Price-setting behaviour in the heroin market

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ABSTRACT

The present article analyses price-setting behaviour in drug markets, starting with an analysis of the forces driving drug markets ("expected profit") and those restraining their expansion ("risks"), distribution patterns, the involvement of organized crime and the importance of market concentrations, before addressing in more detail the question of price-setting behaviour along the trafficking chain. Examples are drawn primarily from the opium/heroin markets, as they have experienced the most significant price changes in recent years, thus making possible the testing of two different hypotheses: additive versus multiplicative price-setting. On the basis of empirical analysis, the article argues that neither the additive nor the multiplicative model are fair reflections of reality. Following the ban of opium poppy cultivation by Afghanistan in 2001, the empirically determined rise in the price of heroin in the consumer markets of Western Europe (taking changes of purity into account) was less than the rise predicted by the multiplicative price model but significantly higher than that foreseen by the additive price model.

Keywords: drug markets, heroin markets, drug prices, heroin prices, purity, price-setting behaviour, risk, profit, intervention, distribution pattern, organized crime, opium, heroin, opium poppy ban, Afghanistan, Iran (Islamic Republic of), Pakistan, Tajikistan, Western Europe, France, Germany, Italy, United Kingdom of Great Britain and Northern Ireland, additive model, multiplicative model.

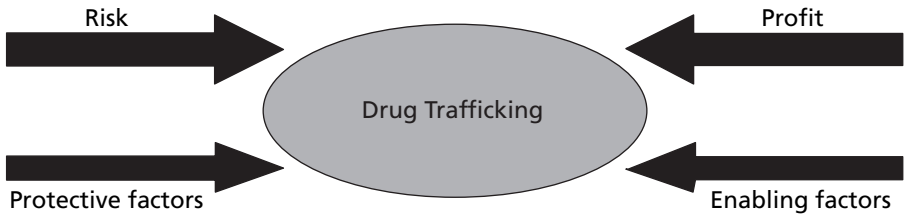
Overview

The present article is a slightly modified and updated version of a paper prepared previously by the United Nations Office on Drugs and Crime, entitled "Factors to be taken into account in modelling drug trafficking operations", which was presented at the United States Library of Congress in January 2003. It starts with some general considerations on the operations of illicit drug markets, such as profits and risk, distribution patterns, the involvement of organized crime and the importance of market concentrations, before addressing in more detail—based on empirical observations—the question of price-setting

behaviour along the trafficking chain. Though the analysis is not restricted to any specific drug, examples are drawn primarily from the opium/heroin markets as they have experienced the most significant price changes in recent years, thus enabling the testing of two different hypotheses (the additive versus the multiplicative price-setting model).*

Drug trafficking, in conceptual terms, can be analysed by two key factors: profits and risk, as well as a number of enabling and protective factors (see figure I). Protective factors include what is usually described under the heading of "social capital" (community cohesion, usually fostered by local traditions, local culture, religion, local employment opportunities and so on). Enabling factors are, inter alia, ethnic diaspora, marginalization of significant proportions of the population, unemployment, uneven income distribution (relative poverty), lack of government control and civil strife. In addition, location plays a key role (transit countries).

Figure I. Conceptual representation of drug trafficking



The key motivation for participation in drug trafficking is usually profit, that is, the expectation of high returns in a relatively short period of time for relatively little work. The higher the profit expectations, the more drug traffickers, as well as people in general, will try to participate in such business operations. A specific question, which will be addressed below in more detail, is whether the return on investment, or profit per unit of substance trafficked, is the key driving force.

The main limiting factor for drug trafficking is risk. The higher the risk, the less, *ceteris paribus*, drug trafficking will take place. This will be true as long as the risk is not offset by growing profit expectations. The "risk function" differs widely among individuals and groups in society. For a few individuals risk can even be the driving force for their activities, though for the majority of people it is the factor that limits their potential involvement in the drug business. In general, males appear to be less risk-averse than females. The readiness to take risks is also stronger among youths and young adults than among the older

*The "additive" and "multiplicative" price transmission models were first introduced—to the knowledge of UNODC—by Caulkins [1] and discussed further by him [2, 3]. Similarly to the findings of this article, Caulkins sees these models as ends of a spectrum with the likely situation being some blend of the two extremes.

population. Risk is also a class phenomenon: people who have good career prospects due to their social origin and their educational background tend to be—for obvious reasons—more risk-averse than those whose economic prospects are, in any case, minimal to non-existent. For similar reasons, risk perceptions differ among people from different countries, often reflecting the levels of development.

In any case, much research is still needed on what governs the risk function and on the impact of various interventions on risk perceptions. Preliminary research in the late 1990s by the Institute for Defense Analyses of the United States of America suggested—on the basis of interviews with apprehended drug traffickers—that the impact of seizures on drug trafficking was relatively small, unless really huge amounts were taken out of the market. Otherwise, seizures were seen as merely the "cost of doing business". If the goal of deterrence was to reduce the operations of potential drug traffickers by 80 per cent or more, about 80 per cent of drugs in circulation had to be seized, or 20 per cent of the drug traffickers had to be arrested and imprisoned (i.e. more than 1 in 5), or drug traffickers had to believe that there was a chance of more than 1 in 25 (4 per cent) to risk their lives in drug trafficking operations. (This referred, inter alia, to pilots transporting coca base from Peru to Colombia, fearing to be shot down by the authorities.) An average trafficker was found to consider giving up trafficking only after having lost about four loads in a row.

The level of "perceived risk" tends to be more important than "actual risk". Thus, mass media, for instance, seem to play an important role in shaping the risk function. The deterrence thresholds, which prompt the "average" trafficker to respond to perceived risks (e.g. by temporarily ceasing operations or looking for alternative routes) start, according to this model, if more than 30 per cent of the drugs are being seized, if a chance of 2-4 per cent exists to be personally arrested and imprisoned or if there is a risk of near to or less than 1 per cent to die in trafficking operations [4].

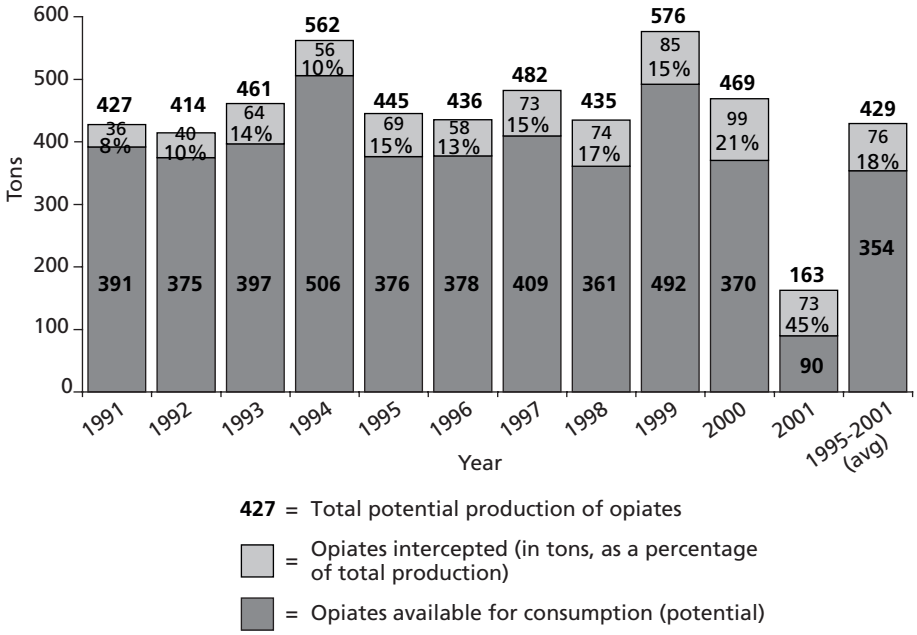
As long as risk and profit expectations are in equilibrium, drug trafficking will remain stable. The profit/risk equilibrium, however, can be broken. An increase in law enforcement activities, for instance, will raise risk. Increased levels of risk will, *ceteris paribus*, reduce drug trafficking, notably once the thresholds levels—outlined above—have been crossed.

As regards empirical information to determine whether such threshold levels are reached, in the case of cocaine, production estimates of the United Nations Office on Drugs and Crime [5] (or the United States Government) [6] and global seizure data (United Nations Office on Drugs and Crime) [7] suggest that 40 per cent of the potentially available cocaine was seized over the period 1995-2001. Over the last two decades the interception rates for cocaine increased from 37 per cent of the cocaine produced over the period 1986-1995 to 45 per cent over the period 2001-2002. This looks quite impressive, but unfortunately does not mean that the necessary threshold levels for cocaine traffickers to give up their activities have been reached. Such calculated interception rates have an inherent upward bias as they are not adjusted for changes

in purity along the trafficking chain. As drugs move closer to the end consumer they tend to be diluted. The actual psychoactive content of cocaine usually declines from levels around 90 per cent in the producer country to some 60 per cent in the main consumer countries. Thus, the actual interception rates were at around 30 per cent over the period 2001-2002 [8]. Calculations of a global interception rate are based on aggregate seizures covering all levels (producer countries, transit countries and seizures in the consumer countries). Each level of trafficking is characterized by the existence of additional layers (e.g. importer, large-scale wholesaler, medium-market distributors and street-sellers). All of this means that at any individual layer along the trafficking chain the actual interception rate is significantly below a threshold level of 30 per cent.

If the interception rates at the global level for opiates are calculated, it can be seen that on average 18 per cent of the opiates produced were seized over the period 1995-2001 [9], up from 11 per cent over the period 1990-1995 (see figure II). In 2002 the interception rate amounted to 19 per cent. Based on the considerations discussed above, such seizure levels may be significant, but they still fall short of being a deterrent to trafficking. In the case of other drugs, interception rates are even lower.

Figure II. Global illicit supply of opiates, 1991-2001
(in tons of heroin equivalent)

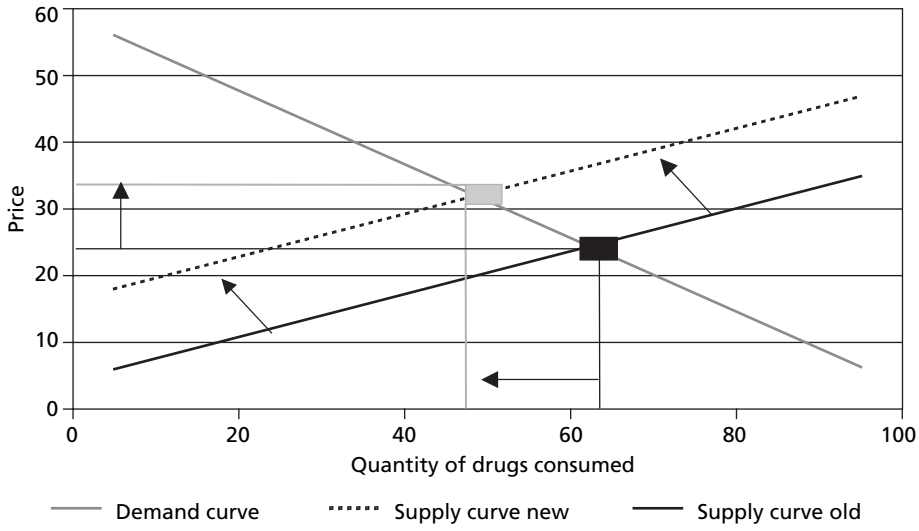


Source: Global Illicit Drug Trends 2003 (United Nations publication, Sales No. E.03.XI.5).

Thus, a key problem is that most enforcement interventions targeting drug trafficking take place below threshold levels that would prompt a change in traffickers' behaviour. Yet this does not mean that supply-side interventions are systematically failing: in fact they work indirectly. Increased levels of risk translate into higher drug prices, compensating for the higher risk. The higher drug prices have a positive impact on consumption in the sense that drug consumption, in general, is "price-sensitive" though not necessarily "price-elastic".* Higher drug prices, *ceteris paribus*, tend to lower drug consumption [14]. (Similarly, lower drug prices tend to raise consumption.) Thus, the overall amount of drugs consumed (and therefore "required" to be trafficked) can be expected to fall once prices increase (see figure III).

This is the case as long as the new risk-profit equilibrium remains intact under the changed conditions. However, the higher profit margins are a constant incentive for new participants, who have a lower degree of "risk-awareness", to enter the market. ("Illegal aliens" and marginalized youth, including children of second-generation immigrants, are particularly vulnerable in this regard.)

Figure III. Supply reduction intervention



*This is an important distinction: drug prices are considered "elastic" if a 1 per cent increase in prices would result in a more than 1 per cent decline in consumption; otherwise they are considered "inelastic". According to estimates provided by the Institute for Defense Analyses, cocaine use price-elasticity amounted to –0.63 (Drug Abuse Warning Network), –0.29 (Drug Use Forecasting), –0.6 (Smith Kline Beecham Chemical Laboratories), –0.38 (Treatment Episode Data Set), so that the authors proceeded with an assumed price-elasticity of –0.5 [10]. Caulkins, based on a review of the literature, arrives at substantially larger elasticities for cocaine use, ranging from –0.72 to –2.0 [11]. There is also some evidence suggesting that similar price-elasticities apply to heroin as well. One study carried out in three Swiss towns in the late 1990s revealed a heroin price-elasticity of -0.7 [12]. A previous study carried out by the National Bureau of Economic Research found for the United States price-elasticities of –0.9 for heroin and –0.55 for cocaine [13].

The elimination of a (potentially violent) drug trafficking network may well inspire other groups to fill the vacuum. This is a potential dilemma for law enforcement. Successful interventions increase risk and result in higher drug prices and thus larger profit margins. The net result is less trafficking in the short term. This does not however exclude the possibility that the supply curve will—eventually—fall back to its original position prior to the intervention, as other criminal groups become interested in the strong incentives for involvement in the drug market. The supply curve may even fall below its original position if a well structured trafficking network, which held a local monopoly, is removed from the market. In some cases, perceived risk is larger from rival drug trafficking gangs than from the police and the elimination of a violent group may well lower overall risk to operate in such a market, thus attracting many more groups to enter the market. This will increase competition as well as the overall supply of the market. (This seems to have been the case once the powerful Medellín cartel and then the Cali cartel were dismantled and many more smaller groups filled the gap [15].)

One could assume from this that law enforcement interventions are futile as they do not guarantee a long-term shift in the supply curve, but this is definitely not the case. Even temporary reductions in overall drug consumption are positive. If they do not occur, there is a potential danger of the development of a self-reinforcing drug epidemic. Once demand for certain drugs becomes "trendy", fuelled by sufficient supply, more and more people will promote the consumption of such drugs to finance their addiction. Drug consumption can thus grow exponentially, promoted by thousands of small-scale traffickers who actively contribute to the growth of the market, leading to a full-scale drug epidemic.

The analysis also reveals that one-time law enforcement actions will not be enough to ensure change. Constant efforts are required to keep the supply curve at the new equilibrium point of higher prices and thus less consumption. The model also suggests that any gradual increase in enforcement interventions, moving in parallel with growing profit margins, will not necessarily lead to an end of drug trafficking. The deterrent effects—as long as they are below the threshold levels—are then offset by the larger incentives reflected in the profit margins. The only limitation comes from the demand curve. Higher prices, prompted by the larger profits, will limit consumption.

Drug-specific characteristics

Regional characteristics

Geographical location is an important determinant of drug price. Prices usually rise along the trafficking chain from producer country to consumer country. Moreover, drug trafficking locations are often characterized by important spillovers. They tend to lower the retail drug prices in the respective markets, thus enabling a local consumer market to emerge.

The main indicator for such trafficking activities are seizures, which take place primarily in the transit countries in and around the main countries of production, as well as in traditional consumer countries of North America and Western Europe [16]. Differences in the global trafficking pattern can be explained, first of all, by differences in location and consumption. The main trafficking route of cocaine leads from the Andean countries to the United States; the main heroin trafficking routes from Afghanistan to Western Europe. Both heroin and cocaine trafficking are thus to a large extent interregional.

There are also important differences in the distribution patterns. While most cocaine is produced in Colombia and criminal groups from Colombia also play a key role in the world's largest cocaine consumer market (notably the east coast of the United States; the west coast and the states close to the southern border appear to be dominated by Mexican groups), the heroin trade is far more fragmented. Opium is typically produced by Pashtun villages in Afghanistan (and to a lesser extent by Tajik villages in the north). Opium is then sold at the local bazaars and shipped by traders to the borders or transported to local laboratories where it is processed into heroin. Heroin produced in northern Afghanistan usually leaves the country via Tajikistan. Once across the border, Tajik groups take over the business and sell the drugs across the region of the Commonwealth of Independent States, notably to the Russian Federation. Opium/heroin produced in eastern Afghanistan is trafficked across the border by Pashtun traders. In the case of opium produced in southern Afghanistan, specialized Baluchi traders take over once the opium has been shipped to the borders and ship the opium, morphine or heroin to the Islamic Republic of Iran, either directly or via Pakistan. Once in the western part of the Islamic Republic of Iran, Kurdish groups take over and ship the morphine/heroin across the border to Turkey. From eastern Turkey, opiates are usually shipped to Istanbul. Turkish/Kurdish groups and, increasingly, Albanian groups then transport the heroin to Western Europe, sometimes subcontracting local East Europeans [17]. Several depots exist in Eastern Europe. Many of the bulk deliveries head towards the Netherlands, from where they are then further distributed across Western Europe. In addition, there are some direct deliveries of heroin from Pakistan to the United Kingdom of Great Britain and Northern Irealnd [18], which may also explain the overall higher levels of purity found in the United Kingdom of Great Britain and Northern Ireland compared with those in the rest of Western Europe. The actual sales at the street level have in recent years been taken over increasingly by West Africans and, in some locations, by North Africans [19].

A different distribution system is typical for amphetamine-type stimulants (ATS). In this case, most trafficking is intraregional. Interregional trafficking is limited to the supply of the precursor chemicals [20]. (One exception here is methylenedioxymethamphetamine (MDMA, commonly known as Ecstasy), which in recent years has gained popularity outside Europe, though most production still takes place within Europe.) ATS do not need to be imported into Europe or the United States, but they are to a significant degree locally produced. ATS laboratories exist primarily in the Netherlands and neighbouring Belgium (often operated by groups from the Netherlands), as well as, to a lesser extent, in practically

all other West European countries and increasingly in East European countries as well. Production of ATS in Europe is focused on amphetamine and MDMA. ATS manufacture in North America, by contrast, is dominated by methamphetamine, which is also the main ATS produced in East and South-East Asia [19].

With regard to trafficking in cannabis herb, there is a focus on Mexico, the United States and Africa, though practically all countries are affected by trafficking in and abuse of cannabis [21]. Trafficking in cannabis resin concerns mainly Europe (notably Spain), as well as Morocco and Pakistan [22].

Involvement of organized crime

The more organized crime is involved in drug trafficking, the higher are the overall dangers for society. The risks usually emerge from drug-related violence and the financial power of such criminal groups to corrupt the economic and the political system, leading to a crowding out of legitimate investment, inefficient capital allocation and eventually to lower economic growth and poorer living conditions. Ironically, a strong involvement of organized crime will, in general, lead to rather high drug prices (owing to reduced competition) and will thus actually contribute to lower levels of drug consumption than under competitive market conditions.

Based on qualitative information (such as intelligence reports but also press reports), the strongest involvement appears to be in the cocaine trade, followed by trade in opiates. This is also confirmed indirectly once drug seizure cases are analysed. The larger the seizure, the more efforts are likely to have gone into planning and financing such a drug trafficking operation.* Based on this indicator, the largest involvement of organized crime can be found for cocaine, followed by opiates and ATS, notably methamphetamine.

In the case of cocaine, the joint United Nations Office on Drugs and Crime/International Criminal Police Organization (Interpol)/Customs Cooperation Council (also known as the World Customs Organization) database on significant seizures shows a total of 36 cases equivalent to 1 ton or more (going up to 21 tons) for 2001. By contrast, there were only 8 seizures of opiates exceeding 1 ton reported in 2001 (5 seizures of opium, 2 seizures of heroin and 1 seizure of morphine) and 20 such cases (15 involving opium, 3 morphine and 2 heroin) in 2000. (All of the large opium seizures took place in the Islamic Republic of Iran and the morphine seizures in the Islamic Republic of Iran and Pakistan.) In the case of ATS, there were only four cases of methamphetamine seizures exceeding 1 ton in 2001 (all of them in China). No individual seizure case exceeding 1 ton was reported for either cannabis herb or cannabis resin for 2001 [23].

According to replies to the annual reports questionnaire of the United Nations Office on Drugs and Crime, the average size of a cocaine seizure amounted to 3.9 kilograms (kg) at the global level in 2001 and was thus significantly larger than the average heroin seizure case (0.17 kg) or the average size of a seizure of ATS (0.07 kg) in 2001 (including MDMA) [19].

*Of course, one should not exclude the possibility that highly sophisticated trafficking networks could also resort to a large number of small deliveries in order to improve their overall risk management.

Another possibility (see the table below) is to calculate the ratio of overall reported total seizure cases (T) to significant seizure cases (S). This is based on the assumption that the involvement of organized crime in "significant" seizure cases, reported by Member States to the United Nations Office on Drugs and Crime, Interpol or the World Customs Organization, is, in general, more important than for all seizure cases. The lower the ratio T:S, that is the higher the proportion of significant seizures (S) in total seizure cases (T), the higher the likelihood that organized crime is involved in such business activity. Using that indicator, the highest involvement of organized crime at the global level appears to be in trafficking cocaine, followed by heroin, cannabis resin, cannabis herb, amphetamines and MDMA.

Reported seizure cases, 2000 and 2001

	Cocaine		*Heroin*		*Cannabis resin*		*Cannabis herb*		*Amphetamines*		*MDMA*
	2000	*2001*	*2000*	*2001*	*2000*	*2001*	*2000*	*2001*	*2000*	*2001*	*2000*
T[a]	58 229	77 633	182 405	170 482	293 915	194 826	275 790	230 865	226 299	79 768	71 765S
S[b]	5 433	6 533	3 131	2 310	3 036	2 876	1 595	1 975	624	557	207
Ratio T:S	11		65		83		142		259		347

[a]Average total seizure cases (T) of 2000 and 2001.

[b]Average significant seizure cases (S) of 2000 and 2001.

Sources: United Nations Office on Drugs and Crime, annual reports questionnaire data and United Nations Office on Drugs and Crime/Interpol/Customs Cooperation Council significant seizures database.

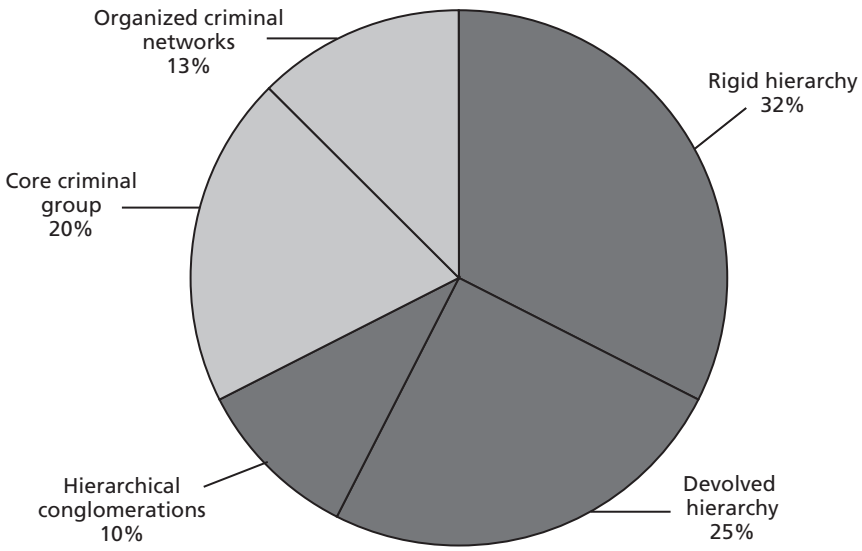
Not only the involvement of organized crime as such, but also the actual structure of the groups involved plays an important role in the price-setting behaviour of the players in a drug market. In a study conducted by the United Nations Office on Drugs and Crime in 2002, 40 transnational organized criminal groups, located on all continents,* were analysed with regard to their activities, structure, size, transborder operations and (ethnic and social) identity, violence, corruption,

*The study was based on information collected from Australia, Canada, China, Colombia, the Czech Republic, Germany, Italy, Japan, the Netherlands, the Russian Federation, South Africa, the United Kingdom, the United States, the Caribbean region, as well as on information on Albania, Belarus, Bulgaria, Lithuania and Ukraine obtained from a similar study by the United Nations Interregional Crime and Justice Research Institute (UNICRI). The 40 transnational organized criminal groups investigated in detail were located in Australia, Bulgaria, Canada, China, Colombia, Germany, Italy, Japan, Lithuania, Mexico, the Netherlands, the Russian Federation, South Africa, Ukraine, the United States and the Caribbean region. The following institutions and agencies were involved in the research process: the Australian Institute of Criminology, the Canadian Anti-Organized Crime Division, Ernst and Young in the Netherlands Antilles, the Universidad Nacional de Bogotá, the Institute of Criminology and Social Prevention in Prague, the German Bundeskriminalamt in Wiesbaden, the Direzione Centrale della Polizia Criminal in Rome, the National Police Academy in Tokyo, the Research and Documentation Centre of the Ministry of Justice in the Hague, the Academy for International Cooperation of the Ministry of the Interior in Moscow, the Institute of Security Studies in Cape Town, South Africa, the National Criminal Intelligence Service in London and the National Institute of Justice in Washington, D.C. UNICRI partners in the study were the University of Tirana, the European Humanities University of Belarus, the Varna Free University of Bulgaria, the Law Institute of the Ministry of Justice of Lithuania and the National Academy of Sciences of Ukraine.

political influence, penetration into the legitimate economy and cooperation with other organized criminal groups [24]. The study found, inter alia, that drug trafficking was still the key business activity for more than half of the organized criminal groups investigated. The drug trafficking activities of such groups were centred around cocaine, heroin, cannabis, methamphetamine and amphetamine. For a significant number of organized groups in which drug trafficking was not the key activity, it played, nonetheless, a role for overall income generation. Forty-three per cent of the organized criminal groups were reported to have been involved in just one key activity (which in almost 60 per cent of these cases was drug trafficking), though this did not exclude that a number of related criminal sub-activities were also carried out (e.g. money-laundering). A quarter of criminal groups operated in two or three crime sectors. Among organized criminal groups for which multiple key activities (more than three) were reported (a third of the groups), about 60 per cent were active in drug trafficking [25].

Though there seems to be a general trend towards smaller, looser and less hierarchically organized groups (one third were loosely organized in forms of core groups or networks), two thirds of the criminal groups studied still had a classical hierarchical-type structure (see figure IV and box). Such classical hierarchical structures—in combination with the actual size of such criminal groups—allow such groups to be active price-setters, while the more loosely organized forms of core groups and networks are usually "price-takers" (i.e. they simply react to the incentives provided via the drug prices in the market).

Figure IV. Structure of transnational organized criminal groups in 16 countries (N = 40)



Source: Centre for International Crime Prevention, "Assessing transnational organized crime: results of a pilot study of 40 selected organized criminal groups in 16 countries", *Trends in Organized Crime,* vol. 6, No. 2 (winter 2000).

Typology 1. hierarchy

Characterized by: *a single leader; a clearly defined hierarchy; a code of conduct (code of honour); strong systems of internal discipline; group known by a specific name; often strong social or ethnic identity; violence essential to activities; and often clear control over defined territory*.

The standard hierarchy was found to be the most common form of organized criminal group in the sample of 40 organized criminal groups. The standard size is some 10-50 members. Criminal groups in Asia, Eastern Europe and some groups in the Americas in particular fit this typology.

Typology 2. Regional hierarchy ("devolved hierarchy")

Characterized by: *a single leader; a line of command from the centre but a degree of autonomy at the regional level; a code of conduct (code of honour); strong systems of internal discipline; multiple activities; group known by a specific name; often strong social or ethnic identity; and violence essential to activities.*

Nowadays Asian (Japanese) and Italian organized criminal groups fit this organizational structure. The Italian organized criminal groups, for instance, have a hierarchical structure, headed by a single boss or an oligarchy. Most of these groups are based on a three-tiered organizational structure with a high level controlling a province (or a region), a middle level with representatives or families controlling a territory and a lower level of members executing the orders. In the case of several of the Asian groups operating in Australia, Japan or the United States, the overall business activities are overseen by a leader, but day-to-day business is left to "managers" who have significant levels of autonomy and are generally in full control of operations in specific geographical areas.

Typology 3. Clustered hierarchy ("hierarchical conglomerates")

Characterized by: *association of organized criminal groups with a governing or oversight body; high degree of autonomy for constituent groups but the cluster has a stronger identity than the constituent groups; often the result of a variety of individual criminal groups coming together to divide markets or regulate conflict between them; and over time, the cluster assumes some identity of its own*.

Relatively rare; some Italian, Russian and South African groups fit this profile.

Typology 4. Core group

Characterized by: *a core group surrounded by a loose network; a limited number of individuals form the core group (less than 20 persons); flat, horizontal organizational structure; seldom a particular social or ethnic identity (may include several nationalities); only in a limited number of cases known by a specific name; opportunistic, shifting to whatever activities promise most profits*.

Around the core group, there may be a large number of associate members or a network which are used from time to time depending on the criminal activity in question. Use of violence is less prominent than in the standard hierarchical groups. Such groups were mainly identified in Western Europe, Australia, Colombia and Mexico though as law enforcement pressure increases on hierarchical groups across the globe, this type of organization may well become one of the most common organizational forms.

Typology 5. Criminal networks

Characterized by: *activities of key individuals; prominence in the network is determined by contacts and/or skills; personal loyalties and ties are more important than social and/or ethnic identities; network connections survive coalescing around a series of criminal projects; low profile, seldom known by any name; and the network reforms after the exit of key individuals*.

Criminal networks are defined by the activities of key individuals who engage in illicit activity in often shifting alliances. Such individuals often do not regard themselves as being members of a group. Networks are formed around a key series of individuals (nodal points) through which most of the network connections run. It is likely that networks are more common than represented in the sample (as they are more difficult for the authorities to identify). They are considered to be a growing phenomenon. Even when key individuals are arrested, the network tends to reform itself quickly around new individuals and activities. Caribbean and West African criminal groups involved in cocaine and heroin trafficking, often fit the profile of such criminal networks, which from the outside may appear unstructured and not highly sophisticated, though in fact their operations are highly effective and enduring as such networks can quickly reform themselves around new players.

Source: Centre for International Crime Prevention, "Assessing transnational organized crime: results of a pilot study of 40 selected organized criminal groups in 16 countries", *Trends in Organized Crime*, vol. 6, No. 2 (winter 2000).

In terms of size, transnational organized criminal groups turned out to be smaller than expected, however. Most of the transnational organized criminal groups were found to have fewer than 100 members (63 per cent); 35 per cent were found to have a membership of 20-50 persons. This suggests that the price-setting capabilities of most organized criminal groups are in fact limited, as groups of this size have, in general, problems to achieve and defend a monopoly position in a drug market. There are, however, a few groups with several hundred members and a few groups with up to 1,000 regular and a total of 10,000 associate members [26]. Members are usually drawn from the same ethnic or social background (close to 60 per cent of the transnational organized criminal groups) [27].

Three quarters of the groups investigated were found to be also engaged in the legitimate economy. In almost half of the cases there was even extensive cross-over between legitimate and illegitimate activities, indicating clearly the high degree of penetration of the legitimate economy by such criminal groups. In the majority of cases, criminal activities took place in multiple countries [28].

Violence formed an essential part of the business activities in close to 60 per cent of the organized criminal groups investigated and in a further 25 per cent violence was used from time to time. For three quarters of the groups corruption was a key element in undertaking organized criminal activities, with either occasional or regular use. One third of the groups were said to have political influence at the local or the regional level [29].

Once the variables are correlated, a number of additional findings are revealed:

- The stronger the hierarchy, the more likely is the use of violence.
- Where trafficking in illicit drugs is regarded as either the primary activity of a group or an important core activity, the level of violence practised is generally much higher.
- There is also a positive correlation between involvement in the illicit drug trade and a strong ethnic basis in criminal groups.
- The stricter the hierarchy, the more likely a group is to have a strong ethnic or social basis.

In other words, the most violent groups are generally those which have a hierarchical structure, are characterized by strong social or ethnic identity and are involved in drug trafficking. In contrast, more loosely organized groups were found to be smaller in size, have no particular social or ethnical identity and use less violence. Thus, they are seldom seen as posing the same threat as hierarchical groups.

Against this background, dismantling the hierarchically organized Medellín and Cali cocaine cartels by the Colombian authorities in the early 1990s must be seen in a positive light—though it did not stop drug trafficking and de facto made possible an increase in the total number of organizations participating in this business. The new groups consist of tightly controlled core groups, assisted

by a web of individuals engaged in auxiliary services. While drug trafficking operations were dominated in the past by 10-15 major organizations and their subsidiary groups, the illicit drug trade over the last few years is thought to have been dominated by 150-200 smaller organizations and many other groups made up of as few as 10 people [30].

One side-effect was increased competition and thus an ongoing pressure of cocaine prices to decline—even though enforcement efforts in the Americas, and notably in the United States, increased considerably.

Price-setting behaviour along the trafficking chain

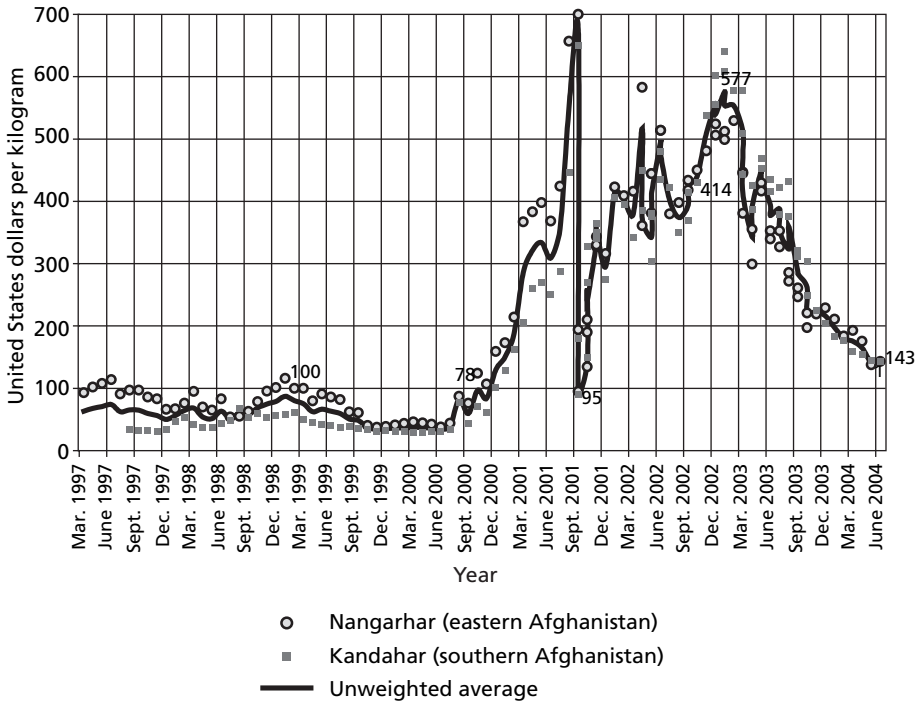
On the question of the price-setting behaviour of drug trafficking groups along the trafficking chain,* here the opium/heroin market will be investigated in more detail. That market is particularly interesting as major price changes have taken place in the main source country—Afghanistan—over the last few years. It is thus interesting to see how those price changes have affected the markets in neighbouring countries and in Western Europe.

Price changes in Afghanistan

From an initial analysis of changes in opium prices observed in Afghanistan, it can be seen that opium prices react strongly to actual changes in supply and to changes in expectations of future supply, which are often related to political factors that are seen to have a potentially important impact on future supply. Following reports of excessive rain at harvest time in 1998, opium prices started rising in Afghanistan, thus providing an additional incentive for farmers to grow opium. "Salaam arrangements" also played a role. (In such arrangements farmers sell some of their future opium harvest in advance to obtain cash immediately; the repayment of the cash loan is then in terms of opium.) Farmers who were not in a position to repay their loans with opium in 1998 often had to offer their creditors twice the amount of opium for repayment in 1999. As a result, Afghanistan had a bumper crop in 1999. Prices reacted immediately: they fell in eastern Afghanistan by almost two thirds by mid-2000 (from around $100 in early 1999 to $30 by mid-2000). Following the announcement by the Taliban of the ban on cultivation of opium poppy in mid-2000, the opium markets again reacted immediately. Prices rose 10-fold from mid-2000 ($30 per kg) to harvest time in 2001 ($300 per kg) and skyrocketed to levels close to $700 prior to 11 September 2001 as no end of the opium poppy ban was in sight (see figure V). This changed after 11 September 2001. Immediately following the attacks on the World Trade Center, traders in the Taliban-controlled areas tried to get rid of their stocks, fearing air attacks. Prices plummeted to levels around $90 as

*This section draws on experience that the United Nations Office on Drugs and Crime has acquired over the years in analysing the operations of the "opium economy" of the world's largest producer of opium, Afghanistan, and its impact on neighbouring countries and on the main final destinations, Europe and, to a far lesser extent, North America.

Figure V. Afghanistan: prices for opium, March 1997-June 2004



Source: United Nations Office on Drugs and Crime, Illicit Crop Monitoring Programme-AFG/F98, Monitoring of opium production in Afghanistan.

stocks were moved out of the country to neighbouring Pakistan [31]. Soon afterwards, prices started recovering, rising to around $350 per kg at harvest time in 2002 [32]. Despite a good harvest in 2002, prices continued upwards to levels around $580 per kg in January 2003. Speculative purchases by traders, following some eradication activities and notably following the announcement of the Karzai Government (in September 2002) that it would implement a new opium poppy ban in 2003, have been largely responsible for this price hike [33]. As the expectations of the market players of a harsh implementation of the opium poppy ban did not materialize, the good opium harvest of 2003 and the even better opium harvest of 2004 led again to a massive fall in opium prices to around $140 per kg in May 2004.

Price changes in neighbouring countries

As regards the question of how the price changes in Afghanistan affect prices in neighbouring countries, two opposing models have been proposed in the literature, the "additive" and the "multiplicative" price model. According to the additive price model, any increase in the price of a kg of opium in a producer country will be reflected by an increase of the same amount (in absolute terms)

in a neighbouring country and ultimately in the countries of final destination. According to the multiplicative price model, the growth rate will be about the same along the trafficking chain.* In the first model it is assumed that traffickers are de facto paid a fixed price for their services, while in the second model it is assumed that profit margins, reflecting risk, remain unchanged.

These theoretical concepts have important policy implications. If one assumes that the drug markets operate along the lines of the additive price model, interventions by third parties in producer countries would have to be considered a waste of money. The impact of a $100 increase per kg of opium in Afghanistan, equivalent to a $0.1 increase per gram of opium or $1 per gram of heroin (assuming that 10 kg of opium are needed for 1 kg of heroin), would not really change the behaviour of drug users in consumer countries where a gram of heroin (at street purity) costs around $70 (Western Europe). By contrast, if the original opium price was around $50, an increase of $100 would be equivalent to a threefold increase in the producer price. If this were to translate into a threefold increase in consumer price, interventions at or close to source, driving up the consumer price, would be extremely efficient from an economic point of view in reducing drug consumption.

The massive changes in prices in Afghanistan provide an almost ideal opportunity to test the two opposing models for their practical relevance. For this purpose, the price developments in the Islamic Republic of Iran, Pakistan and Tajikistan, as well as in Western Europe, will be analysed. In order not to complicate the analysis too much, the following analysis will focus primarily on the impact of the opium price hike in Afghanistan in 2001 as a consequence of the opium poppy ban.

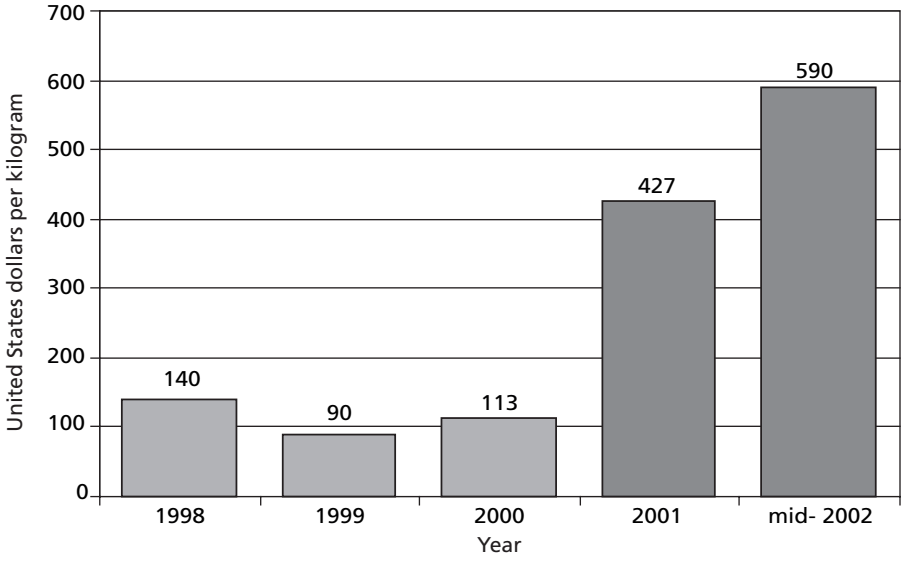
Price changes in Pakistan

Available information suggests that the largest outlet of opiates produced in Afghanistan is Pakistan [34]. Opium prices, based on average annual data, rose fivefold in Afghanistan in 2001 (from $60 per kg on average in 2000 to $300 per kg on average in 2001). The rise in Afghan opium prices prompted opium prices to rise fourfold in Pakistan, from slightly more than $100 per kg in 2000 ($113) to more than $400 per kg in 2001 ($427) (see figure VI). Based on the additive price model, a price rise of $240 per kg in Afghanistan should have resulted in prices of $353 in Pakistan, while a purely multiplicative model should have resulted in prices of $565. The actual opium price in Pakistan turned out to be in between—about 50 per cent higher than the expected results according to the additive price model and about 25 per cent less than the expected results according to the multiplicative model.

*Thus, if opium prices in Afghanistan rose from $30 to $300 or by $270 per kg between mid-2000 and mid-2001, the same increase should also be found in neighbouring countries. An opposing model is the multiplicative price model: if opium prices in Afghanistan increased 10-fold, a 10-fold increase in prices in neighbouring countries would be expected.

The results are more complex when it comes to heroin as additional factors are at work here. Statistics show a fall in heroin prices in Pakistan by about a third between 1998 and 2000 (see figure VII). This reflected—to some extent—Afghanistan's bumper harvests of 1999 and 2000. Opium prices fell over the same period in Pakistan; but their decline was far less pronounced (about 20 per cent) than the decline in heroin prices. In this case, both the additive and the multiplicative price-setting models fail to explain the price movement, as another factor played a more important role. The difference between the changes in the opium and the heroin prices is most probably due to the rising heroin manufacture capacity in Afghanistan during the late 1990s, which led to strongly falling heroin prices in Pakistan.

Figure VI. Pakistan: wholesale prices for opium, 1998-2002

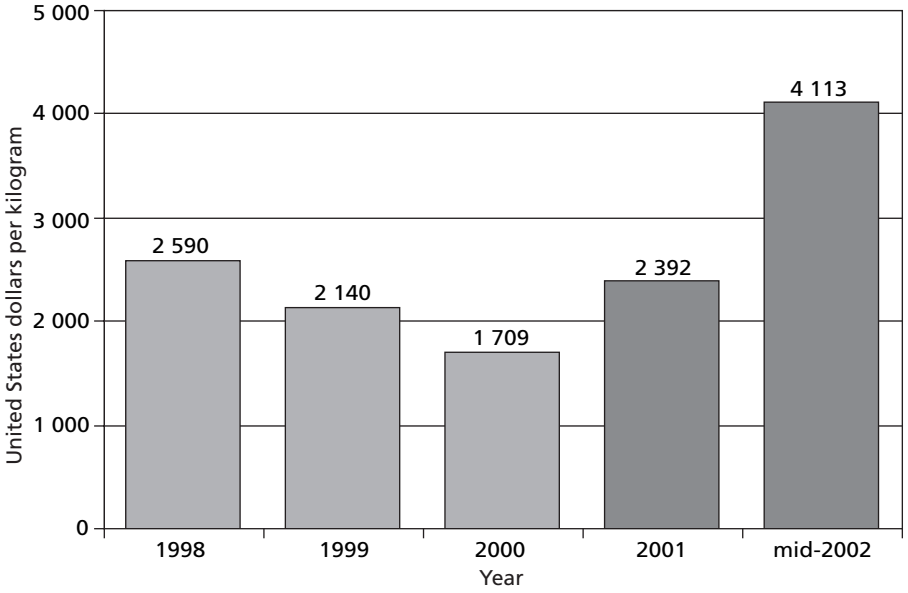


Source: United Nations Office on Drugs and Crime, annual reports questionnaire data and Field Office.

Both the additive and the multiplicative price-setting models fail to explain subsequent price changes in Pakistan. When opium prices quadrupled in Pakistan in 2001, the overall increase of heroin wholesale prices was just 40 per cent (average 2001 data compared with average 2000 data). If prices of opium in Afghanistan had risen by $240 per kg over the period 2000-2001, they would have had to rise—according to the additive price model—by $2,400 per kg of heroin, assuming a 10:1 conversion ratio. If the transformation ratio of opium to heroin were changed to 7:1 (reflecting higher levels of laboratory efficiency and of the rather high morphine content of Afghan opium), the expected price rises would still have amounted to $1,700 per kg of heroin according to the additive model. The actual heroin price increase in Pakistan, however, amounted

to less than $700 per kg. Likely alternative explanations for the actual changes in heroin prices can be seen in the existence of huge stocks of heroin—acting as a buffer—as well as changes in purity levels. (There were some reports that heroin purity deteriorated in the region in 2001.) In short, both the additive and the multiplicative price model failed to explain the price movements of heroin in Pakistan as additional factors apparently played a more important role.

Figure VII. Pakistan: wholesale prices for heroin, 1998-2002

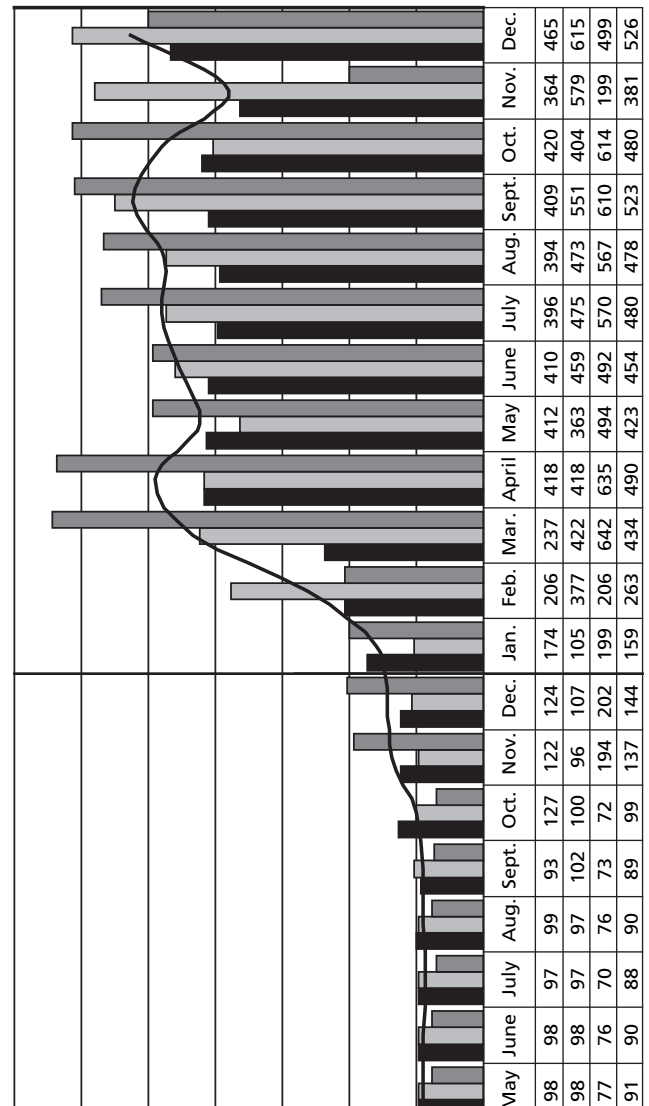


Source: United Nations Office on Drugs and Crime, annual reports questionnaire data and Field Office.

The basic results do not change significantly if the time frame is extended for an additional year. Between 2000 and 2002, the overall increase in heroin wholesale prices was two and a half times in Pakistan; over the same period, opium prices rose more than fivefold in Pakistan and increased more than six-fold in Afghanistan.

More detailed monthly data, available for 2000 and 2001, also confirm that picture. From the announcement of the poppy ban in Afghanistan in mid-2000 to harvest time in the spring of 2001, opium prices in Afghanistan actually rose 10-fold. The 10-fold increase in opium prices in Afghanistan led a four- to five-fold increase of opium prices in Pakistan in 2001 (see figure VIII). Average opium prices increased by about $400 per kg in Pakistan between January and December 2001. The outcome of the price rise was thus again in between the expected results of the additive and the multiplicative price model. Developments in opium prices in Pakistan showed that price rises turned out to be some 50 per cent more than expected by the additive price model, while the multiplier was about half as high as the multiplicative model would have predicted.

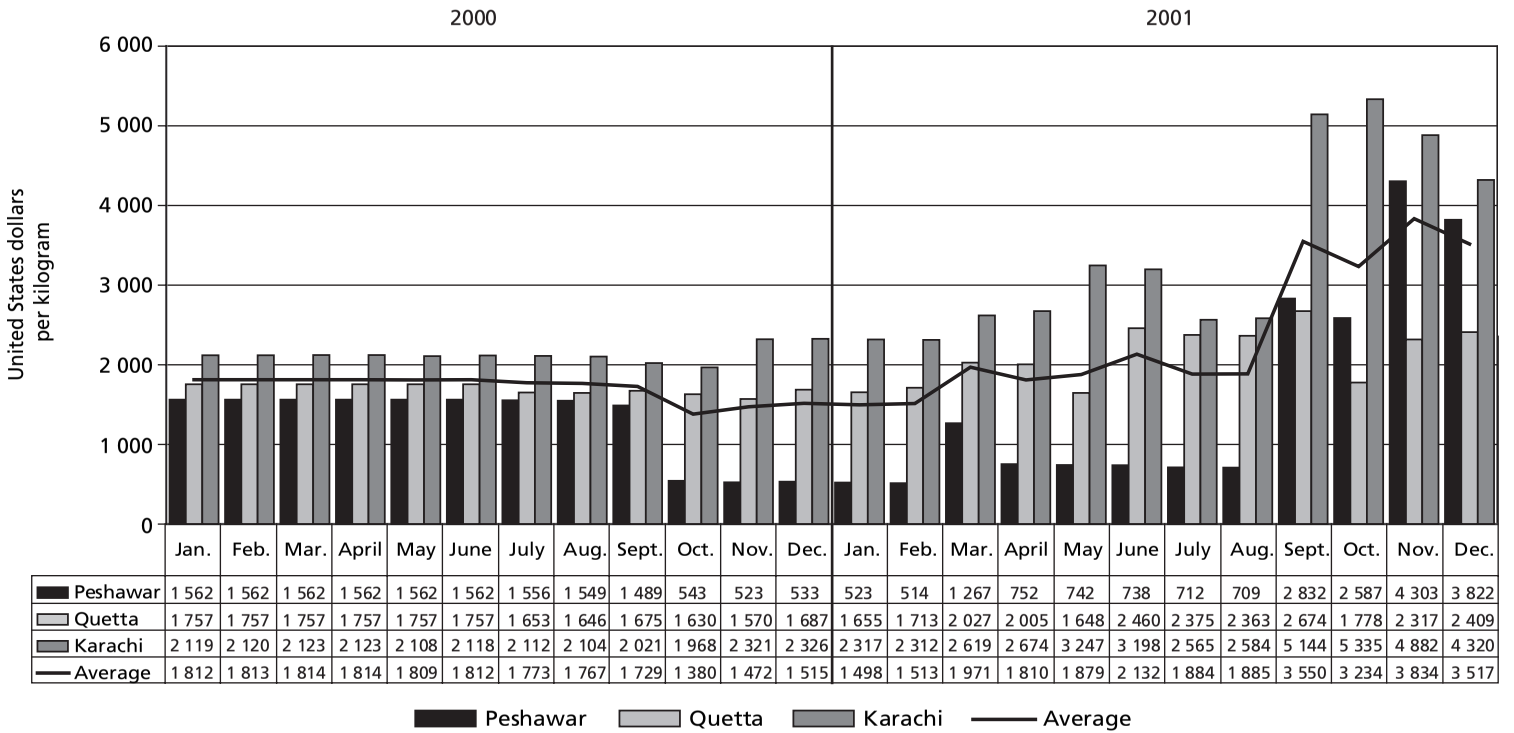
Figure VIII. Pakistan: prices for opium, 2000-2001



	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Peshawar	98	98	98	98	98	98	97	99	93	127	122	124	174	206	237	418	412	410	396	394	409	420	364	465
Quetta	98	98	98	98	98	98	97	97	102	100	96	107	105	377	422	418	363	459	475	473	551	404	579	615
Karachi	77	77	76	77	77	76	70	76	73	72	194	202	199	206	642	635	494	492	570	567	610	614	199	499
Average	91	91	90	91	91	90	88	90	89	99	137	144	159	263	434	490	423	454	480	478	523	480	381	526

Source: Global Illicit Drug Trends 2002 (United Nations publication, Sales No. E.02.XI.9).

Figure IX. Pakistan: wholesale prices for heroin, 2000-2001



	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Peshawar	1 562	1 562	1 562	1 562	1 562	1 562	1 556	1 549	1 489	543	523	533	523	514	1 267	752	742	738	712	709	2 832	2 587	4 303	3 822
Quetta	1 757	1 757	1 757	1 757	1 757	1 757	1 653	1 646	1 675	1 630	1 570	1 687	1 655	1 713	2 027	2 005	1 648	2 460	2 375	2 363	2 674	1 778	2 317	2 409
Karachi	2 119	2 120	2 123	2 123	2 108	2 118	2 112	2 104	2 021	1 968	2 321	2 326	2 317	2 312	2 619	2 674	3 247	3 198	2 565	2 584	5 144	5 335	4 882	4 320
Average	1 812	1 813	1 814	1 814	1 809	1 812	1 773	1 767	1 729	1 380	1 472	1 515	1 498	1 513	1 971	1 810	1 879	2 132	1 884	1 885	3 550	3 234	3 834	3 517

Source: Global Illicit Drug Trends 2002 (United Nations publication, Sales No. E.02.XI.9).

If the analysis is extended to heroin, monthly data show price increases that clearly exceeded those seen in average annual data. Heroin prices—though not quintupling like the opium prices—actually doubled between the beginning and the end of the year 2001. The increase was, nonetheless, less than predicted by the additive or the multiplicative model (see figure IX). An increase in heroin prices in Pakistan was only observed in September, that is, six months after the price increases in opium started to be noticed. The explanation for this can be found in the existence of important heroin stocks, which acted as a buffer and thus prevented any increase in heroin prices for several months—and even when heroin prices did start rising, the stocks prevented them from skyrocketing. However, the quality of heroin was reported to have deteriorated. Thus, part of the actual price increases may have actually been caused by increased dilutions of the end product.

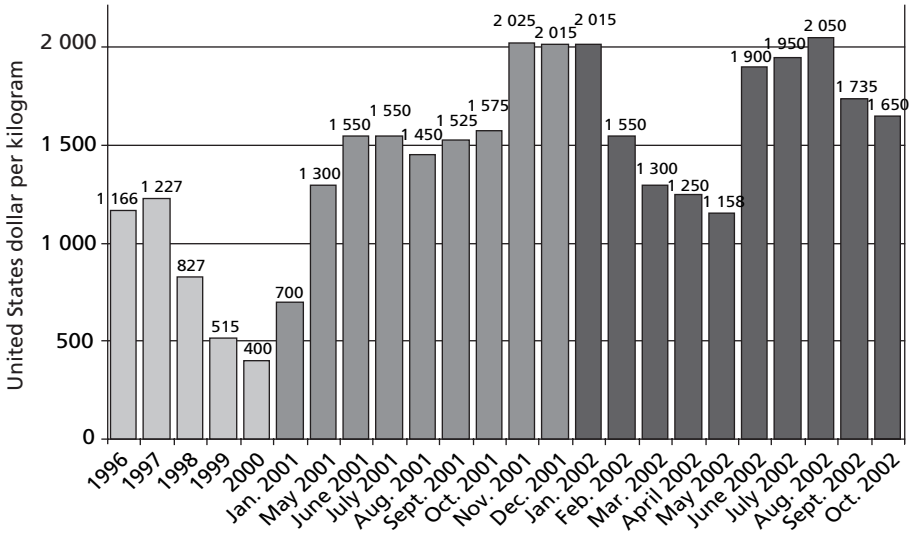
Price changes in the Islamic Republic of Iran

From Pakistan opiates are usually shipped to the Islamic Republic of Iran. There the price level of opiates is significantly higher than in Pakistan, which creates the main incentive for traffickers to engage in such an activity. In addition, opiates are also directly smuggled from Afghanistan into the Islamic Republic of Iran. Based on the analysis of the locations of individual seizures within the Islamic Republic of Iran (reported for 2001), it can be estimated that 66 per cent of the heroin and morphine enters the country via Pakistan and 34 per cent directly via Afghanistan [35].

Opium prices fell in the Islamic Republic of Iran between 1998 and 2000 by half, reflecting the bumper harvests of 1999 and 2000. Between 2000 and the end of 2001, opium prices quintupled in the Islamic Republic of Iran (see figure X).

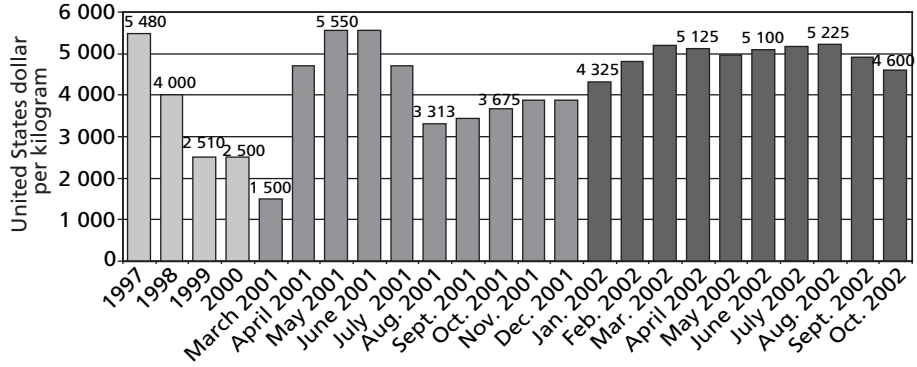
If the additive price model is applied, the price rise of about $270 in Afghanistan should have led to opium prices of around $670 ($400+$270) towards the end of 2001. If the price rises in Pakistan of about $400 were used, the additive price model would have predicted prices around $800 ($400+$400). The actual opium prices rose, however, to more than $2,000 per kg by December 2001. The price rises were thus twice as large as the additive price model would have predicted. Given a 10-fold increase of prices in Afghanistan and a four-to fivefold increase in prices in Pakistan and given the existing supply routes (66 per cent Pakistan, 34 per cent Afghanistan), the multiplicative model would have suggested a slightly more than sixfold increase of opium prices in the Islamic Republic of Iran to about $2,500 per kg. The actual opium prices turned out to be about 20 per cent less. In other words, actual opium prices in the Islamic Republic of Iran were again in between the additive and the multiplicative price model, but turned out to be far closer to the expected values of the multiplicative model than those of the additive model (see figure XI).

Figure X. Islamic Republic of Iran: wholesale prices for opium, 1996-2002



Source: The Opium Economy in Afghanistan: an International Problem (United Nations publication, Sales No. E.03.XI.6).

Figure XI. Islamic Republic of Iran: wholesale prices for heroin, 1997-October 2002



Source: United Nations Office on Drugs and Crime, Field Office.

This also meant that the profits per shipment of a kg of opium from Afghanistan to the Islamic Republic of Iran increased significantly though the profit margins declined. Buying a kg of opium in Afghanistan at $30-40 in mid-2000 and selling it at $400 in the Islamic Republic of Iran brought traffickers a gross profit of at least $360 per kg. The profit margins for shipping the opium from Afghanistan to the Islamic Republic of Iran thus promised a 10-fold

increase. In mid-2002, a kg of opium could be bought in Afghanistan for about $350; selling it in the Islamic Republic of Iran at around $2,000 brought a profit of $1,650 per kg, that is, four times more than in 2000. The profit margins, however, fell from a ratio of 1:10 (Afghanistan:the Islamic Republic of Iran) to a ratio of 1:6 by mid-2002, and declined further to a ratio of 1:4 by October 2002.

One consequence of the far higher profits per unit of opium trafficked was that a larger number of small-scale traffickers participated in the business as the shipment of even small quantities became highly profitable. The larger number of participants, at the same time, led to increased competition and thus contributed to the reduction of profit margins. The average size of an opium seizure in the Islamic Republic of Iran in 2000 was 3.2 kg, falling to 1.9 kg in 2001, a decline of 40 per cent in just one year. The average size of a "significant opium seizure" as reported by the Iranian authorities to the United Nations Office on Drugs and Crime, Interpol and the World Customs Organization, fell from 142 kg in 1999 and 76 kg in 2000 to just 50 kg in 2001, a decline of 34 per cent over the period 2000-2001 (or 65 per cent over the period 1999-2001) and the average size of a seizure appears to have remained at the lower levels in 2002 as well. The average size of a significant opium seizure reported to the Office over the first eight months of 2002 amounted to 53 kg per shipment, 63 per cent less than the average size of a significant opium seizure in 1999.

Heroin prices, like opium prices, fell over the period 1998-2000 in the Islamic Republic of Iran and increased thereafter. Nonetheless, the increases in heroin prices in the Islamic Republic of Iran, like in Pakistan, were far more moderate than the increases in opium prices. Starting from a low of $1,500 per kg in March 2001, heroin prices rose to around $3,900 by December 2001, reflecting a two- to threefold increase, slightly more than in Pakistan, but far less than the increase in opium prices in Afghanistan, Pakistan or the Islamic Republic of Iran. Prices continued rising until August 2002 to about $5,200. By then the overall increase since March 2001 was by a factor of 3.5, but this was still less than the fivefold increase in opium prices over the same period in the Islamic Republic of Iran or the more than 10-fold price increase in opium prices in Afghanistan. The existence of heroin stocks may explain this phenomenon in part.

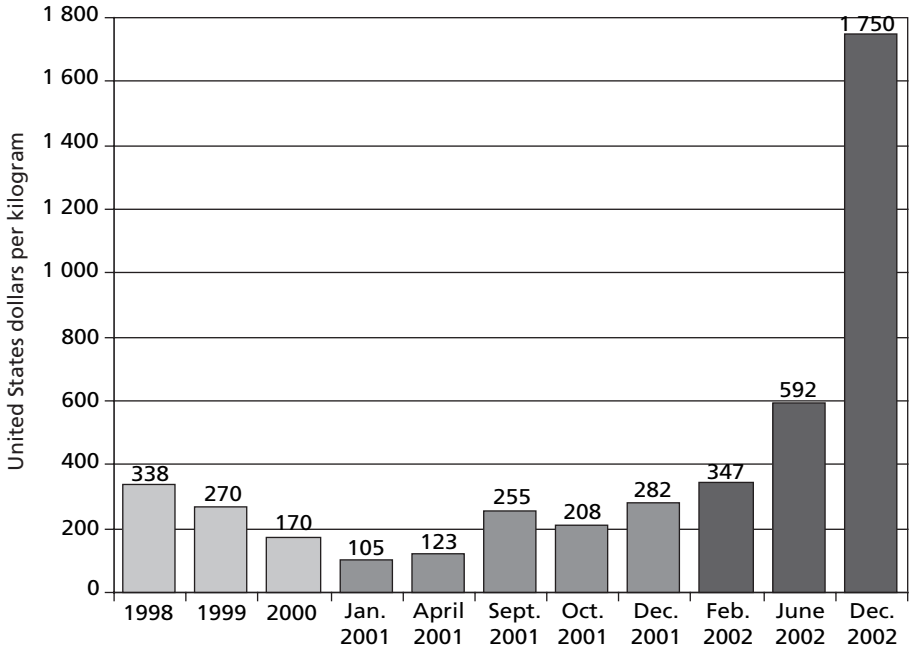
In addition, heroin purity declined in the Islamic Republic of Iran. While the authorities reported an average heroin purity in the Tehran street market of around 20 per cent in the late 1990s, purity levels fell to between 5 and 10 per cent in 2001. One negative side-effect of this were dilutions with all kinds of poisonous substances, causing the number of drug-related deaths to increase by 70 per cent in the Islamic Republic of Iran in 2001.

Price changes in Tajikistan

The main outlet for Afghanistan's opiate production in the north is Tajikistan. The basic picture is again similar to that of Pakistan or the Islamic Republic of

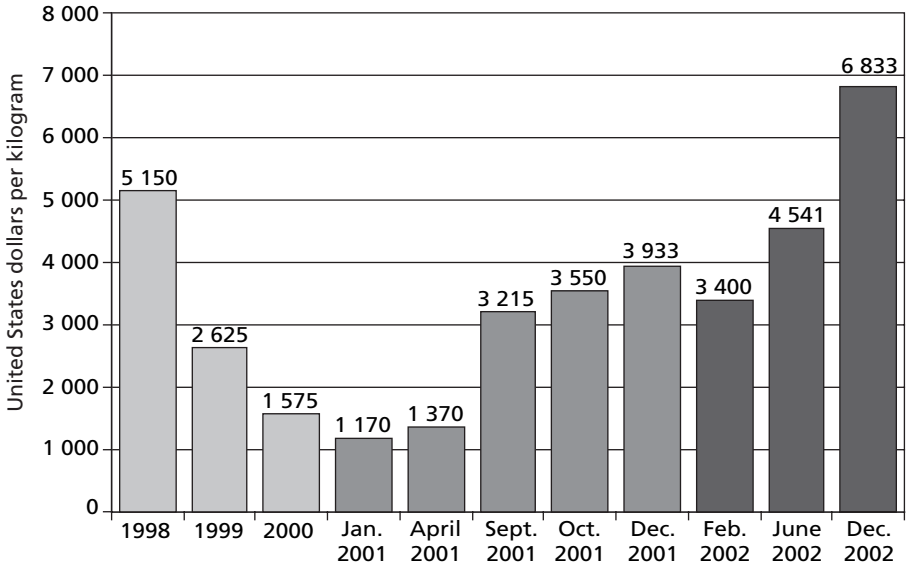
Iran. Both opium and heroin prices declined over the period 1998-2000 and increased in 2001 and 2002 (see figures XII and XIII). Nonetheless, there are some differences in price patterns, reflecting the lack of a unified opium market in Afghanistan in 2001. Tajikistan is mainly supplied with opiates produced in northern Afghanistan (notably Badakshan). No opium production ban was implemented in the northern provinces, which were outside the control of the Taliban regime. Thus, in the first months of 2001, practically no price rises were observed in Tajikistan. Price rises only started in September 2002. There was a less than threefold price rise between January and December 2001, while in Pakistan or the Islamic Republic of Iran prices rose about fivefold. However, as Afghanistan started to unify after the end of the Taliban regime, so did the drug market. Thus by mid-2002 opium prices had increased sixfold in Tajikistan, which was about the same growth rate as in Pakistan and an even higher rate than in the Islamic Republic of Iran (fivefold increase). Opium prices continued to rise steeply thereafter, reflecting ongoing price rises in neighbouring Afghanistan. In December 2002, wholesale prices for opium were six times as high as in December 2001 and 17 times as high as in January 2001.

Figure XII. Tajikistan: wholesale prices for opium, 1998-2002



Source: United Nations Office on Drugs and Crime, Field Office.

Figure XIII. Tajikistan: wholesale prices for heroin, 1998-2002



Source: United Nations Office on Drugs and Crime, Field Office.

Heroin prices rose threefold between January and December 2001 and almost fourfold between January 2001 and June 2002 in Tajikistan. There was thus hardly any difference in the growth rate of opium and heroin prices in 2001 (at a time when northern Afghanistan was still largely independent from the rest of the country). This shows clearly that unless special factors are at play (such as large stocks, changes in purity and changes in the manufacturing infrastructure), there is no reason why heroin prices would perform differently than opium prices. However, following an increasingly unified opiate market in Afghanistan in 2002, the same pattern was observed in Tajikistan as in Pakistan or the Islamic Republic of Iran. Rises in the price of opium exceeded those for heroin. While opium prices increased sixfold between December 2001 and December 2002 in Tajikistan, heroin prices were only some 70 per cent higher. Between January 2001 and December 2002 they increased sixfold, while opium prices were almost 17 times higher.

Summary of results of neighbouring countries

To sum up the discussion so far, it can be stated that a 10-fold increase in opium prices in Afghanistan resulted in:

- An increase of between four and five times in opium prices in the Islamic Republic of Iran and Pakistan in 2001.
- An increase of between five and six times by mid-2002 in the Islamic Republic of Iran, Pakistan and Tajikistan.

Increases in heroin prices were more moderate, apparently reflecting significant stocks in the region, as well as the tendency to reduce purity instead:

- Heroin prices rose between 2 and 3 times in neighbouring countries (the Islamic Republic of Iran, Pakistan and Tajikistan) in 2001 and between 2.5 and 4 times between early 2001 and mid-2002.

Impact of price changes on countries in Western Europe

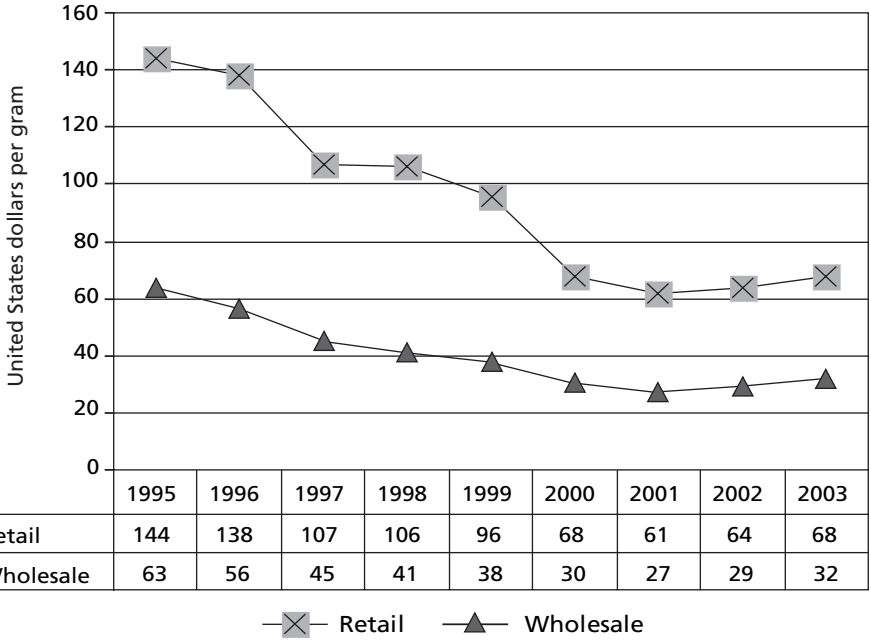
The next question is how price rises in the countries neighbouring Afghanistan translated into price changes in the European consumer markets.

Prices in Western Europe do not seem to have been much affected by the price rises in Afghanistan or the countries neighbouring Afghanistan (see figure XIV). Expressed in dollars, heroin wholesale prices (weighted by population as a proxy for market size) continued to fall by about 10 per cent in 2001, reflecting large heroin stocks along the trafficking routes, and increased by about 19 per cent over the period 2001-2003 to some $32,000 per kg. Heroin retail prices fell by about 10 per cent in 2001 and increased over the next two years by some 10 per cent to slightly less than $70 per gram, on average. Many of these changes, however, reflected shifts in the exchange rate between the dollar and the euro rather than actual changes of nominal heroin prices expressed in local currency. Expressed in euros, heroin prices declined only slightly in 2001 (−7 per cent), remained stable in 2002 and declined again slightly (−10 per cent) in 2003, apparently reflecting the resumption of large-scale opium production in Afghanistan in 2002 and 2003.

How can this apparent discrepancy between a doubling or tripling of heroin prices in the countries neighbouring Afghanistan versus largely stable heroin prices in Europe be explained? Is this the ultimate proof that neither the additive nor the multiplicative price model is correct in predicting price changes in the main consumer markets? Are there other factors at work that have a far stronger influence on the final outcome of the price-setting mechanism? One possible explanation could be a change in the demand curve, offsetting in large part the rise in the supply curve. In theory, such a shift in the demand curve could even lead to stable or even falling prices in the consumer markets despite higher producer prices (see figure XV).

This could be possible if a significant decline in overall consumption were to be observed. There have indeed been some indications of a decline of heroin abuse in Western Europe, as reported by Member States to the United Nations Office on Drugs and Crime. A number of treatment programmes set up in Western Europe, substituting heroin addicts with methadone and other synthetic opioids, appear to have contributed to a reduction in the demand for heroin. There also seems to have been a shift of younger drug users to drugs other than heroin. The average age of heroin users in Western Europe has been rising over the last few years. Heroin seizures declined in Western Europe by some 13 per cent in 2002 as compared with 2001, or by around 20 per cent as compared with 2000, possibly indicating that less heroin was trafficked (and thus probably less heroin was consumed) in the region.

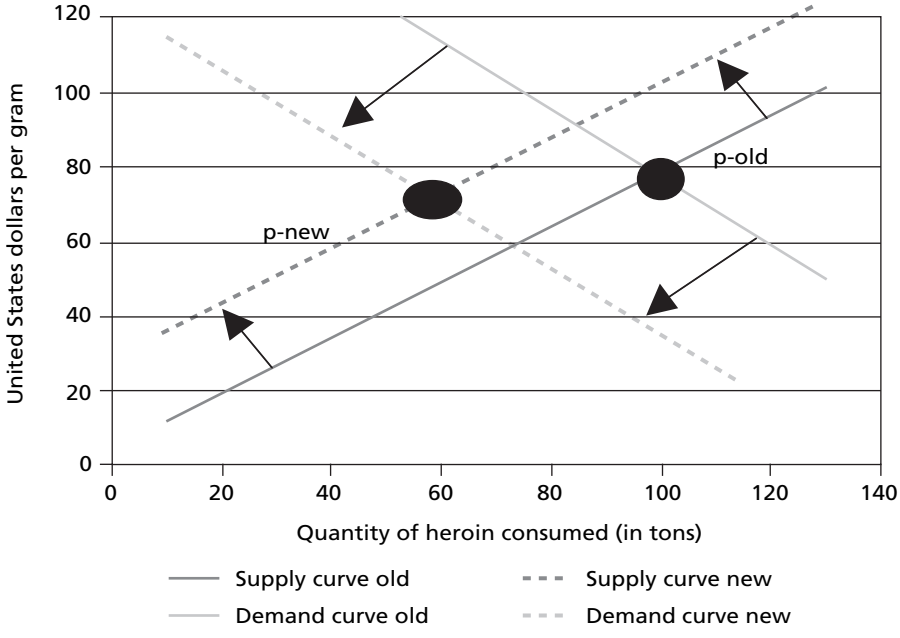
Figure XIV. Western Europe: prices for heroin (weighted by market size), 1995-2003 (not adjusted for purity)



	1995	1996	1997	1998	1999	2000	2001	2002	2003
Retail	144	138	107	106	96	68	61	64	68
Wholesale	63	56	45	41	38	30	27	29	32

Source: World Drug Report 2004 (United Nations publication, Sales No. E.04.XI.16), vol. 1.

Figure XV. Fall in drug prices despite an upward shift in the supply curve

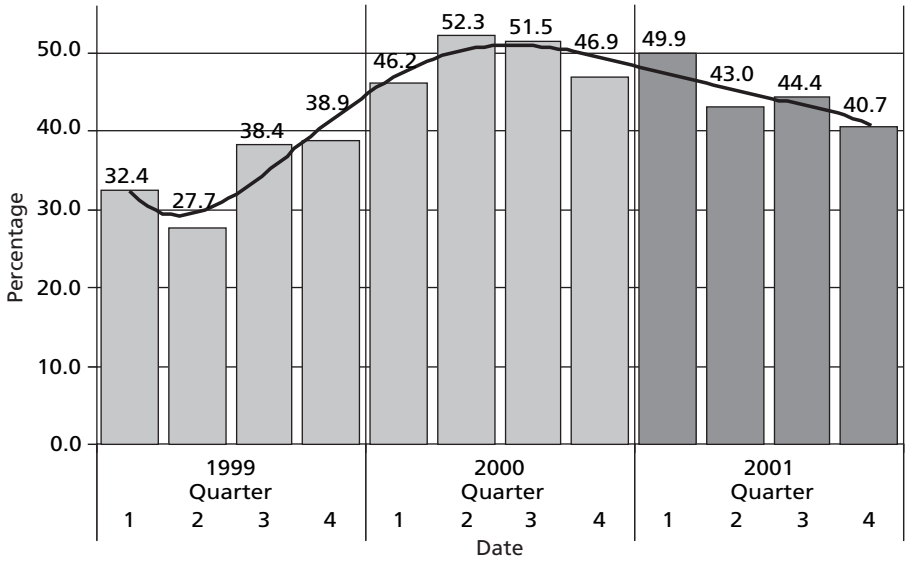


Nevertheless, it is still difficult to believe that in practice shifts in the demand curve in Western Europe would have been sufficient to neutralize the very strong price hikes of heroin reported from the countries neighbouring Afghanistan. In other words, the explanation of stable prices in Western Europe as the result of an offsetting shift in the demand curve may be part of the explanation, but it is unlikely to be the full explanation.

There is another important factor to be taken into account: changes in purity. As far as consumer markets are concerned, prices are not the main variable affected by changes in supply. Indeed, short-term market adjustments usually work via changes in purity rather than changes in prices.* Thus, the purity-adjusted prices rise or fall in line with supply conditions, while the nominal prices, expressed in local currency, tend to remain stable over longer periods of time. A practical reason—notably for retail sales—is that transactions have to be effected rather quickly at the street level to reduce risk. Thus round price figures are usually preferred and they are not changed on a daily basis. Thus, a short-term reduction in supply often results in lower purity levels rather than higher prices. The observed changes in purity levels in Europe seem to confirm such a reaction pattern:

- In *Turkey*, the overall purity of all heroin tested fell from 52 per cent in the third quarter of 2000 to close to 40 per cent in the fourth quarter of 2001 (see figure XVI).

Figure XVI. Turkey: average purity of heroin, 1999-2001[a]

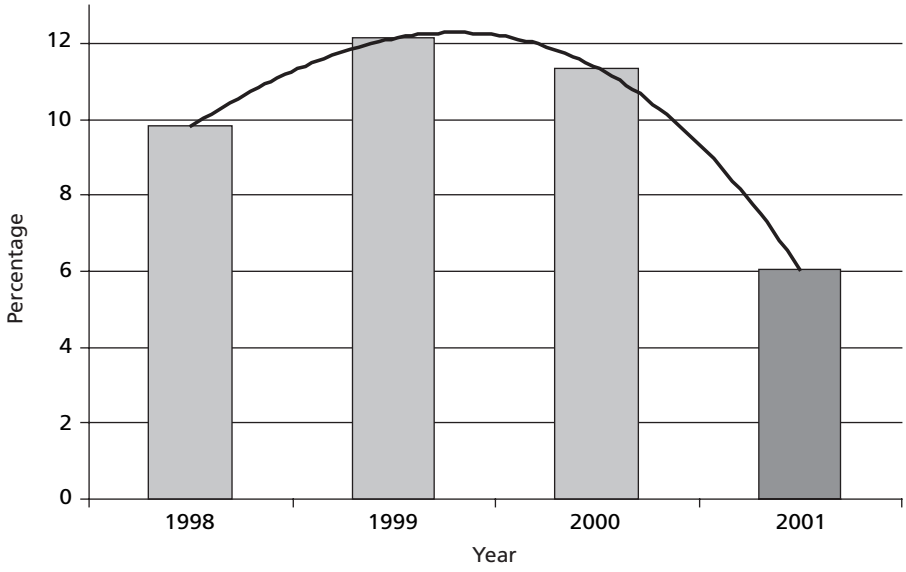


[a]Based on the forensic examination of 404 heroin seizure cases.
Source: Turkey, Ministry of the Interior/Gendarmerie, Narcotics Laboratory, Ankara.

*In addition, there have been reports that the quantities sold may differ, that is, a gram of heroin (or cocaine) can become less than a gram according to the metric system, though the nominal price per gram (whatever the true quantity) may well remain stable.

- In *Greece*, authorities reported that the purity of heroin on the retail market, which went up to 65 per cent in 2000, fell to between 8 per cent and 35 per cent in 2001.
- In *Slovakia*, the average purity of heroin on the local retail market was reported to have fallen from 12-50 per cent in 2000 to just 5-12 per cent in 2001.
- In the *Czech Republic*, authorities reported the average purity of heroin on the retail market to have fallen from 45-75 per cent in 2000 to 10-40 per cent in 2001.
- In *Estonia*, the typical purity of heroin was reported to have fallen from around 50 per cent in 2000 to 13 per cent in 2001.
- In *Lithuania*, the purity of heroin was reported to have declined in retail markets from 40-80 per cent in 2000 to just 0.1-10 per cent in 2001.
- In *France*, authorities reported that 11 per cent of all heroin seized and analysed had a purity of more than 50 per cent in 2000; in 2001 that proportion fell to 6 per cent [36]. The overall average purity of heroin was around 21 per cent in 2001 (see figure XVII).

Figure XVII. France: proportion of heroin tested with a purity level of more than 50 per cent,[a] 1998-2001

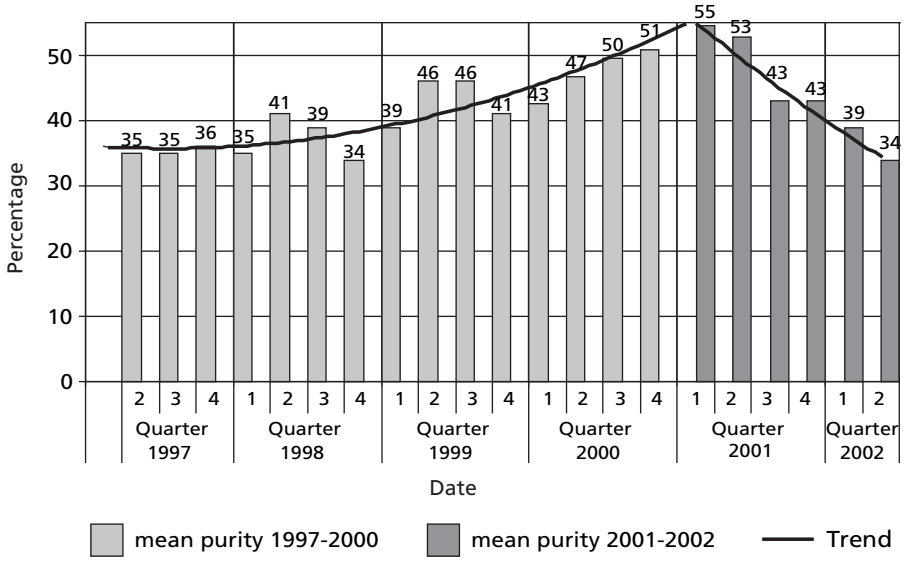


[a]Mean purity was 21 per cent in 2001.

Source: Laboratoire scientifique de la Police de Lyon and Laboratoire interrégional de la Douane de Paris, Observatoire française des drogues et des toxicomanies, *Indicateurs et tendances 2002.*

- In *Italy*, the average purity of heroin seized fell from 36 per cent in 2000 to 31 per cent in 2001 [37].
- In *Germany*, the average purity of heroin seizures of more than 1 kg fell from around 45 per cent in 2001 to some 27 per cent in 2002 (and to less than 10 per cent in 2003) [38].
- In the *United Kingdom*, tests carried out by forensic laboratories showed a decline in the average purity of heroin from 55 per cent in the first quarter of 2001 to, on average, 34 per cent in the second quarter of 2002 and to around 30 per cent by June 2002 (see figure XVIII).

Figure XVIII. United Kingdom of Great Britain and Northern Ireland: changes in the average purity of heroin, 1997-2002



Source: Forensic Science Service, United Kingdom.

According to the United Kingdom authorities' response to the annual reports questionnaire of the United Nations Office on Drugs and Crime, heroin prices in nominal terms declined by about 10 per cent, from £70 per gram ($106) in 2000 to £63 per gram ($90) in 2001. However, the change in purity between the first quarter of 2001 and mid-2002 was equivalent to an effective price rise of more than 80 per cent; a gram of pure heroin cost £127 ($186) at the beginning of 2001 and £210 ($318) at mid-2002 (assuming that the nominal heroin prices had remained largely stable between 2001 and mid-2002). That change would be equivalent to a net price increase of about 65 per cent in pound terms or 70 per cent in dollar terms.

In other words, a doubling (Pakistan) or tripling (Islamic Republic of Iran) of heroin prices in countries neighbouring Afghanistan in 2001 resulted in a de facto 70 per cent increase of heroin prices in West Europe's largest heroin market, though nominal heroin prices declined slightly. The multiplier model would have predicted a doubling or tripling of the prices in the United Kingdom. Based on the additive model, the price increases in the United Kingdom should not have been more than $2.4 per gram (Pakistan) or $3.6 per gram (Islamic Republic of Iran), equivalent to a price increase of between 2 per cent and 3 per cent in the heroin prices prevalent in 2000 ($106 per gram). The overall price increase in the heroin market in the United Kingdom was thus less than predicted by the multiplier model, but significantly more than the additive price model would have predicted.

These results have important policy implications. As long as the price-setting behaviour of illicit drug markets is not just additive but at least in part multiplicative, it seems to make economic sense to assist producer and transit countries with their enforcement efforts, as this will reduce the supply of drugs to consumer countries and help to decrease demand by raising drug prices in the consumer countries as well. In that context, it should also be borne in mind that interventions in and around the drug-producing countries are substantially less costly than in the countries of final destination. With one tenth of the United Kingdom budget at their disposal, the Iranian authorities, for instance, were in a position to take 30 times more opiates out of the market in the late 1990s.* Similarly high efficiency ratios of invested capital and returns, in terms of drugs seized, are also likely to apply to Tajikistan and other transit countries.

Summary and conclusions

Drug trafficking, in conceptual terms, can be analysed in relation to two key factors: profit and risk, as well as a number of enabling and protective factors. The key motivation is profit; the main limiting factor is risk. Prices are a key element in profit considerations. Law enforcement interventions, in general, will increase risk. Operating above certain thresholds, trafficking can be reduced. However, most enforcement interventions are below such thresholds. Under such

*In the Islamic Republic of Iran, the total drug control budget in 1998 amounted to 1,136 billion rials, of which 606 billion rials or $141 million (converted at the official United Nations exchange rate) were dedicated to supply reduction. For comparison, the total drug control budget of the United Kingdom—a country of similar size in terms of population and equipped with some of the most effective drug control organizations in Europe—amounted to £1.4 billion, of which £870 million, or $1.45 billion, were used for supply control purposes. The United Kingdom supply control budget was thus 10 times larger than that of the Islamic Republic of Iran. With that budget, the United Kingdom authorities succeeded in taking 1,346 kg of heroin out of the market in 1998. In the same year the Iranian authorities seized 2,895 kg of heroin, 22,291 kg of morphine and 154,454 kg of opium, which, expressed in heroin equivalents, amounted to 40.5 tons of opiates. Thus with just one tenth of the United Kingdom budget at their disposal, the Iranian authorities were in a position to take 30 times more opiates out of the market than their counterparts in a major European heroin consumer country.

conditions, increased risk will be reflected in increased profit margins and the higher profit margins will largely offset the higher risk. A new profit-risk equilibrium emerges. Nonetheless, as drug prices increase, consumption will decline, and so will trafficking. In other words, interventions on the supply side in general work indirectly.

In order to understand the price-setting behaviour of all the various players in the illicit drug markets, substance-specific issues as well as the organizational structures of criminal groups must also be taken into consideration. Location plays an important role: while much heroin and cocaine trafficking is interregional in nature, trafficking in synthetic drugs is largely intraregional. This has implications for the price structure. Interregional trafficking is, in general, more risky, leading to higher prices as compared with drugs that are only trafficked intraregionally. Interregional trafficking in synthetic drugs is often limited to trade in precursors that have been diverted from licit channels. The level of concentration of specific drug markets is another factor influencing price structure. Cocaine trafficking is still highly concentrated, though it is becoming less so. The heroin trade is far more fragmented, though it often operates along ethnic lines. In terms of involvement of organized crime, there are indications that the strongest involvement is in cocaine, followed by heroin, cannabis and trafficking in ATS. A study conducted by the United Nations Office on Drugs and Crime found that drug trafficking was the key business activity for more than half of the transnational organized criminal groups investigated. Though there is a general trend towards smaller, less hierarchically organized groups, two thirds of the criminal groups investigated still had a classic hierarchical structure. Such a hierarchical structure, in combination with an appropriate size and market concentration, are preconditions for criminal groups to be price-setters, reaping monopoly rents. Smaller groups, in contrast, are rather price-takers. The stronger the levels of hierarchy, the more likely a group is to use violence. The dismantling of the highly hierarchically organized Colombian drug cartels in the early 1990s thus reduced drug-related levels of violence and political interference, but overall trafficking did not decline, as a far larger number of small core groups, assisted by a web of individuals engaged in auxiliary services, replaced the old cartels. The new structure is more resilient to law enforcement interventions and has led to increased market competition. As a result, the downward pressure on cocaine prices continued in the 1990s, even though enforcement efforts were stepped up.

In terms of price-setting behaviour along the trafficking chain, an empirical analysis was conducted, testing the hypothesis of an additive price-setting behaviour of criminal groups versus a multiplicative price-setting behaviour. For the subsequent empirical analysis, the opium market in Afghanistan and the transit of opiates to consumer markets in Western Europe were investigated. The massive price changes in Afghanistan following the announcement of an opium poppy ban offered ideal, almost laboratory-type conditions for the analysis of the price-setting behaviour of drug trafficking groups. The poppy ban in Afghanistan in 2001 led to a 10-fold increase in poppy prices over the period

between July 2000 and harvest time in 2001, from $30 per kg to $300 per kg, and, following some fluctuation, to a further increase to $350 per kg in mid-2002. By the end of 2002, opium prices amounted to $540 and were thus nine times higher than average annual prices in 2000 ($60). The result of the price hike was an increase in opium prices of between four and five times in neighbouring countries and an increase in heroin prices of between two and three times.

The price changes suggested that neither the multiplicative nor the additive price model were correct in predicting price movements. Actual price changes were in between, though, with regard to opium trafficking, leaning more towards the multiplicative price-setting model. Some interesting additional findings also emerged. As a result of rising opium prices in Afghanistan, profits per unit of drugs trafficked increased, prompting a larger number of small-scale traffickers to enter the business, thus increasing competition and reducing profit margins. In the case of heroin, the existence of huge stocks in the region appears to have biased the results.

Despite the doubling or tripling of heroin prices in the countries neighbouring Afghanistan in 2001, no price increases were reported from the transit countries or the countries of Western Europe that year and only moderate price increases were reported over the next two years (with wholesale prices—expressed in United States dollars—rising by some 20 per cent between 2001 and 2003). Theoretically, this could have been the result of a downward shift in the demand curve, offsetting to a large extent the upward shift in the supply curve. While the demand curve may well have shifted downward as a result of several demand reduction programmes in place, it is unlikely that it did this to the extent necessary to offset the marked upward shift in the supply curve. There is, however, an additional explanation at hand. While nominal heroin prices—expressed in dollars—remained stable or declined in 2001 and increased only slightly in 2002 and 2003, purity levels in several European countries were reported to have declined substantially following Afghanistan's opium poppy ban of 2001. Taking the data from the United Kingdom, the decline in purity more than offset the nominal price fall, so that the price of a hypothetical gram of 100 per cent pure heroin actually increased by about 70 per cent between the first quarter of 2001 and June 2002. The price rise was thus still less than the doubling or tripling of prices predicted by the multiplicative price model, but significantly higher than the expected price rise of 2-3 per cent according to the additive price model.

These results have important policy implications. As long as the price-setting behaviour of markets is not just additive but at least in part multiplicative, it makes economic sense to assist producer and transit countries with their law enforcement efforts. This reduces not only the supply of drugs to consumer countries but also helps to lower overall demand by raising drug prices. This must be also seen against the background that interventions in and around the drug-producing countries are far less costly than interventions in the countries of final destination.

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