss. The higher the risk of loss, the higher the interest rate. Drug dealing may be largely internally financed once an enterprise is under way, but the cost of external capital, like the cost of new labor, may determine market prices if the market is expanding.[10]

As the price of drugs at higher levels rises, the capital cost of being a lower-level drug dealer rises as well, for the lower-level dealer must lay out more money per unit purchased. If, as we shall assume, it takes three months for marijuana to move from initial import to final sale, and if the annual cost of capital is 50 percent, then the added capital cost is 12.5 percent of the price increase. That is, a $1.00 increase in the imported price will lead to a $1.125 increase at the retail level.

Nondrug Supplies. A drug dealer needs to buy, rent, or steal vehicles to transport drugs; buy or rent warehousing space; pay the costs of travel for himself and his employees; buy equipment (e.g., communications and communications-interception gear); and pay lawyers' fees, bribes to police, and other expenses of dealing with the criminal justice system.

There will be trade-offs between some of these expenditures and the dangers of enforcement losses. The higher the level of enforcement pressure, the more organizations will choose to invest in evasion rather than suffer enforcement action. Since these expenses, unlike the results of successful enforcement actions, will not in general be officially ob-

[10] There may be little direct connection between drug markets and conventional loan-sharking. Drug dealers may lack the attributes (personal reputation for violence or knowledge about credit risks) to be loan sharks. On the other hand, drug dealers, because they have relatively high risks of incarceration or death, may face difficulties in borrowing from loan sharks.

served, our estimates of enforcement-imposed costs will not include them and will thus tend to underestimate; seizures of nondrug assets (discussed below) suggest that these items constitute a very small share of total distribution costs.

Proprietors' Incomes. Proprietors' incomes can be thought of as returns to their own labor and capital. They may be able to reap high rates of return in growing markets if there are significant barriers to entry. One effect of increasing enforcement pressure may be to make the markets differentially riskier for new players, thus creating entry barriers behind which existing entrepreneurs can pile up windfall profits.

Caveats. There are three important caveats. (1) We observe two things about drug enforcement expenditure and outputs. Neither is exactly what we need to model effects on the market since we do not know enforcement pressure as a function of enforcement expenditure and since enforcement outputs do not measure avoidance costs or risks from other criminals. (2) Enforcement risks depend in part on the ratio of enforcement activity to trafficking activity. The more traffickers there are competing for the attention of any fixed number of agents, the safer the traffickers are. This may explain why Miami was so dominant for so long in marijuana and cocaine importing. It may also create positive-feedback effects from increased enforcement pressure. If enforcement succeeds in shrinking a market, the effective enforcement pressure corresponding with any given level of enforcement expenditure will rise as the number of targets falls. Static estimates of marginal enforcement risk underestimate the total effect of marginal enforcement on costs. (3) This model applies better to high-level than to street-level markets. Street-level costs involve large real transactions costs—search times on both sides—that no one captures as income.

With this conceptual apparatus established, we now turn to the four components of the supply reduction strategy.

III. Source Control[11]

Throughout the twentieth century, the government of the United States has maintained that the solution to the American drug abuse problem lies with the foreign nations that produce the most important illicit drugs. The official tone has become slightly less accusatory over

[11] This section is adapted, with permission, from Peter Reuter, "Eternal Hope: America's Quest for Narcotics Control," *Public Interest*, vol. 79 (Spring 1985).

the years, but there has been no change in the view that cutting exports from countries such as Burma, Colombia, and Pakistan is the best method for reducing U.S. consumption of heroin, cocaine, and marijuana. As the White House stated in 1982, "elimination of illegal drugs at or near their foreign source is the most effective means to reduce the domestic supply of these substances" (Drug Abuse Policy Office 1982, p. 31).

This notion became a genuine part of American foreign policy when President Nixon, under heavy congressional pressure, initiated a series of bilateral agreements with source countries to assist them in reducing their exports. These agreements have become a standard component of battles between the State Department and Congress, with Congress generally charging that the State Department gives too little high-level attention to the drug problem. But there is no political dispute about the centrality of these international programs to American drug policy. The only dispute concerns the appropriate levels of expenditure and the intensity of pressure to be exerted on other nations.

Unfortunately, there is ample evidence that U.S. foreign drug control efforts have been unsuccessful and that the failures of U.S. international programs are not simply the result of incompetence or inadequate resources but are inherent in the structure of the problem. The producer countries jointly lack either the motivation or the means to reduce total production. Even if such reduction were possible, it is unlikely that U.S. imports from each of these countries, apart from Mexico, would be much affected. Just as important, the set of source countries is readily expandable. The international programs may serve a useful function in curbing illicit drug use in some major source countries, but they will do little to reduce drug abuse in the United States.

A. U.S. Control Efforts

Efforts by the United States to suppress foreign production of illicit drugs go back at least to the Shanghai Treaty of 1909. Believing that the instability of China was very much bound up with the widespread use of opium, supplied through much of the nineteenth century from India by British merchants, the United States sought a treaty system that would require all nations to control the production of opium and its derivatives. Other nations were a great deal less enthusiastic, but in 1913 thirty-four nations signed a fairly comprehensive agreement that was later extended, again at the urging of the United States, to cocaine and marijuana. In that more innocent era there was enough faith in

treaties per se that no program of assistance for enforcement was established.

The growth of heroin use in the late 1960s changed U.S. policy markedly. No longer content to work through the international treaty system, the United States for the first time began to seek bilateral agreements, involving the use of U.S. resources and personnel, to strike at production in nations deemed particularly important to the American heroin problem. These efforts have been expanded since 1979 to include cocaine and marijuana.

The United States has tried a number of approaches. Some efforts focus on production itself. Resources are provided to help local law enforcement agencies eradicate crops, either through the spraying of a herbicide (as was done in Mexico for opium poppies) or by manually uprooting plants (as is occasionally done with coca plants in Peru). A number of projects have been funded, either by the United States directly or through multilateral agencies (such as the UN Fund for Drug Abuse Control), that aim at providing alternative commercial crops for farmers growing coca (in Peru) or poppies (in Burma).

Since 1978, the State Department's Bureau of International Narcotics Matters (INM) has been responsible for foreign production control efforts through diplomatic efforts and targeted economic assistance programs. In fiscal year 1985, INM had a budget appropriation of $43 million. The DEA also assists foreign governments in law enforcement activities aimed at refining and distribution, particularly in source countries. It trains foreign police at U.S. facilities and has offices in major source and transshipment countries to help target traffickers particularly significant for the United States. Its international activities were budgeted at $38 million in fiscal year 1985.

The relatively small expenditures on the international programs have sometimes led Congress to charge that the executive branch is not taking the problem seriously enough. Indeed, in 1980 Congress forced the State Department to allocate $7 million to Colombia at a time when INM believed, correctly as it turned out, that the Colombian drug enforcement agencies would accomplish little with the money. Generally, officials in INM have been consistent in their view that the most important tools are diplomatic rather than financial, and they base their optimism on the apparent success of diplomatic efforts. They claim that there is increased interest on the part of senior U.S. officials in raising these issues with their foreign counterparts and that those counterparts are more willing to follow up on promises of action.

The recent success of the Pakistani government in greatly reducing the illicit cultivation of poppies in some areas of the country is cited as an instance of effective diplomatic pressure. Though a total national ban on opium production has not been implemented, new laws, increased police efforts, and low producer prices had reduced estimated Pakistani production levels to less than forty-five tons in 1984, compared to 800 tons in 1979.

In some countries that produce opium, local increases in heroin use may have increased the willingness of governments to implement crop reduction and traffic control programs. While estimates of the addict populations in countries such as Thailand and Pakistan are extremely unreliable, it is clear that these countries believe they have a substantial problem. While there were almost no heroin addicts in Pakistan ten years ago, INM now cites an estimate of 50,000. With a certain amount of skepticism, INM cites a figure of 400,000–600,000 Thai addicts, again an entirely new phenomenon. Domestic Colombian use of a dangerous combination of marijuana and cocaine residue is a cause of concern in that country.[12]

B. Down on the Farm

Despite the increasing concern with local drug use, there are many impediments to successful crop reduction efforts in producer countries. The first is that farmers usually do not have an easy alternative commercial crop; the high value to bulk of drugs compared to other farm products is crucial when the markets are distant and the roads bad. Currently, poppies may indeed be the only crop that can be produced in remote areas of Burma and Thailand to provide steady cash income. Everyone recognizes that increased law enforcement efforts against farmers will have little effect unless other productive opportunities are provided. This takes many years. Moreover, the coca and opium crops have important licit uses; for example, Peruvian coca leaves are used for pharmaceuticals and flavoring, and poppies provide peasant farmers in Turkey with an edible oil, fuel, and cattle feed.

The development of alternative cash crops requires, among other things, the creation of a new infrastructure (roads, in particular) to permit the efficient delivery of bulkier and more perishable crops to distant markets. Farmers must also learn how to produce crops entirely new to their regions, such as cacao in the Upper Huallaga valley of

[12] A discussion of foreign addiction problems is contained in U.S. Senate (1985).

Peru and kidney beans in the Chang Mai area of Thailand. Whether these efforts will turn out to be sufficient is a matter of speculation. Indeed, improving farmers' skills might have the perverse effect of increasing the productivity of their illicit farming. The programs in Thailand show promise but encompass a population of only a few thousand, and there are no instances in which crop substitution has actually been achieved on a large scale. Indeed, a piece of black humor from a Bolivian politician sums up the matter: "We have crop substitution; cocaine has been substituted for everything else" (State Department official, personal communication, 1983).

It should be noted that there is little talk of crop substitution for marijuana producers; enforcement alone is supposed to deal with the problem. Two arguments have been made for this policy. First, marijuana is grown solely for illicit commercial purposes, whereas poppies and coca have licit uses as well. Thus one can simply spray all marijuana fields without worrying whether one or another might in fact be legal. This would not work against coca producers in Peru, where there are some 9,000 licenses for coca production. Second, producers of marijuana are "mercenary"; they are not peasant farmers without a cash crop alternative. As one official suggested, it would scarcely be good policy to reward new marijuana source countries by granting them agricultural development assistance.

A second major obstacle to crop reduction is the generally weak control of governments in the producing areas. The Thai and Burmese governments have long been fighting insurgent movements in the hills that are home to the poppy growers. The Peruvian government has little effective control in some of the regions that produce coca leaves. Similar situations exist in Afghanistan, Pakistan, Bolivia, and Laos at least. Even where governments are in firm control, are strongly motivated, and have sensible plans, they are likely to have great difficulty implementing them. The ubiquitous corruption of source-country police adds yet another obstacle; in the case of Bolivia, at least one cabinet member was actively involved in the cocaine trade.

Third, some major source countries, notably Iran and Afghanistan, are hostile to the United States. Though they may adopt policies to reduce domestic consumption, they are unconcerned about U.S. imports. Fourth, U.S. relations with most of the other countries involved in drug production are very complex. The United States would like Pakistan to adopt certain policies with respect to Afghanistan. It seeks

to retain bases in Thailand. It would like Colombia to take particular positions with respect to Central America. As a DEA official said, explaining the relatively light pressure being exerted on Jamaica, "Some analysts believe that if you came in with a severe narcotics program, you could affect the existence of the present government. . . . Drugs are a serious problem but communism is a greater problem" (Treaster 1984). Given all these considerations and the disinclination of diplomats and policymakers to concern themselves with such unseemly matters as the drug trade, it is difficult to put consistent pressure on source-country governments.

Finally, and perhaps most important, the set of producer countries is not fixed. New producers emerge all the time. Brazil is apparently witnessing a rapid growth in coca and marijuana production. Until five years ago, these crops were minor and were used only for peasant consumption; by 1983, the Brazilian authorities claimed to have destroyed or seized nearly 2,000 tons of marijuana (almost 30 percent of the best estimate of U.S. consumption). Belize, an enclave of 150,000 people in Central America, may have produced 700 tons of marijuana in 1983, all for export, where none was produced five years earlier (U.S. Department of State 1985). Pakistan produced little opium prior to 1948, the British being concerned to protect the markets of opium farmers in other parts of British India. Yet by the mid-1950s there was substantial licit and illicit opium production in the North West Frontier province. There is no reason to believe that other countries with large impoverished peasant populations and weak central governments will not become significant producers if the current producers cut back production greatly. A large or traditional local market turns out not to be essential. In the instance of marijuana, we must also note the rapid growth of production in the United States.

Lack of motivation is also a barrier to effective government action. The national governments in many of these countries believe that the political costs of reducing the cash income of farmers are very high. Indeed, in describing the recent Bolivian crackdown on coca producers in the Chapare region, which involved the moving in of troops, the *New York Times* reported: "On August 17, less than a week after the Chapare occupation, the government was forced to drop the peso's official value by more than half, from 2,000 to $1 to 5,000. And in Bolivia, the world's most politically unstable country, that is enough to start talk of a coup" (Brinkley 1984). Governments dealing with the enforced strin-

gencies of the International Monetary Fund are likely to give pause to efforts that will add to their domestic economic worries. The extent to which foreign exchange earnings from drug exports matter is unclear: in most situations only a small share of these earnings enter the official accounts, but some amount certainly does.

C. The International Pipeline

Crop reduction is touted as a goal by the United States because it is assumed that the less each source country produces, the less will be exported to America. Clearly, if none is produced, then none can be exported. But it is also plausible that quite large reductions (or increases) in any particular country's production will have little impact on exports to the United States.

We start by observing that the price of opium in source countries is trivial relative to the price of heroin in the United States. As shown in table 1, the ten kilograms of opium in Thailand needed to make one kilogram of heroin cost at most $1,000. If that price fell to $100 or rose to $5,000, it would have little effect on the price of heroin delivered to the United States (roughly $200,000 per kilogram at the importation level). Yet the effect of crop reduction, short of elimination, is simply to raise local prices.

Moreover—and contrary to what we would expect in a smoothly working international market—it appears that quite large differences in source-country prices for particular drugs have little effect on the composition of U.S. imports from country to country. For example, in the oil market Nigeria has only to raise its price by 1 percent to lose a large share of its sales; its customers have little hesitation in shifting to other suppliers. Yet the bazaar price for opium in Burma can be half that in Pakistan without any rapid shift in the origins of American heroin imports.

One plausible explanation for this is that the U.S. price of a drug from a particular country is determined chiefly not by the source-country price but by the availability of efficient international distribution networks. This is certainly consistent with the fact that most of the export price of drugs represents payments to couriers and dealers for incurring risks. For example, Mexican-source heroin was relatively cheap not because of the price of opium in Mexico (which was very high relative to other producer countries) but because of the efficient Mexican networks for distribution. The reduction of the supply in Mexico that was achieved did cut the amount flowing through the

pipeline. But if it were easy to smuggle heroin *into* Mexico, the loss of this local production would be of little consequence for the United States; the cheap distribution networks would remain. As it turns out, the Mexican government is reasonably effective at making it risky to bring heroin into that country, so the trafficking networks have been thwarted.

Similarly, the increased availability of Southwest Asian heroin in Western Europe and the United States shortly after 1979 may have had less to do with the price of opium in the local markets than with the growing density of traffic from Southwest Asia to Western Europe. Pakistan has substantial expatriate communities in Britain and West Germany. There are also large communities of Armenians and Lebanese in Europe, and Iranian immigration to the United States suddenly increased after 1977. These provide broad pipelines, so to speak, within which to hide the movement of drugs.

The international cocaine market provides some evidence consistent with this view. Most cocaine entering the United States comes from Colombia, though the raw material is produced mostly in Peru and Bolivia. The advantage of Colombia as an export source is partly that it is the largest South American source of migrants to the United States. On the other hand, most cocaine exported to Europe leaves from Brazil, which has the largest migrant population in Europe.

These broader pipelines have three important advantages for drug smuggling. First, they make it more likely that the courier will not be detected because surveillance decreases in intensity as the general traffic from a particular source country increases. If there is only one flight each day from Karachi to London, then it is possible to scrutinize every vaguely suspicious looking passenger; if there are ten per day, this becomes much more difficult and expensive. Second, the probability of finding a courier able and willing to carry the drugs increases with the size of the pipeline. When the only Pakistanis traveling to London are well-to-do tourists, it will probably be hard to find a courier. The lone peasant on a plane filled by the wealthy might well get caught. But when there is a steady flow of poor migrants, it will be easy to conceal a courier within the flow. Third, if there is a large population of immigrants from the source country in the consuming country, it is more likely that the exporter can find a local high-level distributor. The more Pakistanis resident in London, the higher the probability that a Pakistani exporter can find someone there who will know an English distributor.

If this is so, then we must ask why there are relatively sudden changes in the distribution patterns to source countries. After all, the immigrant flows and the heaviness of traffic from source to consuming countries change relatively slowly; the middle-class Iranian exodus of 1978–80 was unusual. There was not a sudden increase in the number of Pakistanis in Western Europe around 1980 to explain the great increase in the flow of heroin along that path.

The pipeline effect is likely to be nonlinear. There may be thresholds—in number and composition of travelers and in the size of the local community—that, once passed, lead to rapid changes in the efficiency of the distribution through a particular pipeline.

United States source control programs have occasionally had a noticeable impact in particular source countries. Three instances stand out: the elimination of illicit opium production in Turkey in 1972, the dramatic reduction of opium output in Mexico in the mid-1970s, and the slightly later reduction of the U.S. market for Mexican marijuana. The last instance is somewhat ambiguous. The major reason for the decline in American consumption of Mexican marijuana was not the reduction in Mexican production. Rather, it was U.S. consumers' fear that the drug might have been sprayed with paraquat, a potentially dangerous herbicide used to control Mexican production.

None of the three successes had lasting effect. Turkish-source opium was rapidly replaced by that from Mexico. Mexican marijuana was even more rapidly replaced by Colombian production. Only the decline in Mexican heroin production had more than a short-term effect; from 1975 to 1979 there appears to have been a decline in U.S. consumption that is related to availability. Changes in Southwest Asia led then to renewed growth in U.S. heroin consumption. Moreover, Mexico and Turkey represent somewhat special cases. In both countries the central government is quite strong. Equally important, illicit drugs were not very important to the national or major regional economies; the political cost of stringent enforcement was not high. This situation does not hold for many of the current and potential source countries.

The sad fact is that real long-term success stories have had nothing to do with international aid and law enforcement. Vastly more important is political and economic development. Macedonia was, prior to World War II, a significant producer of opium, mostly for domestic consumption. By the early 1970s, opium production had fallen to about 5 percent of its previous level. Some analysts plausibly attribute this to general economic progress in the producing area, which made the rela-

tively labor-intensive crop less economically attractive (Bruun, Pan, and Rexed 1975).

On the political side, we have the success of China in its southwest provinces. Though some minority groups still produce for their own consumption, the major production areas have been eliminated since the establishment of the present regime. That is probably the result of the central government's repugnance for all symptoms of decadence in the old culture. It is hard to draw any but the most pessimistic lessons from these two examples, at least for the design of drug enforcement assistance programs.

IV. Interdiction

Interdiction aims at intercepting drug shipments just as, or just before, they enter the United States. It is expected to raise retail prices by imposing costs to replace seized shipments, by raising the risk of imprisonment for people who transport drugs, and by increasing the uncertainty of dealer supplies and income. Interdiction efforts account for about 33 percent of total federal expenditures to enforce drug laws, about $280 million out of $850 million spent in fiscal year 1982.[13] The amount and share have increased rapidly since 1977 (U.S. General Accounting Office 1983).

The Coast Guard and the Customs Service carry out most interdiction operations. The Coast Guard concentrates its interdiction efforts on sea patrols around Florida and the Caribbean, through which most of the Colombian and Jamaican marijuana passes. In the past few years, especially, it has seized enormous quantities of that marijuana, but little else. The Customs Service seizes drugs through both patrol and inspection at ports of entry. Its patrols account for the majority of all federal cocaine seizures, and its inspections at ports of entry garner significant quantities of marijuana. While nontrivial amounts of heroin are seized annually, this is largely the result of investigation rather than of random inspection; consequently, we ignore heroin in this section.

As shown in table 4, the combined efforts of Customs, the Coast Guard, and the DEA have resulted in substantial seizures of marijuana and cocaine, with a sharp upward trend for cocaine.[14] These amounts

[13] There is no breakdown of drug enforcement expenditures by function for the years after 1982. However, it should be noted that the drug enforcement budgets of the two major interdiction agencies increased from $387 million in fiscal year 1982 to $512 million in fiscal year 1984.

[14] Most DEA seizures took place as a result of investigations, not interdiction. We discuss the effectiveness of investigations later.

TABLE 6

Estimated Interdiction Rates, 1984

Item Estimated	Cocaine (1,000 kg) Lower Bound	Cocaine (1,000 kg) Upper Bound	Marijuana (1,000 kg) Lower Bound	Marijuana (1,000 kg) Upper Bound
Seizures:				
Reported seizures*	12.4	12.4	2,466	2,466
Less overlap in reporting†	2.5	2.5	825	825
Estimated actual seizures	9.9	9.9	1,641	1,641
Shipments:				
Total estimated consumption	34.4	23.3	15,000	6,439
Less domestic production	.0	.0	1,650	704
Estimated amount imported	34.4	23.3	13,350	5,735
Total shipments to U.S. (actual seizures plus imported amount)	44.3	33.2	14,991	7,376
Seizures as percent of shipments	22.3	29.8	10.9	22.2

SOURCES.—For total reported seizures, see Organized Crime Drug Enforcement Task Force (1985, p. 68); for adjustment in reporting overlap, see U.S. General Accounting Office (1983).

* Total seizures reported by federal agencies.

† The adjustment represents rates of double reporting found by the U.S. General Accounting Office in reviewing 1982 data.

represent a significant proportion of total shipments of drugs destined for the United States—between 10 and 30 percent by our estimates (see table 6). To make these estimates, we first reduced reported seizures to correct for the overlap between the various agencies' reports, using data from the U.S. General Accounting Office (GAO) audit (1983). Then we calculated the seizure rate as a proportion of all imports (those shipments that were successfully imported plus those that were seized). Although the range of results indicates some uncertainties, it is clear that federal interdiction efforts currently impose significant costs on drug importers. Despite this, recent studies express continued skepticism about the ultimate effects of interdiction (General Accounting Office 1983; Mitchell and Bell 1980).

A. Drug Seizures

The reason for skepticism is rooted in the drug market's price structure, which is steeply graduated for all illicit drugs. As we noted in table 1, most of the retail price goes to domestic intermediaries, not to

the grower, the exporter, or the importer, despite the fact that these latter parties bear the costs of production, processing, and international transportation. The universal practice of police agencies of valuing seizures at retail price vastly exaggerates the impact of seizures. The true impact is measured by the opportunity cost of those drugs at the point of seizure since that measures what it costs the distribution system to replace them.

Interdiction, treated purely as the seizure of drugs, raises price by requiring the distribution system to begin the shipment of more than one kilo of the drug for each kilo that reaches final customers. The price effect can be captured in a simple equation:

$$P_I = \frac{P_0}{1 - I},$$

where I is the interdiction rate, P_I is the price at that interdiction rate I, and P_0 is the price that would prevail at zero interdiction rate. We have observations of 1984 import selling prices and 1984 interdiction rates, from which we can deduce P_0.

For marijuana, the 1984 figures are an interdiction rate of about 0.22 and an import price of $525 per kilo; this yields a P_0 of $410. Consequently, doubling the interdiction rate to 44 percent will raise the importer selling price to $732. Assuming the absolute price increase is 12.5 percent greater at final sale, retail price rises by $237 per kilo or 13 percent. Table 7 traces out the consequences.

For cocaine, the import price increase from raising the interdiction to 60 percent from the current 30 percent (using the lower-bound con-

TABLE 7

Effects of Increased Interdiction Seizures on Marijuana Price

Item	Current Situation	Hypothetical Situation (Increased Interdiction)
Interdiction rate (%)	22	44
Amount exported to land 100 kg in U.S. (kg)	128	178
Amount seized (kg)	28	78
Amount landed in U.S. (kg)	100	100
Replacement cost of seizures (at $410 per kg) ($)	11,480	31,980
Total retail price (100 kg) ($)	175,000	198,625
Increase in retail price (%)	. . .	13

sumption estimate) is $33,000. The final price increase of $37,000 is about 6 percent of the retail price. If we use the higher consumption figures, doubling interdiction volumes has correspondingly lower retail price effects.

The much greater impact for marijuana is a consequence of the much lower markup of prices as the drug moves from import to final sale. Our assumption that absolute price increases are marked up to the same extent in the two distribution systems may be incorrect precisely because cocaine distribution is a riskier business. Nonetheless, it seems reasonable that a 1 percent rise in import price will have a smaller retail price impact for cocaine than for marijuana.

B. Effects of Arresting Couriers

So far we have considered only how interdiction of goods affects the market. However, interdiction is also supposed to create increased risks for couriers: pilots of small aircraft carrying cocaine and crewmen on vessels carrying marijuana. These people are often captured along with the drugs during interdiction, and how they are treated, once caught, will affect their perceptions of risk. Raising their risk high enough might be expected, a priori, to affect the price of the drug.

It is very difficult to obtain data on the risks faced by couriers. Records of the disposition of interdiction arrests are incomplete, and the various agencies disagree on basic estimates, such as rates of indictment, conviction, and imprisonment (General Accounting Office 1983). Based on the very fragmentary available evidence, it seems that the probability that an arrested marijuana courier will go to prison is about 40 percent.[15] If the probability of a courier's arrest is the same as the seizure rate (22.2 percent), that would imply that a marijuana courier's risk of imprisonment per trip is approximately 9 percent. The time served by imprisoned crewmen probably averaged about one year.[16] No comparable data are available for cocaine couriers.

[15] Coast Guard information for 1981 (the most recent available) shows that, in the one district for which data are available, 68 percent of arrestees were indicted and 86 percent of indictments resulted in convictions (U.S. General Accounting Office 1983, app. X). The GAO examined records of 128 individuals who were arrested and convicted as a result of seizure operations; 67 percent of these received a prison sentence. These rates are likely to be upper bounds (since, e.g., the GAO sample was missing information for many other arrestees), but taken together they suggest a maximum rate of imprisonments per arrest equal to .39 (i.e., $.68 \times .86 \times .67$).

[16] The Coast Guard reports prison sentences in South Florida, the jurisdiction accounting for most interdiction arrests, of 1.9 years. Federal offenders serve approximately 50 percent of their sentences prior to first release.

What if the government were able to raise the marijuana courier's risk radically, say, from 9 to 18 percent? The result would probably differ between marijuana and cocaine because different types of couriers may be involved. Interdiction experience indicates that a large majority of marijuana arrives by sea, mostly in small vessels operated by unskilled Colombian or other foreign nationals (National Narcotics Intelligence Consumers Committee 1984, p. 10). A significant proportion of cocaine appears to be smuggled in dedicated airplanes by skilled pilots, though there have been a number of enormous seizures (500 kg or more) of cocaine in commercial planes (see National Narcotics Intelligence Consumers Committee 1984, p. 20). In the case of marijuana boats, few crewmen have alternative earning opportunities that pay as well as smuggling. For this reason, if the risks of the activity increase, it is likely that an increase in the compensation offered will ensure an adequate supply of Colombian crewmen.

To suggest the consequences of increasing risk we use a model based on expected value of imprisonment time. A study for the Coast Guard concerning seized marijuana boats shows that the average crew numbered about six and carried about ten metric tons (10,000 kg) of marijuana (Mitchell and Bell 1980). If interdiction and prosecution rates could be raised to make crewmen's risk of one year in prison 18 percent rather than 9 percent, and if the average crewman values his freedom at $50,000 a year, each crewman would have to get $4,500 more (.09 × $50,000) per trip to compensate him for the additional risk of prison time. For a crew of six, that would raise the cost of shipping 10,000 kg by $27,000. That change increases the cost of shipment per kilogram by only $2.70—which is 0.5 percent of the importer's selling price. This would raise retail price by only $3.00 per kilo or about 0.2 percent.

Interdiction of cocaine couriers may be another story. At least some pilots bringing in drugs receive severe sentences (U.S. Senate 1981). Pilots skilled enough to fly small planes into remote airstrips at night probably have substantial alternative earning opportunities. With a high enough interdiction rate and severe enough penalties, it might be possible to deter most or all of them. The number of skilled pilots willing to incur a high probability of a long prison sentence may be very limited indeed. Nevertheless, that constraint would last only as long as it took the cocaine trade to adapt. Planes and boats are completely interchangeable for bringing in cocaine. If flying becomes too risky, importers can always revert to shipment by sea.

C. The Possibilities for Adaptation

That consideration brings us to the last point concerning the effectiveness of interdiction, namely, the ease with which cocaine and marijuana smugglers can adapt to interdiction pressure. Even if we assume that the stringency of interdiction could be greatly intensified, we cannot assume that drug smugglers will go on using the same methods once these begin to expose them to very high risks. If the seizure rate begins to rise sharply, they might change their procedures.

At present, cocaine is brought into the United States in relatively large units, often in twenty-five-kilogram loads, on dedicated planes flown by skilled pilots who assume the risk of being apprehended as cocaine couriers. This contrasts sharply with the mode of importing heroin. That drug is brought in in small units (frequently less than 2.5 kg) on general cargo or transportation vessels (both ships and planes) and by unskilled couriers, typically crewmen or air stewards. The second mode of importation appears to be less efficient. At least it is true that the absolute price increase in the export-import transaction is higher for heroin than for cocaine.

Let us assume that interdiction efforts aimed at the specialized cocaine planes become effective enough that skilled pilots could not be found to fly in the drug. More cocaine importers could then adopt the heroin mode of importation currently used by some cocaine smugglers. To see the effect of that on the final price of the drug, we can compare the costs of the two modes. The comparison is complicated by the fact that distribution is itself expensive. By importing cocaine in much smaller units, the importers are able to eliminate one level of distribution and sell further down the chain at a higher per-unit price. Taking this into account, and assuming that the price rises by 85 percent at each transaction point,[17] we can show that the middle-level price of cocaine would rise by less than $100,000 and the final price by less than $150,000 or about 20 percent.

This is not additive with the drug seizure effect since the adaptation takes place precisely to lower that seizure rate. Our models are not sufficiently refined to permit determination of the interdiction rate at which it becomes optimal to switch importing modes; in any case, it will differ among organizations. It should also be noted that the heroin

[17] This is consistent with a three-level distribution chain between importer and retailer and a thirteenfold price rise. Different figures would apply for marijuana.

mode price effect estimate is an upper bound since heroin couriers are probably subject to more severe penalties than are cocaine couriers if caught; that is, heroin couriers demand more money for a given size shipment.

Marijuana importers would have more difficulty adapting to extreme enforcement pressure. The bulkiness of the drug per-unit value means that the value of much smaller units simply would not compensate for the risks of smuggling them. Moreover, marijuana has a distinctive odor that is hard to mask. The heroin importation mode is not feasible. Nonetheless, importers could shift to forms of cannabis that have less bulk for a particular quantity of THC—higher potency marijuana, hashish, or hashish oil. Under current conditions, the higher labor costs of hashish production make it unattractive to market, but that could change if the risks of transporting marijuana rose.

The optimal adaptation for modest increases in pressure may simply be scaling down the size of shipment brought in by specialized vessels. Instead of bringing up "mother" ships from Colombia with fifty tons of marijuana and then off-loading to smaller coastal vessels, much marijuana is now smuggled in small, very fast oceangoing boats, known as "cigarettes." This is reflected in the failure of quantities seized to rise along with Coast Guard expenditures.

Although this adaptation raises transportation costs, it is less feasible to stop many small, fast boats than a few large ones. Since a major portion of the cost in interdiction is a Coast Guard ship's "waiting time" between sighting and boarding a smuggling vessel and returning the smuggler's boat to port (Coast Guard, personal communication, 1983), a switch to smaller smuggling craft requires much greater resources to achieve a given interdiction ratio. Moreover, with this mode of transportation, the drug again passes through fewer distribution levels, thus avoiding the markups at those levels.

Higher interdiction could also result in higher domestic production. This is not strictly an adaptation by the import business, but it could frustrate the ultimate objective of interdiction. We have little systematic data on either current or potential domestic production, but the recent increase in apparent availability of sinsemilla, Hawaiian, and other high-THC specialty varieties of marijuana suggests a substantial expansion in domestic capacity. The most recent official estimate is that 11 percent (by weight) of U.S. marijuana consumption comes from domestic sources (National Narcotics Intelligence Consumers Commit-

tee 1984, p. 9). Since domestic marijuana is of higher potency and price than imported marijuana, the domestic share of total expenditures may be much higher.

Finally, note that the cost of achieving a doubling in the interdiction rates for cocaine and marijuana may be very high indeed. The Coast Guard more than doubled its expenditures on interdiction between fiscal years 1978 and 1982 (a real increase of about 50 percent) yet seized scarcely more marijuana (and trivial amounts of any other drug) in the latter year. The interdiction rate may actually have gone down since the market probably expanded somewhat over the same period. It appears that the interdiction rate for cocaine increased substantially in 1983; that may, however, reflect a decline in the export price induced by overplanting in producer countries. Lower export price would reduce the replacement cost of seized drugs and hence the incentives to invest in costly interdiction-avoiding expenditures.

To sum up, interdiction rates currently seem to intercept about 10–30 percent of the marijuana and cocaine shipped to this country. Our analysis suggests that, unless some unforeseen change creates a strong constraint on supply in the producing countries, even much higher interdiction rates would not raise retail prices very greatly and would be very costly to achieve. If interdiction efforts were to rise sharply, cocaine and marijuana traffickers could change transportation methods that make them vulnerable to present enforcement tactics and lower the effectiveness of these efforts.

V. Actions against High-Level Domestic Distributors

The federal government has for many years conducted investigations aimed at arresting and incarcerating high-level distributors. It has recently greatly intensified that effort, as indicated by increases in the number of arrestees (table 3) and in the numbers classified as high-level dealers (Drug Enforcement Administration 1985). The DEA now devotes most of its resources to making cases against such dealers. The Treasury Department, through the Customs Service and the Internal Revenue Service (IRS), also conducts its own investigations against major dealers. These actions take the form of undercover investigation—"sting" operations—tracing dealers' finances through Currency Transaction Reports (CTRs), asset seizures, and taxation of drug-related income (National Narcotics Intelligence Consumers Committee 1983*a*). They have produced very visible results in the form of large

drug seizures, arrests (and long prison sentences) for tens of principals in big importing and distribution enterprises, and seizures of many millions of dollars of assets. The federal drug enforcement program now accounts for a significant share of all federal law enforcement effort. For example, drug offenses accounted for 19.7 percent of all defendants disposed of in federal court in 1982, compared with 13.8 percent in 1972.

A. Types of Actions

In many recent successful investigations, federal agencies have mounted sting operations that capitalize on the drug trade's need for certain services. Cocaine smugglers need to obtain planes and pilots. Marijuana importers need to off-load tons of the drug very rapidly once it comes ashore and to find safe warehouses where it can be stored until sold. And high-level dealers in both trades need financial services to protect their very large incomes from detection and to invest them profitably. In buying these services from independent entrepreneurs, dealers make themselves vulnerable to investigators. In a number of cases, DEA agents have set up transportation and financial "firms," building strong cases against dealers who sought their services. For example, a federal agent with the improbable name of Ted Weed set up what became the largest off-loading enterprise in the marijuana business, leading eventually to hundreds of arrests and the seizure of hundreds of tons of marijuana (Kleiman 1985, chap. 2). In addition, federal agencies continue their more traditional types of investigations using undercover drug purchases and informants.

It has been argued that the newer investigative approaches such as sting operations have the great virtue of producing large effects because they are targeted on organizations rather than on individuals. It takes time and money for traffickers to re-create large organizations because of the need to rebuild contacts, relationships of trust, and so forth. Thus removing fifty individuals from one organization may have a larger effect than removing fifty randomly selected individuals from many organizations.

However, despite the success of such techniques in building cases, we are skeptical that eliminating organizations has much additional effect simply because there are many successful dealers who operate on a much smaller scale. If large-scale organizations were made unprofitable because of excessive exposure to law enforcement, their place

would be taken by smaller-scale ones; since many smaller-scale organizations now operate, they can apparently compete with the large ones at current prices.

Apart from undercover operations, federal agencies have also begun regularly using CTRs to make cases against high-level distributors. Federal regulations require financial institutions to file CTRs for transactions of $10,000 or more. Agents have analyzed CTRs to identify members of major dealer organizations and to locate their assets for later seizure and taxation. In addition, failure to file CTRs has served as the basis for prosecution, and bribery attempts to keep bank officials from filing have provided investigative leads.[18]

Federal agencies also have authority to seize the assets of drug dealers, including vessels, aircraft, vehicles, real estate, front businesses, cash, and bank accounts. The DEA can seize assets if they are used in the drug traffic or if they were purchased with drug-produced income. The Customs Service can confiscate vehicles, aircraft, and boats used in attempts to smuggle contraband and can also seize cash entering or leaving the country in violation of currency reporting laws (reports must be filed for all cash or bearer-negotiable instruments in excess of $5,000). In addition, the IRS has used procedures such as jeopardy assessments that also enable the government to take assets quickly to satisfy tax claims.

B. Effects of Asset Seizures

Let us consider the effects of asset seizures first because the analysis is quite straightforward. The various asset seizure programs have an obvious attraction as devices for attacking the drug trade. They are relatively speedy compared with the trials of well-defended traffickers. They immobilize assets during court proceedings, thus disrupting the cash flow of criminal organizations. They serve as a condign punishment since, given that dealers enter the drug trade because they seek large incomes, it seems appropriate that they lose the assets generated by that trade. Finally, they generate revenues that help offset the costs of enforcement.

Nonetheless, it appears that these seizure programs have little prospect of making a significant difference in the retail price of drugs. The amounts reported seized do not represent the actual financial penalty

[18] The strengths and weaknesses of this approach have been examined in a recent report by the President's Commission on Organized Crime (1984).

imposed on a trafficker. A two-stage procedure is involved: in the first phase (seizure), the agency freezes the assets to prevent the dealer from removing them beyond the government's reach; in the second phase (forfeiture), ownership finally passes to the government after legal proceedings. After litigation, the amount realized is likely to be much lower than the amount originally seized.[19] In fact, counting actions for all types of drugs, in 1981 the DEA actually obtained only $13 million in forfeitures from its asset removal program, though seizures totaled $161 million (National Narcotics Intelligence Consumers Committee 1983*b*). For more recent years, we have only seizure figures, which in 1984 totaled $134 million. Forfeitures probably were less than half that amount.

These amounts are not large in relation to the retail value of all drugs ($20 billion for marijuana, cocaine, and heroin together, according to our lower-bound estimates). Even if federal agencies managed to realize considerably more in the future, the effect on final retail price would be modest. For example, let us suppose that the agencies could triple the value of the dealers' assets that are forfeited or taxed and that 50 percent of that value came from marijuana dealers. Although those are improbably high figures, they would raise the retail price of marijuana by less than 1 percent, treating the seizures as a tax on marijuana imports.

C. The Possibilities for Increased Investigative Effort

The prospects for making progress through intensified enforcement are a little better. One constraint that presents a major problem for local enforcement is not present; prison space can be expanded if the federal government significantly increases the numbers of those convicted of drug offenses. Also in contrast to local drug enforcement efforts, the federal government has had little difficulty in obtaining convictions and prison sentences for those it charges with violations of drug laws.

In 1984, the DEA reported 10,939 persons convicted for drug violations resulting from federal investigations (Drug Enforcement Administration 1985). In federal court, the conviction rate has been about 80 percent in recent years. Of the 10,939 convictions in 1984, 72 percent

[19] For instance, if a seized house is mortgaged, the mortgage holder may successfully petition for return of the property. Claims of a wife or a family may be accepted. Valuation of real property may be overstated. Vehicles may deteriorate in storage during forfeiture proceedings. In tax proceedings, the IRS may seize large amounts of assets before closure, but the amount seized may bear no relation to the actual tax assessment. Finally, the agency may lose its claim in court.

resulted in prison sentences, and the average sentence was approximately fifty-six months.[20] Though the data series available to us are not perfectly comparable, it appears that the numbers of persons convicted and the average sentence length have risen very substantially, perhaps doubling over the period 1980–84. This increase roughly parallels the increase in resources devoted to high-level drug investigations; the principal investigative and prosecutive agencies (DEA, FBI, IRS, U.S. Attorneys, and Criminal Division of the Department of Justice) increased their expenditures on drug cases from $280 million in fiscal year 1982 to $512 million in fiscal year 1984.

The success of the increased investigative effort, in terms of persons arrested, convicted, and incarcerated, is impressive. We note, though, that there are adaptations that may reduce the long-run effectiveness of that effort. We suggest that they are likely to take some time to occur because they may come about only as a result of changes in the composition of the dealer population.

For example, the newer and more successful techniques, such as sting operations and analysis of CTRs, are defeated by relatively simple adaptations. Large smuggling or distributing organizations are vulnerable to undercover operations (e.g., selling financial or transportation services) precisely because of their scale. If these investigations present too much risk, organizations can simply scale down and handle smaller quantities of both goods and money. It is useful to note here that these investigations appear to have had little success with respect to heroin, where the relatively small import bundles are handled by much smaller organizations.

As for the analysis of CTRs, a dealer can avoid the CTR requirement by converting currency into other negotiable instruments without ever making a $10,000 transaction; it simply takes slightly smaller transactions with different financial institutions. Consequently, the effectiveness of CTR analysis may be self-limiting. Ease of entry into the marijuana and cocaine markets has meant that some people who have little education or familiarity with U.S. institutions and finances have amassed considerable wealth. Thus the CTR requirement may help to weed them out, leaving a more sophisticated dealer population. It is likely that there are enough potential dealers to keep the removal of the less competent from making a difference in the market.

[20] Note that drug violators, like other federal prisoners, are released after serving, on the average, less than half their sentence.

D. Price Effects of Intensified Investigations

Despite the difficulties just enumerated, it is conceivable that federal agencies could, through greatly increased efforts and resource expenditures, make many more cases against high-level dealers. Let us suppose that they achieved a very large increase, say, doubling the number of drug violators now sent to prison. What effect would that have on drug prices?

We again estimate the additional compensation that dealers would require to cover their increased risks of spending time in federal prison. From the sentencing data cited earlier, we estimate that about 29,800 years of prison time were imposed on drug dealers caught as a result of federal investigation of marijuana, cocaine, and heroin dealing. Given that dealers serve, on the average, only about 45 percent of their sentence, this implies about 13,371 actual years of imprisonment.[21] Now assume that this number were doubled, that is, that 13,371 more years were imposed on dealers. In response, dealers would require extra compensation for the added risk of imprisonment. Since these are high-level dealers, many of whom are earning very large incomes, it is reasonable to impute very high values. For highest-level dealers (class 1 violators as defined by the DEA), we use a figure of $250,000, for second-level (class 2) dealers $125,000, and for the remainder $75,000.[22] Assuming the distribution of classes of dealers remained the same under the new situation as it was in 1984, the added years of imprisonment would result in a total of $2 billion added to retail prices. Compared with the total retail value of drugs, this added cost would represent a price increase of only about 10 percent.[23]

Even this modest increase would probably not appear for a few years. There would probably be a substantial time lag between increasing expenditures and completing cases. It takes time to build a network of informants, to accumulate a pool of experienced agents, and to mount investigations. These considerations must be taken together with the possibilities of dealer adaptations and the probability of very high costs.

Of course, there are numerous uncertainties here; it may be that

[21] Details of these calculations are presented in Kleiman (1985, tables 2–4).

[22] In 1984, the DEA estimated that, of 10,839 total domestic drug dealers sentenced, 1,447 were class 1 dealers, 779 were class 2, and 8,613 were class 3 or 4 (Drug Enforcement Administration 1985).

[23] Most of these cases are made against persons involved in high-level domestic distribution. The markup to retail price is presumably significantly less than that which applies to rises in the import price.

dealers will not readily adapt, that the agencies could accommodate large budget increases quickly, or that further innovations in investigative techniques, such as targeting organizations, will pay off more than we expect. However, with currently available information it seems unlikely that even a dramatic expansion of investigative effort against high-level drug distributors would have a very large effect on the availability or price of drugs.

It is also important to note two possible adverse consequences from increasingly stringent enforcement. First, the price increase may raise high-level dealer incomes if the elasticity of demand is less than one, a highly plausible condition for marijuana and heroin. Second, more stringent enforcement may lead to more violent organizations, which are able to discipline agents more effectively, dominating the market.

VI. Local Law Enforcement

As shown in table 3, local police make numerous arrests for drug offenses. The figure has exceeded half a million annually since 1972, though most of these arrests are for simple possession of marijuana and result in little additional penalty beyond the confiscation of a small amount of the drug. However, local law enforcement does pose a major instrument against at least one of the markets, that for heroin.

This section is divided into two parts. The first deals with the peculiar virtues of street enforcement with respect to heroin. It also argues that street enforcement is not comparably effective for cocaine and marijuana. The second part then calculates the effect on cocaine and marijuana prices of a doubling of the efficacy of local enforcement.

A. The Virtues of Street-Level Enforcement

Enforcement activities directed at major distributors and wholesalers of drugs have most of their impact on money price. In effect, they raise the "raw materials" cost of the retail-level drug dealing business without changing other conditions. Thus if high-level enforcement succeeds in raising the wholesale price of a drug, users will have to pay more for their supplies of the drug, but their search time to find a connection will not tend to change. Whether the net result is more or fewer dollars spent on the drug depends on the price elasticity of demand.

By contrast, enforcement directed at retailers and first-level wholesalers can change the number of street dealers and the openness with which they flaunt their wares. As street-level enforcement increases, the typical user will not have to pay more for a given quantity

of drugs but will have to search longer for a connection. This constitutes an increase in the nonmonetary costs of the drug.

The effects of this may be large or small, but they are unambiguously good (assuming only that drug consumption is on balance an evil). Both quantity consumed and dollars spent on drugs will decrease—and, consequently, so too will the earnings of drug merchants—as a result both of the drop in quantity (due to lower effective demand) and of the downward pressure that that drop puts on prices. In addition, insofar as heroin users commit property crimes to obtain money for drugs, an increase in search time will directly reduce their incentives to commit such crimes by making it harder to convert money into heroin.

But with street-level as with high-level enforcement, heroin is far more susceptible to the effects of increased pressure than is marijuana or cocaine. Again, a major reason is sheer size: measured by numbers of regular dealers, the heroin market is perhaps a fourth the size of the cocaine market. Imposing any given level of risk on the average cocaine dealer, therefore, requires four times as many arrests, prosecutions, convictions, and prison terms as are required to impose the same level of risk on the average heroin dealer.

Two other characteristics of retail heroin dealing make it particularly susceptible to enforcement pressure. First, heroin transactions take place largely outdoors because heroin dealers are reluctant to be alone inside with heroin consumers. Second, heroin users buy drugs daily because they find it difficult or impossible to hold onto personal inventories without consuming them all at once. By contrast, marijuana transactions are infrequent; while the conventional unit of marijuana consumption is the joint, the conventional unit of purchase is the ounce, roughly sixty joints. This suggests that marijuana consumers hold personal inventories. Consequently, it is difficult to impose substantial search-time costs on a regular marijuana user, but it is easy to impose them on a regular heroin user. Moreover, since the regular heroin user suffers some discomfort unless his consumption of the drug stays regular, a failure to connect has much more serious consequences for him than an equivalent failure for even a regular marijuana user whose personal inventory is exhausted. Increased search time for heroin users, combined with occasional failures to connect, may lead users to enter drug treatment or simply to quit unassisted as the attractiveness of the user life-style decreases.

As in any drug market, if enforcement succeeds in shrinking the

number of participants, the same level of enforcement resources will impose a greater level of risk on the remaining participants. In addition, a second kind of positive feedback, one due to the behavior of search time as the number of participants shrinks, may be at work in the heroin retail market. The possibility that cruising around will lead to a successful meeting whether one is a buyer looking for a seller or a seller looking for a buyer depends on the number of buyers and sellers in the market in a given region. But the number of buyers and sellers itself depends in part on the probability of a successful meeting: the search time to "score" from the buyer's perspective, the waiting time between customers from the seller's.

Unlike a higher-level dealer, a heroin retailer facing increased risks and the need to operate more discreetly may have difficulty raising his prices. He, like his customer, spends considerable time waiting for an opportunity to do business. When a willing buyer meets a willing seller, both have substantial investments in being able to take care of business right then. The situation is one of temporary bilateral monopoly, which may account for conventional pricing in the retail heroin market; no one wants to take the risk of an unsuccessful negotiation. Increased search time due to tougher enforcement increases the sunk costs on both sides; if the dealer refuses to deal with new customers, his old customers are that much more valuable to him. Thus dealers are likely to make fewer transactions without being able to raise margins. This may cause some of them to leave the business.

If, then, increasing search time in the heroin market decreases the number of active users, the decrease in the number and aggressiveness of retail dealers may not create opportunities for new entry because the smaller number of active users tends to increase dealer search time and reduce the financial rewards of the business. This combination of positive feedbacks might, in some cases, cause a local market to drop below the minimum size at which it remains self-sustaining, establishing a new equilibrium with no active users and no sellers. This is, after all, the condition that obtains throughout most of the country and even in most neighborhoods in the cities where heroin is a problem.

There is now some empirical evidence that local enforcement initiatives against heroin dealing may be effective in reducing both drug consumption and some kinds of acquisitive crime. A recent study in Lynn, Massachusetts, found that burglaries fell 41 percent year to year after the introduction of a small heroin task force (six officers from a total force of 120 in a city of 80,000) that concentrated entirely on retail sales (Kleiman, Holland, and Hayes 1984).

That decrease in burglaries was more than four times the average declines nationally, statewide, and in other Massachusetts areas with heroin problems. During the same period, demand for heroin treatment in Lynn jumped 90 percent while remaining stable in the rest of Massachusetts. Similar results have been reported (anecdotally) on the Lower East Side of Manhattan and in Richmond, Virginia.

B. Cocaine and Marijuana

For cocaine and marijuana, the dominant effect of increased local enforcement is on dealer risk. We revert then to our earlier line of analysis and try to estimate the effect that this might have on retail prices.

Arrest is, of itself, a fairly minor sanction for most arrestees. To estimate the stringency of local law enforcement, it is also necessary to obtain data on the percentages of various kinds of drug arrests leading to jail or prison sentences. Unfortunately, we have only fragmentary data on these matters. We shall use the available data to estimate the current risks that dealers face from local police, namely, the probabilities of arrest, jail time, and at least one year in prison. As before, these calculations will require that we make many assumptions. In choosing those assumptions, we shall attempt to avoid downward bias in estimating the effectiveness of possible increases in the local police effort devoted to marijuana and cocaine. We will then consider the effect on cocaine and marijuana prices of doubling local police effort.

Table 8 presents estimates of the risk of arrest for marijuana, cocaine, and heroin dealers.[24] We assume that marijuana possession arrests do not include any dealers but that one-quarter of heroin and cocaine possession arrests are of dealers.[25]

Unfortunately, heroin and cocaine are lumped together in the FBI's annual *Uniform Crime Reports*. The sale and possession arrests for heroin and cocaine are assumed to be evenly divided between the two drugs; we would guess that the true figure is that three-quarters of the dealer arrests are of heroin dealers, but that is very impressionistic. Our assumption exaggerates the estimated efficacy of the cocaine enforcement increase.

Of the jail and prison rates resulting from arrests, we have only the following data elements. (1) On December 31, 1979, 15,500 out of

[24] Throughout this section we shall ignore risks posed by federal agencies, which eschew low-level investigations and arrests.

[25] Not including jugglers (Moore 1977), i.e., addicts supporting their habits through sales.

TABLE 8

Risks Faced by Drug Retailers, 1984

	Heroin	Cocaine	Marijuana
Dealers	45,000	180,000	500,000
Sale arrests	24,000	24,000	74,000
Dealer possession arrests	12,000	12,000	0
Total dealer arrests	36,000	36,000	74,000
Annual arrests per dealer	.8	.2	.15
Probability of jail, given arrest	.16	.16	.26
Probability of prison, given arrest	.07	.07	.02
Annual probability of jail	.32	.08	.04
Annual probability of prison	.14	.035	.001
Annual expected incarceration time (days)	131	33	4.3

175,000 inmates of state prisons were serving sentences for drug offenses (Brown et al. 1984, p. 577). For purposes of calculation we assume that this is a steady-state number, that is, that 15,500 years of prison time are allocated to drug dealers each year. (2) In California, 4,931 marijuana sales arrests in 1979 produced fifty-five prison sentences and 1,301 jail sentences. Felony arrests involving drugs other than marijuana totaled 27,005 in 1979. These led to 807 prison sentences and 6,921 jail sentences.[26] (3) In New York City in 1980, there were 11,600 nonmarijuana drug felony arrests. These produced 1,200 prison sentences and 850 jail sentences (Califano 1982).[27]

The second and third pieces of data are interesting in themselves. California felony nonmarijuana drug arrestees face a 3 percent probability of a prison term, and those in New York City face over a 10 percent probability of the same outcome. But the probability of some incarceration is higher in California (28.6 percent) than in New York City (17.7 percent).

We have no data on the length of jail sentences; we know only that they are less than one year. Califano (1982) reports that only 10 percent of those jailed following conviction on misdemeanor drug arrests received more than thirty days. Let us assume, from now on, that a jail sentence is ninety days. Again, this probably biases upward our estimate of efficacy.

[26] These figures come from unpublished Offender Based Transaction Statistics tables, provided by the California Bureau of Justice Statistics.

[27] The 850 sentences were for misdemeanor convictions following felony arrest. A very small portion may have received prison sentences of a little more than a year.

For marijuana, we shall double the frequency of California for the national imprisonment rate; 2 percent of sales arrests result in prison. Judicial attitudes in California toward marijuana dealers are probably more lenient than in most other states. The jail rate we shall leave at the California level. For heroin and cocaine, we average the California and New York prison and jail rates. The probability of state prison sentence following a felony sale or dealer arrest is 7 percent; the probability of jail is 16 percent. It should be noted that these are not much lower rates than for felony arrests generally.

Our final assumption concerns length of prison sentences. The probabilities calculated so far yield approximately 5,500 dealers going to prison each year. State prisons have 15,500 serving time for drug offenses. A significant share may be for drugs other than marijuana, cocaine, or heroin. In 1981, these other drugs accounted for 32,000 sale or manufacture arrests, nearly 30 percent of the total for sale or manufacture. If we allocate for these drugs the same percentage of drug prison time, then we have 11,000 years of prison time for our three drugs and an average sentence of two years actually served.

Use of this figure, together with our assumed ninety-day jail sentence, yields the last line of table 8. The average heroin dealer can expect to spend 35 percent of his dealing career incarcerated; marijuana dealers spend 1 percent of their time incarcerated. Let us assume now that local law enforcement agencies were able to double the present level of risk imposed on cocaine and marijuana dealers. This might well require more than doubling police expenditures on drug enforcement.

If arrest rates doubled and the probabilities of various outcomes following arrest remained unchanged, what might happen to the prices of marijuana and cocaine? We need to place a value on incarceration time and on arrest itself. Given that almost all these arrests are of retailers earning significant but not large incomes from being dealers, we place a modest value on the cost of time, $50,000 per year, or $137 per day. Since arrest is a penalty per se, we need to place a value on that. Surely $5,000 would seem a high enough value for a low-level dealer. Doubling arrest and incarceration rates then requires that cocaine dealers receive an additional $7,000 each; this raises total throughput cost for twenty-three tons of cocaine by $1.3 billion or about 16 percent. For marijuana, average dealer compensation must rise by about $1,340; this raises throughput costs by $620 million or about 14 percent.

These are extremely primitive calculations. They require the use of a

very large number of quantitative assumptions. We have chosen in general to use assumptions that seem biased toward detecting large effects from the application of more resources to drug law enforcement. Even under those assumptions a dramatic increase in that enforcement seems to produce only quite modest price effects. An increase of 14 percent in the price of marijuana, from about seventy-five cents to eighty-six cents per joint, would appear to require very substantial reallocation of criminal justice system resources but would generate a decrease in consumption. At a time when there is a general concern about the system's ability to apprehend and punish offenders who commit property and violent crimes, it may be hard to justify such a diversion for such modest returns.

The apparent insensitivity of the system to increases in the stringency of local enforcement is somewhat puzzling; after all, that aims at the part of the distribution system that accounts for most of the final price. If doubling the risks of arrest and incarceration for retailers does not greatly increase the price of drugs, then we must ask why the retailers receive such large returns for their participation. We speculate that the answer lies in the discontinuities of dealer utility functions. A substantial part of their current return comes from entry into the trade and is not affected by marginal changes in the various risks associated with it. For example, the vulnerability that dealers may feel as a result of their inability to seek police protection when they are robbed is not something that changes with enforcement intensity.

Similarly, the indirect risks from other participants in the trades may not be much affected by increased enforcement intensity. For example, the measures a dealer adopts to ensure that he is fairly safe from customer robbery (such as giving his drugs to an associate while he collects the money) may be just as adequate when the price of heroin is $2.00 per milligram as when it is $2.50. Finally, we suggest that, for low-level dealers, an important part of their total compensation is the return to the investment of time. If our estimates of total marijuana income, dealer numbers, and markups are correct, then the average marijuana retailer earns only about $5,000 per year from the trade. A large part of that may simply be payment for making trips to suppliers and waiting around for customers. Enforcement will have little impact on that element of his costs.

VII. Some Policy Implications

This last section considers some implications of the foregoing four policy choices. We first present a brief summary of the major results. The

second part then suggests what additional considerations should be taken into account in making decisions about the level of effort that should be devoted to supply reduction programs.

A. Pessimistic Conclusions

One obvious conclusion that might be drawn from this essay is that the enforcement-oriented strategy will not work. That is not correct, or at least not in such a simple form. We have looked only at what could be achieved by fairly large increases in the efforts, predominantly federal, aimed at the cocaine and marijuana markets. The analysis has not addressed the question of what has been accomplished by drug enforcement to date. We discuss that briefly before going to the implications of what we have done.

The most striking observation about illicit drugs in this country is their high prices. Even marijuana is vastly more expensive than it would be if legally available, mostly a consequence of illegality per se and of the enforcement of that illegality. Heroin surely represents the limits of enforcement effectiveness. A white powder, readily manufactured from poppy gum, which would cost only a few dollars if legal, instead costs about $2,000 per gram on the streets of American cities. Not only is it absurdly expensive and of extraordinarily low purity, but it can also be obtained only by incurring significant risks. One surely could ask no more of enforcement against an illegal market. Yet approximately half a million people are prepared to lead quite degraded lives in pursuit of the drug.

Enforcement against cocaine and marijuana has not accomplished as much as has heroin enforcement. It is not clear that it could, given the differences in characteristics of the drugs and, perhaps relatedly, their users. But cocaine and marijuana enforcement have certainly had significant consequences for the use of the two drugs in this nation.

The question that we have addressed is whether intensified enforcement, particularly by the federal government, can much further reduce consumption. We have concluded that this is not likely. The experience of the last five years, with its large increases in federal enforcement against these drugs and at least modest increases in the risks imposed by local agencies, does not contradict this. The cocaine market may have expanded, and price has certainly declined. Marijuana prices have increased modestly, but if there has been any significant decline in consumption, as indicated by the high school seniors survey, it is most probably explained by changed attitudes toward the health consequences of marijuana use.

Part of the problem is that so many of the enforcement resources are focused on a part of the drug distribution system that accounts for very little of the retail price of the drug. Limiting coca production in Peru, capturing Colombian crewmen on marijuana smuggling ships, or imprisoning importers of Iranian heroin produces impressive statistics but imposes relatively light costs on the drug distribution system. Even producing a lot more of these enforcement outputs will not much raise the costs of distributing drugs.

More stringent enforcement at the local level does not seem to offer better prospects, except for heroin. The scale of the markets, the significance of costs that are unrelated to enforcement, and the infrequency and privacy of individual transactions all mitigate against effective cocaine and marijuana enforcement. Only for heroin do we see much possibility for increased local enforcement to reduce the availability of the drug further.

It should be noted that our analysis makes use of very conservative estimates of the size of the cocaine and marijuana markets. That has the effect of biasing upward our estimate of the efficacy of increased enforcement. For example, if the marijuana market truly is 13,000 tons and generates revenues of $18 billion, as suggested in official publications, then the likely price effect of raising total marijuana seizures through interdiction to 4,000 tons is even smaller than we estimated.

It is useful to note again that our pessimism does not extend to drug enforcement generally. There are some markets in which increased enforcement has effectively reduced the availability of the drug. Methamphetamines and methaqualone are two recent instances. Whereas these drugs were readily available in the late 1970s, a combination of treaties with the small number of foreign producer countries, in which they were produced by pharmaceutical companies for legitimate medical purposes, and the targeting of abusive prescribers in the United States, greatly reduced their availability and use by 1984. The need for expensive centralized production facilities was probably critical in those cases.

B. Evaluating Drug Enforcement Policies

The analysis above lays the basis for evaluating drug enforcement policy choices, at least qualitatively. Those choices can be thought of as concerning (1) the overall budget; (2) its allocation between high-level (close to the source for the importer) and street-level (close to the final retail transaction) activities; and (3) its allocation among target drugs—

marijuana, cocaine, heroin, and the "dangerous drugs" (synthetics). The current federal strategy is to increase the resources available, direct attention toward high-level cases, and concentrate on marijuana and cocaine.

An evaluation ought to consider both the efficacy of a given set of enforcement activities (compared to their costs and the alternative uses of those resources) in reducing drug abuse and any unwanted side effects it may have.

The analysis above does not allow us to judge whether the increase in the overall federal drug enforcement budget is wise. The current budget of about $1.2 billion looks small in relation to either the $20–$35 billion Americans spend each year on illicit drugs or the recent $47 billion estimate of the total annual social costs of illicit drug abuse (Harwood et al. 1984). On the other hand, $1.2 billion is a healthy chunk of the total federal law enforcement budget—roughly $4 billion—and a multiple of the negligible sums spent on drug abuse prevention. One cannot say whether we should be spending more or less on drug enforcement overall without making assumptions about the alternative uses of those funds, unless it appears that some spending is either futile or likely to generate unwanted side effects of greater magnitude than its benefits.

Much of the current surge in federal drug enforcement spending may, however, be going into precisely such futile or counterproductive uses. High-level marijuana and cocaine enforcement is likely to be of very limited efficacy in reducing drug abuse both because of the limited ability of federal enforcement to increase prices and otherwise limit availability and because of the relatively inelastic demand for marijuana and cocaine. Inelastic demand—the tendency of marijuana and cocaine consumers to reduce consumption less than proportionately if prices increase—means that the total dollars paid for these drugs will tend to increase as enforcement increases prices. This creates two unwanted side effects, one on consumers' budgets and the other on illicit revenues; as consumers pay more, becoming poorer, drug market entrepreneurs earn more, becoming richer. If, in addition, toughened enforcement encourages the development of drug-dealing organizations that are more enforcement resistant because they are more violent and corrupt, the overall result of putting more pressure on the top levels of the marijuana and cocaine trades will be to give the most dangerous criminals a bigger share of a larger market.

Increasing enforcement directed against users and low-level dealers

of marijuana and cocaine, though without the side effects of increasing high-level enforcement, is likely to be futile because of the sheer numbers involved. Local police already arrest 400,000 marijuana consumers per year; to make use significantly more risky would require a substantial rise in the share of scarce prison space allocated to users of the drug. Heroin, by contrast, trades in a much smaller market in which demand, we have argued, is likely to be relatively elastic to price. Both these factors boost the likely efficacy of increased enforcement pressure in reducing drug abuse, and elastic demand also means that dollars spent by addicts and earned by dealers will decrease rather than increase if enforcement tightens.

High-level heroin enforcement thus deserves a bigger share than it now receives of federal drug resources. In addition, since the size and structure of the retail heroin market make it a particularly attractive enforcement target, it might be desirable to find ways to funnel federal resources into street-level heroin enforcement. This could take the form of federal investigation and prosecution of retail-level cases—as exemplified by the DEA State-Local Task Forces (now largely moribund) or the prosecutions under Manhattan's Operation Pressure Point—or of federal funding of local agents and prosecutors.

Policy-making in a field as highly charged as drug abuse is not likely to be so rational—in the economic sense—as to make these relatively refined notions a central part of the debate. We hope, however, that the approach suggested here, and the numbers that the approach generates, will create a greater interest in determining just what will be accomplished by ever-increasing federal enforcement against the cocaine and marijuana trades.

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