The Market for Narcotics. Is there a Case for Regulatory Policy?

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Abstract

I study a theoretical model of the market for narcotics, consistent with available evidence and other studies, where there is a case for regulatory policy. Namely, a ceiling for the price at which addicted consumers can buy drugs is an example of such a policy. I also show that the price ceiling outperforms drug legalization.

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1 Introduction

A typical analysis of the market for narcotics (see, for example, Baumol and Blinder's textbook "Economics, Principles and Policy") says that the billions of dollars spent on trying to stop illegal drugs at the border shift the supply curve of drugs to the left, thereby driving up street prices. This, in turn, raises the rewards for potential smugglers and attracts more criminals into the "industry", which shifts the supply curve back to the right. The legalization, on the other hand, would shift the supply curve of drugs to the right, thereby driving down street prices. Presumably, legalized drugs would be vastly cheaper as South American farmers earn only pennies for drugs that sell for hundreds of dollars on the streets of Los Angeles and New York. This would almost certainly reduce crime but produce more addicts. This is why many economists believe that any successful antidrug program must concentrate on reducing the demand.

Can the number of drug addicts be reduced by legalization, possibly combined with other policy instruments? Is there any effective "supply side" regulatory policy, which can reduce the number of drug addicts? Probably the answers to those questions depend on the structure of the market for narcotics. In this paper, I study a structure, consistent with available evidence and other studies, and I indicate some regulatory strategies that can reduce the number of addicts at no cost in terms of crime.

I assume that the consumption of drugs by "young" individuals is a particularly important determinant of the number of addicts. Drug-dealers enjoy some monopoly power, and can price discriminate between addicted and not addicted individuals. The bulk of their profits comes from addicts, so they offer cheap narcotics to young consumers in order to get more consumers hooked on the addictive good.

A bulk of sociology literature emphasizes the importance of early life-stages for the entire life-path. There is at least some narrative evidence that illegal drugs are being sold by dealers who control their territories and therefore enjoy local monopoly power. Further, the dealers are especially active in areas with a significant teenager population (e.g., schools) where they offer cheap drugs to get more consumers hooked on the addictive good. The optimality of this strategy of monopolists in addictive good markets has also been confirmed by theoretic studies of Becker's et al. (1990), and Fethke and Jagannathan (1996). Both papers do not study, however, the effectiveness of regulatory policy.

2 Myopic Consumers and Patient Dealers

Imagine first a territory being under the control of a single drug dealer. Both the drug dealer and consumers live two periods. No consumer is addicted in period 1 of her life. In period 2, a consumer can become addicted or she can stay not addicted. Each period, each consumer demands one or no unit of drugs. Let $v_1 \in [0, \overline{v_1}]$ stands for a consumer's valuation of the drug. The total mass of consumers is normalized to 1, and different consumers may have different valuations of the drug. Let $q_1 = D_1(p)$ stand for the total demand in period 1 (by assumption, $D_1(0) = 1$ and $D_1(\overline{v_1}) = 0$). Each consumer who takes a drug in period 1 becomes addicted in period 2 with probability π. In particular, the mass of consumers who become addicted in period 2 equals πq_1. Let v_2 stands for an addicted consumer's valuation of the drug. For simplicity, assume that $v_2 \in [0, \overline{v_2}]$ is a realization of a random variable independent of v_1. Let $q_2 = \pi q_1 D_2(p)$ stand for the demand of addicts in period 2 (by assumption, $D_2(0) = 1$ and $D_1(\overline{v_2}) = 0$). Assume that the elasticities of demand, $\varepsilon_1(p)$ and $\varepsilon_2(p)$ increase in p and

$$\varepsilon_1(p) > \varepsilon_2(p) \tag{1}$$

for every p. The assumption $\varepsilon(p)$ increase in p guarantees the uniqueness of optimal prices. Assumption (1) is a certain version of "habit reinforcement". Habit reinforcement has been usually found by experimental studies of harmful addiction (see Donegan et al. (1983)) and appears in one form or another as a fundamental assumption in all versions of the rational addicts model (see Becker and Murphy (1988)). The demand of non-addicts in period 2 is assumed to be 0. The dealer can price discriminate between addicted and not addicted individuals. The production cost equals to 0.

In this section, I assume that the representative consumer is myopic, i.e., when making a decision in period 1, she does not take into account the future (period 2) consequences of the decision, while the dealer is infinitely patient, i.e., she maximizes the sum of profits in both periods. Then the dealer chooses prices p_1 and p_2 (in periods 1 and 2, respectively) to maximize

$$p_1 D_1(p_1) + \pi D_1(p_1) p_2 D_2(p_2).$$

Therefore the single-period monopoly price $p_2^* = p_2^M$ is optimal in period 2 and $p_1^* < p_1^M$ in period 1 because a decrease in p_1 at $p_1 = p_1^M$ has only a second order effect on profits in period 1 but a first order effect on profits in period 2. The monopolist lowers the price in period 1 to get more consumers hooked on the addictive good. The optimality of this strategy has been asserted by Becker et al.(1994) (see also Becker et al. (1990), and Fethke and Jagannathan (1996)). It follows from (1) that $p_1^* < p_1^M < p_2^M = p_2^*$. For some parameters of the model, the dealer even distributes narcotics for free among not addicted consumers.

Now imagine that the same territory has competitive market for narcotics instead of a single drug dealer. However, narcotics are subject to an excise tax, t. Since the production cost is assumed to be 0, the market price is equal to the tax rate. If consumers are myopic, as it is assumed in this section, we have fewer addicts under this structure of the market if and only if

$$p_1^* < t.$$

Suppose that initially drug selling is illegal in our territory, and is under the control of a single dealer. Next suppose that we legalize selling drugs and competitive market emerges. If we now impose an excise tax $t > p_1^*$, then the number of addicts will fall. There are however several qualifications. Will this policy be effective? Will competitive market emerge? Are there any implementation problems? Consider these questions in turn.

An illegal activity always exposes an agent to the risk of being caught, so in order to engage in selling drugs she must be sufficiently compensated for that risk. Say, her profits must be greater than some z. Under legal competitive market structure with an excise tax a dealer can still engage in an illegal activity (this time it is avoiding taxes), but the presence of legal competitors imposes a constraint, namely $p_2 \leq t$. If

$$t < p_2^*$$

her profits fall. There are two effects of this constraint. First, the dealer cannot extract the monopoly profits in period 2, which may make her exit the market. Second, lower period 2 profits reduce the incentive to offer a lower price in period 1 in order to get more consumers hooked on the addictive good. If the legalization has no effect on z[1], the question is whether the dealer's profits can be reduced sufficiently to eliminate the illegal activity. That is, whether there exists a $t > p_1^*$ such that

$$max_{p_1} \{p_1 D_1(p_1) + \pi D_1(p_1) t D_2(t)\} < z. \tag{2}$$

[1]It can be argued that z should depend on the volume of illegal trade. Such a modification does not alter qualitatively the implications of the model. The only essential assumption is that there is a fixed cost of engaging in an illegal activity.

It is, unfortunately, likely that avoiding taxes exposes agents to smaller risk than selling drugs illegally. So it can happen that even (2) is not a sufficient condition. However, even if the dealer decides to conduct her activity illegally, the price in period 1 should go up, and therefore the number of addicts should fall.

The emergence of competitive market for narcotics is probably the most controversial assumption. For example, the cigarette industry while legalized is highly concentrated. The legalization policy would probably have to be supplemented by other means. An alternative and arguably more effective approach would be to simply make drugs available at a price of t. This does not legalize drug-dealing but instead places a ceiling on the price a dealer can illegally charge non-addicts. This gets around the problem that tax-avoiding may be less risky for the drug dealer as opposed to illegal drug trading.

In the model of this section, where consumers are myopic, t should be equal to 0. If addicts can get drugs for free, the dealer can make money only in period 1. Then obviously the monopoly price p_1^M is optimal. It can however happen that the monopoly profit in period 1 is smaller than z. For example, Stevenson (1994) suggests that harm reduction policy and legal prescribing of illegal drugs replaced illegal market in Merseyside, United Kingdom. Frey (1997) offers another piece of evidence.

To see that exit may reduce the number of addicts imagine that z differs for different dealers, e.g. there is a measure of dealers and z is an i.i.d. random variable on $(0, \infty)$, and a lower measure of dealers in the industry leads to a more concentrated market (larger territories), and consequently, higher prices.

Finally, two potential implementation problems are worth stressing. First, since addicts can buy narcotics at a lower price, their consumption increases, and may increase by more than the fall in the consumption of non-addicts due to a higher price. Therefore the total consumption may temporarily rise when the regulatory policy gets implemented. Second, suppose that the decision maker is uncertain about the effects of the proposed regulatory policy, and she takes into account the possibility that the policy can be abandoned if desired effects are not observed. In this scenario, the dealer may stay in the market and keep her price strategy despite her profits being temporarily smaller than z.

3 Forward-Looking Consumers

The model is the same as in Section 2, except that when making a decision in period 1, the representative consumer takes into account the period 2 consequences of the decision. More precisely, I assume that the utility from becoming addicted in period 2, expressed in terms of period 1 is $-p_2$ if the consumer buys a drug and 0 otherwise. The utility of remaining not addicted and consequently not buying narcotics in period 2 is 0. This is a simple utility function with a certain version of “tolerance”. Tolerance has been usually found by experimental studies of harmful addiction (see Donegan et al. (1983)) and appears in one form or another as another fundamental assumption of the rational addicts model (see Becker and Murphy (1988)).

Therefore, given $p_1$and p_2, a consumer buys a drug in period 1 if and only if

$$v_1 - p_1 - \pi p_2 D_2(p_2) \geq 0,$$

where v_1 stands for the period 1 valuation of this consumer, and $D_2(p_2)$ is the expected probability of buying the drug conditional on being addicted in period 2. This yields

$$D_1^{-1}(q) - p_1 - \pi p_2 D_2(p_2) = 0. \tag{3}$$

The dealer optimizes her profits $p_1 q + \pi q p_2 D_2(p_2)$ given q. The set of available price pairs depends on whether the dealer can commit to p_2 when consumers make their decisions in period 1. If she can commit, then she optimizes with respect to $p_1$and p_2

. If such a commitment is impossible, then $p_2 = p_2^M$ and she optimizes with respect to p_1.

I shall consider only the case when the dealer can commit to p_2. By (3), $q = D_1\left(p_1 + \pi p_2 D_2(p_2)\right)$, and so the profit of a dealer can be expressed as

$$[p_1 + \pi p_2 D_2(p_2)] D_1\left(p_1 + \pi p_2 D_2(p_2)\right) = r D_1(r),$$

$$\text{where } v = p_1 + \pi p_2 D_2(p_2).$$

There are two important conclusions. First, if the dealer and consumers have the same discount factor, then a price ceiling on p_2 either does not change or raises the number of addicts. Indeed, if the dealer can adjust p_1 to achieve $r^* = \arg\max r D_1$ (r), then the number of addicts remains unchanged. If r^* cannot be achieved, then $r < r^*$ and the number of addicts increases. Second, the dealer cannot extract more surplus from forward-looking consumers with the same discount factor than she can extract from myopic consumers only in period 1.

4 Heterogeneous Societies

In Sections 2 and 3, I have obtain quite different conclusions. In Section 2, I showed that imposing a price ceiling in period 2 leads to a lower number of addicts, and in Section 3, I concluded that price ceilings do not change, or even raise, the number of addicts.

Imagine now a territory whose habitants differ with respect to their discount factor. I simply assume that they are either myopic or infinitely patient. Say, λ and $1 - \lambda$ of them are myopic and infinitely patient, respectively. The territory is under the control of a single drug dealer. The dealer, who is one of the habitants, is either myopic or infinitely patient.

Now, I will compare the per period profits of both types of dealers. A myopic dealer takes the number of addicts μ as given and optimizes

$$\mu p_2 D_2(p_2) + \lambda p_1 D_1(p_1) + (1-\lambda) p_1 q,$$

where

$$q = D_1\left(p_1 + \pi p_2 D_2(p_2)\right)$$

(see Section 3), with respect to p_1 and p_2. In long-run,

$$\mu = \lambda \pi D_1(p_1) + (1-\lambda)\pi q. \tag{4}$$

An infinitely patient dealer solves the same optimization problem, but she takes into account that μ is determined by (4). Therefore a dealer of the latter type can make more money per period than a dealer of the former type. An infinitely patient dealer sacrifices some profits today in order to increase the number of addicts in the future. The future profit compensates her for the current loss. A myopic could make more money in future by sacrificing some profits today and raising the number of addicts. However, the future profit cannot compensate her for the current loss.

Recall that there is some cost z of conducting an illegal activity. If z is higher than the per period profits of a myopic dealer but lower than the per period profits of an infinitely patient dealer, then we can observe self-selection among dealers. Only the latter type of dealers enters the market, because only the latter type of dealers can make real money in this business. If this is the case, then the conclusions from Section 2 basically remain valid.

However, there are two important qualifications. First, the presence of infinitely patient agents may reduce the dealer's incentives for getting more consumers hooked on the addictive good by offering a lower p_1, which in turn, may reduce the effect of a price ceiling on p_2. Second and more important, a higher price in period 1 need not outweigh the effect of a lower price in period 2 in the case of infinitely patient consumers. This may raise the number of forward-looking addicts, and reduce the total effect of a price ceiling on p_2. This also may make the optimal price ceiling positive (unlike Section 2, where t should be equal to 0). Additionally, a decision-maker need not target the total number of addicts, but may rather be interested only in the policies that reduce both myopic and infinitely patient addicts.

5 Conclusions

I studied a market for drugs, where (a) the consumption of drugs by young individuals is a particularly important determinant of the number of addicts, (b) drug dealers enjoy some monopoly power and can price discriminate between addicted and not addicted individuals, (c) there is significant heterogeneity of individuals with respect to the discount factor, and I showed that there is a case for regulatory policy. Namely, a ceiling for the price at which addicted consumers can buy drugs is an example of such a policy. I also showed that the price ceiling outperforms drug legalization.

6 References

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