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DESTROYING THE MARKET FOR DRUGS:

An Economic Analysis

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This paper is meant to be a serious attempt to analyze the social problems of the externalities created by consumption of (narcotic) drugs. The views expressed do not reflect the opinions of the above-mentioned institutes - whether they reflect the final opinions of the author remains to be seen.

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ABSTRACT: The paper rejects the idea of liberalized distribution of narcotic drugs through private markets. It is shown that this proposal does not go far enough in elimination of the negative social externalities of drug consumption. Nonetheless, direct governmental controls are shown to result in reduction of welfare when compared to the market allocation. The tax optimum is defined through equality of the social costs of "parliamentary taxes" and the social gains from reduction in "street taxes". It is shown that subsidization of drug production even through distortionary taxes comprises the optimal second best policy. This result points to the use of Pigouvian taxation to eliminate the gap between the equilibrium market price and the socially optimal price. A program is suggested which socializes the production sector of drugs and builds the distribution on organized liberalization through the public sector based on dispersed price structure. While this program turns the Ramsey rule on its heads, it also transforms an externality-creating private good into an externality-free public good.

KEY WORDS: Drugs, Externalities, Tax Policy

Question: "Does there exist an intelligent way of destroying the market for drugs?" After the first course in undergraduate economics, the obvious answer is: "Let the market price collapse down to zero".

I Introduction

Production, distribution and consumption of narcotic drugs is increasingly regarded as one of the major social problems of today throughout the urbanized societies. There are two quite different reasons, though, for this concern. First, consumption experiments undertaken by the newcomers and intended to be temporary have the strong tendency of changing consumer's preferences. The probability of creating dependence is substantial. Moreover, the human values represented by the subsequent addicts deviate from those of non-users. The second reason is the various social externalities associated with the drug culture. Indeed, the single major factor which explains the rocketing crime rates throughout urban areas is misuse of drugs.[1] Fundamentally, it is the liquidity constraint of the drug-users which causes this externality and the cash in advance technology in the market place.

From the point of view of economic behavior, drug consumers can be classified into two groups. There are users whose demand already has turned inelastic with respect to the price and there are users whose demand still is price elastic. To the first group belong the permanent users with more or less permanent dependence, usually on strong drugs. The demand by

newcomers, who ordinarily also start with milder drugs, can be expected to have price-elastic demand. The externalities caused by the first group are much more penetrative than those caused by the second group.

The fundamental social problem of course is why some people become drug users in the first place. Economics can hardly shed much light, however, on this issue. The current paper is about the economics of drugs: it will focus on the social consequences of the drug problem using an economic approach. The model of the paper focuses on the alternative allocation schemes in societies with a stable population of permanent drug consumers causing externalities for the non-user segment of population. It argues that Friedman's (1983) proposal of liberalization of distribution of drugs, at least those causing severe externalities is socially suboptimal.

Our result will be that the socially optimal price of drugs causing externalities is rather low and does not cover the cost of production and distribution. Friedman's view is identified with the market solution. It is hoped that this interpretation does not do too much injustice to his contribution on this social issue of priority importance. The price elastic drug consumption associated ordinarily with rather low or no externalities raises the question of optimal price dispersion. This issue and the optimal pricing to deal with the newcomers will be discussed in section VI.

The reasons for the market failure can be traced to the negative social externalities which still remain if Friedman's proposal is followed.[2] It will be, however, shown that relative to the currently prevailing anti-drug policies, Friedman's proposal indeed is welfare-increasing. This result follows from reduction of producer's risks caused by expenditures on law enforcement.

Section V of the paper introduces "parlamentary taxes" and shows in which way they can be utilized to replace the "street tax". This section shows that in a society with competitively organized production of drugs, the optimal second best policy takes the form of price controls and subsidization of drug production. The tax optimum is derived where the optimal tax rate on non-drug commodities is shown to depend on the social gains from reduced externalities and the social costs caused by the tax distortions. This important result can be utilized to construct a suggestive program for dealing with the drug problem in a feasible way in practise. Indeed, it may be optimal for the government to levy a Pigouvian tax to finance either public production of drugs or subsidize competitively organized private production to be distributed to consumers in a manner described in section VI. This program will be called <u>controlled liberalization.</u>

All the results are obtained under the handy assumption of competitively organized production sector. If anything, the implications are only reinforced by the empirical facts that, in the current world, production is run by monopolistic mafias

while the demand is quite inelastic. These observations point to the case that, at any rate, substantial rents are created. Hence, the true social costs of the currently prevailing drug culture are clearly underestimated when the assumption of competitive production is adopted.

II Social Optimum

Consider the socially optimal allocation in a stable, heterogenous society with two types of consumers, non-users of drugs (N) and users (U).[3] This allocation will be derived from maximization of the social welfare criterion, to be given below. We propose that the externality of drugs may be of three quite different types. First, a non-user may derive direct disutility from the consumption of a user due to social disapproval. This effect, called here of Type I externality, will not be explicitely modelled for two rather different reasons. First, this externality can very easily be incorporated in the model by following the classic analysis of Sandmo (1975) in a somewhat different context. Second, but more fundamentally, it may be hard to take a position as to the type of preferences people should have.

Excluding the externality of Type I, it can be argued that it is not the act of consumption that will cause other externalities but rather the way the consumption is financed. Two types of taxes will be considered. The first is a "street tax" and the second a "parlamentary tax". The street tax involves the idea

that the users satisfy their liquidity needs by taking the money stochastically from the non-users, given the cash-in-advance technology in the street markets. The street tax creates our second externality, the Type II one, defined as the pure income effect. However, there is an additional externality associated with the street tax, called the externality of Type III: the street tax reduces proportionally the total utility of the non-users through reduction in personal security. Hence, the cost to the payer exceeds the revenue to the receiver. The paper will focus on the externalities of Type II and III, manifesting themselves in high crimes rates. In section V, the issue revolves around the minimum social costs necessary to reduce or even eliminate these externalities.

Define now the utilities of the non-users and users as follows

$$u = u(1 - x_o^N - x_{od}^N,\ x^N,\ x_d^N)\theta(\pi) \tag{1}$$

$$v = v(1 - x_o^U - x_{od}^U,\ x^U,\ x_d^U). \tag{2}$$

The variable x_o stands for labor (to be employed in two production sectors), $x = x^N + x^U$ for the (vector of the) ordinary consumer goods and $x_d = x_d^N + x_d^U$ for drugs. The functions u and v are assumed to be strictly concave with $u_o > 0$, $u_x > 0$, $v_o > 0$ and $v_x > 0$. For the non-users, it is appropriate to impose a restriction $u_d < 0$ for all $x_d^N > 0$. This is a rather restrictive assumption because it means that the non-users do not become users. It of course is of major social concern as to why people become users in the first place. The economics

may, however, have rather little to say about this question. In the current model, the assumption of a given population of users is justified as a steady state assumption.

Anticipating the subsequent analysis the following properties

(3) $\lim v_d = 0$ as $x_d \to x_d^*$, $\lim v_d = \infty$ as $x_d \to 0$

are assumed with x_d^* standing for the saturation level of drug consumption. One would tend to think that the users are more averse towards working than are the non-users, i.e. $v_o >> u_o$. With no loss of generality, it will be assumed below that the number of users and non-users is equal to one.

The externality of Type II, to be identified with the size of the street tax π, will be introduced in the analysis of the market solution via budget constraints as the market value of total drug consumption. Here, $\theta(\pi)$ stands for the externality of Type III and it is assumed to satisfy the following assumptions

(4) $\theta(0) = 1$, $0 < \theta(\pi) \leq 1$, $\theta_\pi < 0$, $\theta_{\pi\pi} < 0$.

Concavity of θ-function is quite a natural assumption. It says that a higher street tax reduces the utility of the non-users at an increasing rate, cf. Figure 1. This property will be of importance for the optimal second best policy.

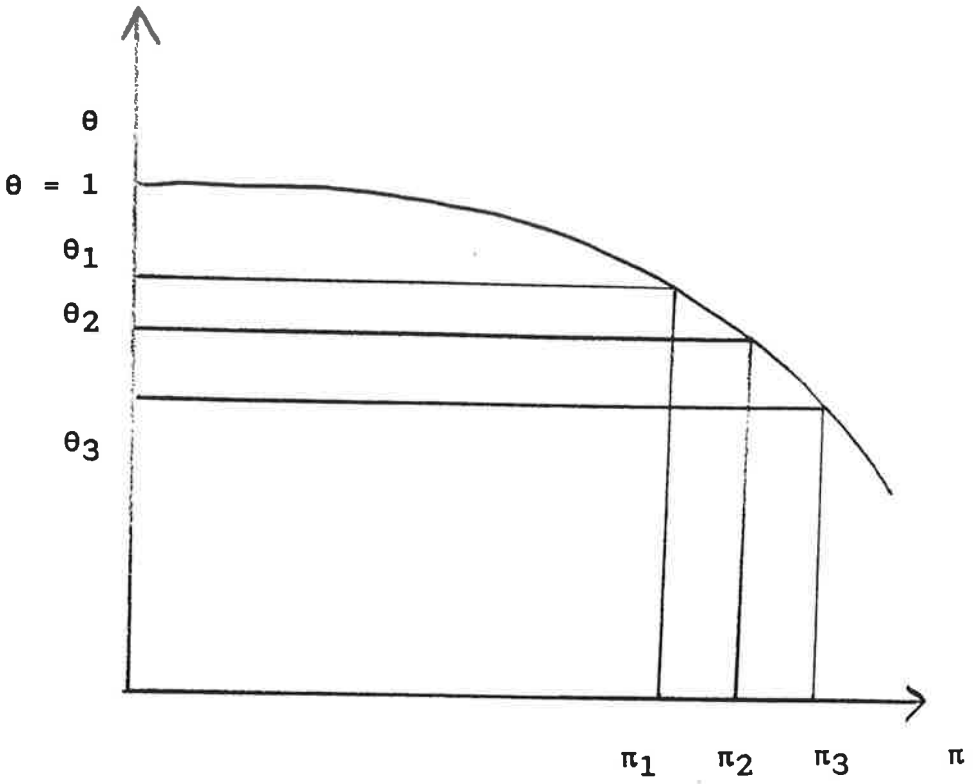

Figure 1. Utility Effect Caused by the Street Tax

The externality of Type III introduced is fundamentally associated with the street tax. In the case of parlamentary taxes, this externality vanishes. Hence, in the social optimum accomplished by the planner, we take $\theta = 1$ and let the planner employ lump-sum taxation to achieve the desired income distribution.

It is anything but trivial to justify the incorporation of any particular welfare criterion if only because the preferences of the two types of consumers are radically different. Perhaps the most natural way to represents the social preferences in such a society would be

$$(5) \qquad w(u,v) = u + v^{o}$$

where v^{o} represents a constant level of utility of the users (dictated by the majority). This amounts to assuming that the planner would respect the preferences of the non-users under the constraint that a given level of utility of the users is satisfied. The allocation associated with this choice of social preferences can be arrived at by choosing, say through a parameter α, the corresponding income distribution within the set of Pareto-optimal allocations

$$(6) \qquad w(u,v,\alpha) = \alpha u + (1-\alpha)v.$$

Hence, from this on, α will be taken as parametric.[4] Note, however, that the income redistribution can go to either

direction.

One of the most evident personal costs of permanent drug consumption is the ruin of human capital which results in a reduction in labor productivity. It is convenient to model this feature through a fixed-coefficient (linear) transformation function, borrowed from Sandmo (1975) as

$$(7) \quad T = -[a_o^N(x_o^N+x_{od}^N) + (a_o^U(x_o^U+x_{od}^U)] + ax + a_dx_d = 0.$$

The marginal productivities of non-users $[a_o^N/a, a_o^N/a_d]$ can be assumed to exceed those of the users $[a_o^U/a, a_o^U/a_d]$. With a proportional correction, the two inputs are perfect substitutes. It would be a natural extension of the model to endogenize the marginal producitivities of the non-users by allowing them to be functions of x_d^U.

Given that the optimal income distribution is determined through (6), the social planner would choose the allocation arising from the following maximization problem

$$(8) \qquad \max_{\{x_o^N, x_{od}^N, x^N, x_d^N, x_o^U, x_{od}^U, x^U, x_d^U\}} L = \alpha u + (1-\alpha)v + \mu_o T$$

where $\mu_o > 0$ is the social shadow price generated by the production constraint. The social optimality conditions are then given by

(9a) $\delta x^N/\delta x_o^N = u_o/u_x = a_o^N/a$

(9b) $\delta x_d^N/\delta x_o^N = u_o/u_d = a_o^N/a_d$

(9c) $u_x/u_d = a/a_d$

(9d) $\delta x^U/\delta x_o^U = v_o/v_x = a_o^U/a$

(9e) $\delta x_d^U/\delta x_o^U = v_o/v_d = a_o^U/a_d$

(9f) $v_x/v_d = a/a_d$

(9g) $\alpha/(1-\alpha) = v_x/u_x = v_d/u_d = (v_o/u_o)(a_o^N/a_o^U)$.

Optimality requires equality between the marginal rates of transformation and the marginal rates of substitution over both commodities and the four labor inputs. Note that the supply prices of labor (9a), (9b), (9d) and (9e) are different in the x and x_d sectors.

Given that $u_d < 0$ but that negative consumption is excluded, (9b) and (9c) cannot hold in equilibrium as cannot the second equality in (9g), either. These three conditions are henceforth excluded. But with no danger of confusion, the more constrained equilibrium satisfying $x_d^N = 0$ and the rest of the conditions (9a)-(9g) will be called here the first-best full planning optimum.

It is worthwhile to make the following points here. First, given that $v^o > 0$ (and hence $\alpha > 0$), the planner would indeed allocate some labor input for production of drugs. Second, in the social optimum, both groups "finance" their own consumption by themselves. The equilibrium would be more complicated if non-users were required to finance the consumption of users, too

(say, if the productivity of the latter were completely destroyed).

III Market Allocation

Friedman's well-known thesis on liberalization of private distribution of drugs will here be mimiced by the free market allocation in the absence of government. Given that some externalities will be associated with the market allocation to be characterized below, it does not sound as any novelty to claim that the allocation is inefficient. But it appears worthwhile to be specific about these externalities. The inefficiency of the market solution could alternatively be motivated on the basis of monopolistic competition in the production sectors. But this is not the point here.

In the pure market solution, there is no planner nor any government. The consumer and producer prices are denoted by vectors $P = (P_o^N, P_{od}N, P_o^U, P_{od}^U, P_x, P_d)$ and $p = (p_o^N, p_{od}^N, p_o^U, p_{od}^U, p_x, p_d)$ respectively. Note the there are altogether four prices of labor because there are two production sectors with two heterogenous labor inputs.

The externality of Type II will be modelled with an interplay of the budget constraints of the non-users and users through parameter π, which is the size of the street tax:

$$(10a)\quad -(P_o^N x_o^N + P_{od}^N x_{od}^N) + P_x x^N + P_d x_d^N + \pi = 0$$

$$(10b)\quad -(P_o^U x_o^U + P_{od}^U x_{od}^U) + P_x x^U + P_d x_d^U - \pi = 0.$$

This appears to be a natural way of modelling the non-Paretian income transfer due to thefts. It also makes the matters more straightforward for the purposes of the subsequent analysis when an assumption

$$(11)\qquad \pi = P_d x_d^U$$

is made. Hence, the users solve their liquidity problem by fully financing their drug consumption from outside financing. Working with an interior "debt to equity" ratio would not seem to add any new insight.[5] Thus, it is the market value of the total drug consumption, not the quantity that provides the relevant measure of the externality of Type II.[6] Note that then the last two terms disappear from the users' budget constraint (10b).

The demand side of the market solution can now be found by allowing both the non-users and users to maximize their utilities under their budget constraints:

$$(12a)\quad N:\ u_o/P_o^N = \beta^N/\theta,\ u_x/u_o = P_x/P_o^N,\ x_d^N = 0,\ P_o^N = P_{od}^N$$

$$(12b)\quad U:\ v_o/P_o^U = \beta^U/\theta,\ v_x/v_o = P_x/P_o^U,\ v_d = 0,\ P_o^U = P_{od}^U$$

where $\beta^N > 0$ and $\beta^U > 0$ stand for the marginal utilities of income. Note that their equilibrium values are reduced by the

externality of Type II.

The equilibrium imposes several restrictions on the price vector which is required to support this equilibrium. First, the prices of labor have to be equalized within each group of consumers. Second, one of the prices has to be understood to be the numeraire. Third, production efficiency requires that firms price according to the marginal cost principle. Thus, producer prices should obey

(13a) $p_o^N/p_x = a_o^N/a,\ p_{od}^N/p_d = a_o^N/a_d$

(13b) $p_o^U/p_x = a_o^U/a,\ p_{od}^U/p_d = a_o^U/a_d.$

Necessary conditions for social efficiency include $P_o^N = p_o^N$, $P_o^U = p_o^U$, $P_x = p_x$ and $P_d = p_d$. But these conditions are not generally sufficient for social optimality.

Though the market solution satisfies Pareto-optimality, the resulting income distribution is socially suboptimal (except by chance) due to the street tax. Moreover, the street tax imposes a direct, adverse utility effect. Hence, the first-best cannot be achieved by the market mechanism:

Theorem 1. The production efficiency and liberalized consumption are not sufficient to make the free market solution socially optimal in the allocation of drugs. The market solution brings along negative externalities both of

Type II and III. []

The assumptions of constant returns and price taking do not characterize the actual production conditions in reality, where the deviations from the first-best are even more dramatic. It certainty would be correct to claim that more competition would limit the rents created and by implication, the magnitude of the externalities. But the latter could not be totally eliminated. Moreover, excessive amount of resources would be drawn to this sector. The equilibrium magnitude of the externalities would depend both upon the demand and supply conditions but in a conflicting way. The competitive real price would be potentially very low due to relatively low costs of production. This would limit the externality. But it can be taken for granted that the demand is quite inelastic - a matter which would tend to raise the externality.

IV Government Controls

The mere existence of market distortions does not per se justify government intervention. This section presents an analysis of the major implications of the standard governmental policies towards drugs. They have included both (i) making the production, distribution and consumption of drugs illegal (ii) collecting distortionary taxes to finance expenditures on law enforcement. The argument to be put forward is that this set of policy actions not only is highly inefficient but, under plausible conditions, actually is welfare-reducing relative to

the free market solution. This conclusion is not striking given the every-day facts in the major U.S. cities: in spite of the half-military actions against the drug sector, the gestimated catch rate hardly exceeds "the market rate of interest". In a word, the government has lost its war against drugs.

The microeconomic theory of public policy towards drugs should acknowledge the stochastic nature of the problem. The economic theory of crimes (Becker (1968)) suggests that the option is between controlling the probability of being caught, and alternatively, using the expected punishment from being caught as the preventive action. This choice no doubt has an impact on the pricing and distribution policies of private suppliers. For the purposes of the current analysis, it is sufficient to raise the point that, if anything, the government's control measures increase the nondiversifiable risk to the producers.[7,8]

The point will be made in the most simple way. Let g stand for resources allocated by the government to control measures operating like a negative externality on producers. Then the catch rate can be assumed to be positively related to g. The implied additional cost to producers, say s, is a positive function of g, $s = s(g)$ with $s'(g) > 0$. Then 'the unit cost' of output coming to the market place can be presented as

$$(14) \qquad a_d = a_d(s(g)) \qquad a_d' > 0.$$

Given marginal cost pricing, the increased risk will be priced

in the (black) market equilibrium price, $p_d(g)$, $p_d' > 0$. Moreover, given the saturation property, the higher street tax enhances the externalities to be born by the non-users. Nothing more is required to establish:

> Proposition 1. Direct control measures increase the producer's risk in the drug sector, hence raise the equilibrium price and substantiate the negative externalities born by the non-users of the society. The reduction in welfare is enhanced to the extent the government revenue is collected through distortive taxation. []

A natural counterargument arises that the control measures by the government contribute to the personal safety in general by imposing social discipline. But this is highly unlikely and does not seem to be corroborated by the empirical facts. The control measures seem to be highly inefficient when it comes to controlling the behavior in the drug sector because the tax payers evidently try to free-ride. The street tax is collected stochastically and the major impact of control measures seems to be redistribution of this tax.

If anything, the control measures seem to result in higher rather than lower street tax due to higher (black) market prices which seem to ration demand only to a limited extent.[9] It seems safe to conclude that substantial success in control would required use of resources far exceeding the level that the tax payers in any country so far have been willing to

finance.[10]

V Optimal Second-Best Policy

In the absence of the externality of Type III, the non-users are rather indifferent as between paying a parlamentary tax and a street tax (apart from the fact that the latter is stochastic and leaves room for free-riding). It is the externality of Type III which differentiates these taxes. In the current section, the question is raised to what extent the society might want to substitute a parlamentary tax for the street tax. However, the way the tax revenue is assumed to be utilized is rather unconventional.

The previous section presented an argument why tax-financed control measures are likely to reduce welfare. In face of this failure, let us look at the problem from a different angle. Study first the following hypothetical allocation:

(i) Assume that the production and consumption of drugs is legalized and that the production is carried out by the competitively organized production sector.

(ii) Assume (unrealistically) for a moment that the government can effectively control the market price of drugs and that it decides to set the market price, say p_d^*, below the social cost of production.

(iii) Assume that the government has access to a distortionary (parlamentary) tax only. It is assumed to collect commodity taxes on the normal goods at a rate τ so as to finance the required subsidy

$$(15) \qquad S = \tau p_x x = (c - p_d^*)x_d > 0$$

where c = unit cost. It is assumed that the tax rate cannot be differentiated with respect to different consumers.

The question is, under what conditions is it part of the optimal second best policy to tax the normal goods in order to subsidize the production of externality-yielding drugs. Is $\tau > 0$ socially optimal? Clearly, this problem falls in the gerenal field of optimal public pricing (cf. for example Hagen (1988) and the references therein).

As compatible with section II, take the social objective as

$$(16) \qquad w(u,v^*,\alpha) = \alpha u(1 - x_o^N - x_{od}^N,\ x^N,\ 0)\theta(\pi) + (1-\alpha)v^*$$

but allow for the saturation property i.e.

$$(17) \qquad v^* = v(1 - x_o^U - x_{od}^U,\ x^U,\ x_d^*)$$

with

$$(18) \qquad x_d^* = \arg\{v_d(x_d^U)\} = 0.$$

Let $V^U(\tau)$ stand for the corresponding indirect utility function of the users indicating that they also contribute to the tax revenue, $V^U_\tau < 0$.

Then the externality of Type II is given by $\pi = p_d^* x_d^*$. Solve then the non-users' problem under commodity taxation (note that the users have to solve a similar problem)

$$(19) \qquad \max_{\{x_o^N, x_{od}^N, x^N\}} L^N = u(1 - x_o^N - x_{od}^N, x^N, 0)\theta(\pi) + \beta^N[p_o^N x_o^N + p_{od}^N x_{od}^N - (1+\tau)p_x x^N - \pi].$$

The first-order conditions are

$$(20) \qquad u_o = \beta^N/\theta(\pi), \; u_x/u_o = (1+\tau)p_x$$

where $p_o^N = p_{od}^N = 1$ has been used as the numeraire. It follows from diminishing marginal utility that through the income effect, the marginal utility of income is increasing in the street tax. This effect is reinforced by the utility effect of the street tax. Thus, $\beta^N = \beta^N(\pi)$ with $\delta\beta^N/\delta\pi > 0$. Then conditions (20) imply

$$(21a) \qquad x^N = \underset{(-)(-)(-)}{x^N(\tau, \pi, \theta(\pi))}$$

$$(21b) \qquad x_o^N = \underset{(+/-)(+/-)(+/-)}{x_o^N(\tau, \pi, \theta(\pi))}$$

$$(21c) \qquad x_{od}^{N} = \underset{(+/-)(+/-)(+/-)}{x_{od}^{N}(\tau,\pi,\theta(\pi))}.$$

Substituting these expressions into the utility function gives the indirect utility as $V^N = V^N(\tau,\pi,\theta(\pi))$ where $\delta V^N/\delta\tau < 0$, $\delta V^N/\delta\pi < 0$ and $\delta V^N/\delta\theta < 0$.

The price subsidization scheme means that there will be a negative relationship between the street tax and the commodity tax rate to be solved as

$$(22) \qquad \pi = cx_d^* - \tau p_x x.$$

Then the government's (second best) problem can be cast in terms of indirect utilities as follows

$$(23) \qquad \max_{\tau,\pi} \alpha V^N(\tau,\pi,\theta(\pi)) + (1-\alpha)V^U(\tau) + \mu[\tau p_x x(\tau,\pi,\theta) - cx_d^* + \pi]$$

where $\mu > 0$ is the social marginal utility of tax revenue and where $x = x^N + x^U$. No claim, of course, is made that it is the government that sets the street tax. But it can calculate and hence implement it indirectly.

The first-order conditions are given by

$$(24a) \qquad \alpha[-V^N{}_\tau] + (1-\alpha)[-V^U{}_\tau] = \mu[x + \tau x_\tau]p_x$$

$$(24b) \qquad \alpha[-V^N{}_\pi] = \mu[1/p_x + \tau x^N{}_\pi]p_x.$$

The left-hand sides of (24a) and (24b) provide the marginal social costs of higher parlamentary and street taxes, respectively. The right-hand sides provide the marginal gains in terms of higher tax revenue (24a) and lower revenue requirement (24b), respectively. For brevity, the latter is denoted by $\phi = 1/p_x + \tau x^N{}_\pi$. The following notation has been introduced

$$x_\tau = \delta x^N/\delta\tau + \delta x^U/\delta\tau < 0$$
$$V^N{}_\tau = \delta V^N/\delta\tau < 0, \; V^U{}_\tau = \delta V^U/\delta\tau < 0$$
$$V^N{}_\pi = \delta V^N/\delta\pi + V^N{}_\theta\theta_\pi < 0$$
$$x^N{}_\pi = \delta x^N/\delta\pi + (\delta x^N/\delta\theta)\theta_\pi < 0$$

The last two expressions indicate that the utility effect of the street tax reinforces its income effect. Note that in (24b) $x_\pi = x^N{}_\pi$ because there is no corresponding income effect for the users.

From (24a) and (24b), the social marginal rate of substitution between the parlamentary tax and the street tax, say $\Gamma = -d\pi/d\tau$, is equal to

$$(25) \qquad \Gamma = [x + \tau x_\tau]/\phi$$

where $\Gamma = [\alpha V^N{}_\tau + (1-\alpha)V^U{}_\tau]/\alpha V^N{}_\pi$. Since τ is the relative tax wedge between the producer and consumer prices, Roy's identity can be used to solve for $V^N{}_\tau = -\beta^N{}_x x^N p_x$ and $V^U{}_\tau = -\beta^U{}_x x^U p_x$.

Moreover, since $\delta V^N/\delta\pi$ can be identified with the negative of the income effect, $V^N{}_\pi = -\beta^N + V^N{}_\theta\theta_\pi$. Thus, the marginal rate of substitution reads as

$$(26) \qquad \Gamma = p_x[\beta^N x^N + (1-\alpha/\alpha)\beta^U x^U]/[\beta^N - V^N{}_\theta\theta_\pi].$$

For gaining some intuition over equations (25)-(26), consider all other parameters for a moment as if they were constant and let the government raise its tax rate τ starting from $\tau = 0$. Initially, there will be a relatively large gain in terms of a reduced street tax while the loss due to the higher parlamentary tax is relatively small. This is because of the concavity of the $\theta(\pi)$ function. When more substitution is carried out, the absolute value of θ_π becomes smaller and smaller. During this fictitious adjustment process, the marginal rate of substitution Γ starts growing from a "small" number to become equal to (25) which gives the tax optimum. In terms of Figure 1, this mechanism is represented by movement from (π_3,θ_3) to, say (π_1,θ_1).

In (25), $x_\tau = (\delta x/\delta P_x)(\delta P_x/\delta\tau) = p_x\delta x/\delta P_x$. Use the Slutsky equations $\delta x^j/\delta P_x = \delta h^j/\delta P_x - (\delta x^j/\delta M)x^j$ for $j = N,U$ where the h's are the compensated demands and M stands for income. Then (25) and (26) can be used to solve explicitely for the optimal tax rate

$$(27) \qquad \tau^* = (x - \Gamma p_x)/p_x[(\delta x^N/\delta M)x^N + (\delta x^U/\delta M)x^U - (\delta h^N+\delta h^U)/\delta P_x + \Gamma x^N{}_\pi].$$

Equation (27) will be used to characterize the tax optimum as follows. The results to be derived, however, are conditional on the condition $p_x x - \Gamma > 0$. This suggests that a positive optimal commodity tax rate is only obtained if the tax base is sufficiently large.

Theorem 2a. The optimal tax rate τ^* is positively related to the magnitudes of the externalities of Type II and Type III. []

These externalities will appear in the denominator of (27) as the income effect and the utility effect, $x^N_\pi = \delta x^N/\delta\pi + (\delta x^N/\delta\theta)\theta_\pi < 0$. The stronger both of these effects are, the greater is the optimal commodity tax rate τ^*. It should be pointed out that the utility effect has an ambiguous effect on Γ, too (cf. (26)), which may or may not partly offset the mechanism resulting from the adjustment of τ^* to x^N_π. (We assume here that it does not, however, reverse this mechanism).

Theorem 2b. The optimal tax rate τ^* depends on the relative weight obtained by the users and non-users in the social welfare criterion as follows: $\delta\tau^*/\delta\alpha > 0$ if $x_\tau/x^N_\pi < p_x x$. []

The proof is to differentiate (27) with respect to α and note that $\delta\Gamma/\delta\alpha = -V^U_\tau/\alpha^2 > 0$. The intuitive explanation for this result is that the distortion caused by the tax shall not exceed the gain for the non-users of a lower street tax.

Theorem 2c. The optimal tax rate τ^* is negatively related to the sum of the unweighted income effects and the sum of the compensated own price effects from the commodity tax. []

This follows directly from (27). Note that the magnitude of the compensated price effect obviously depends upon the substitutability between leisure and the commodities x.[11]

VI Program Towards Drugs

Over the long run, substantial changes have taken place in the drug culture. In earlier non-industrialized and non-urbanized societies, consumption of the flora-based drugs substantially derived from medical purposes and was mostly limited to adult consumers. Today, drugs belong to the consumption basket of a large number of people in urbanized societies.

Statistically, more than half of crimes in the streets of the major cities are drug-related. Of course, the gang-oriented distributors ravage each other, too, in battles for the market shares. Indirectly, that boosts the externalities if monopoly power is strenghtened. The control measures only seem to make things worse by raising the economic risks of the producers. The theory of optimal taxation suggests that pure economic rents should be taxed away. These rents are bound to be quite substantial in the drug sector where the cost of production is quite limited and where the demand is quite inelastic for

permanent consumers. This all suggests that there is a substantial gap between the equilibrium black market price and the socially optimal price. This paper has suggested use of Pigouvian taxation as the corrective measure. Having the marginal productivity of drug consumers depend on drug consumption would reinforce the case for Pigouvian taxation.

Our analysis has rejected Friedman's proposal as it stands: the market solution to the drug problem is highly inefficient. The previous sections, however, accepted Friedman's idea of liberalization though in quite a different meaning. Unlike Friedman, government intervention in the form of price subsidy is introduced. Is there a feasible way to implement this idea? In the suggested program below, the aim will be restricted to the elimination of the externalities while letting the price ration entry of new consumers.

Given that there is very little hope of changing the preferences of permanent drug consumers, the question has to be raised of the optimal production and pricing. The above analysis suggests that the production could be organized in two alternative ways. First, the government could allow competitive private production to be bought by the monopsonist goverment. Second, and alternatively, if the government has access to the same production technology as has the private sector, the whole output of drugs could be produced by the government (alternatively bought from the producer countries' governments). Consumption should be legalized but unlike Friedman suggested,

distribution should be conducted by the public sector instead of profit-seeking private distributors.

The idea of controlled distribution is the key. This means that one should consider units like the existing network of public medical centers as the obvious candidates for taking responsibility for distribution at least of strong drugs - but in a way which excludes second-hand trading.

The problem is that there are two types of consumers. Aggregate demand for drugs at any given point in time consists of the demand by the permanent consumers and the demand by the newcomers. The permanent users do not have any reputation costs from consuming in controlled environments. The situation is different with the newcomers - mostly young people. Moreover, the consumers are segmented in the sense that the demand by the latter group quite evidently is price elastic and is directed towards consumption of milder drugs. When studying the problem of the latter group, there are three essential mechanisms to be noted. One is the cost of organizing private markets. The second is the dependence of the markets for strong drugs on the markets for mild drugs. The third is the pricing policy of private dealers which tends to make drugs display the characteristics of a Giffen good through price discrimination.

Public distribution of drugs for permanent users destroys the two last-mentioned mechanisms. The dealers charge a lower price for newcomers in order to create dependence (utilizing

the time-inconsistency of the consumers) and to have a higher discounted payoff on the subsequent consumption. Were it the case that the demand by permanent users could be satisfied from public distribution, the "second-period" payoff of dealers would disappear and they would have to charge a price covering all the costs in the "first period". Since the demand by newcomers is price-elastic, there would be a standard price effect which rations the demand, i.e. new entrants to the market. Moreover, to the extent that there are economies of scale in the costs of organizing the markets for mild and strong drugs, public intervention in the market for strong drugs would raise the fixed costs of running markets for milder drugs. This would also tend to raise the black market price.

The model of the current paper did not differentiate the different types of drugs but was focused on those which give rise to most serious externalities. Even if the current externalities caused by the newcomers and other consumers of mild drugs are rather limited, the situation is different if and when they turn to stronger drugs. If only for this reason one would like to minimize the flow of new consumers. Given that newcomers not only start with mild drugs but also evaluate the reputation costs of entering the public distribution system there is a possibility for the government to use price discrimination. Here we come close to Friedman's suggestion, though we find it more appropriate that it is the government which takes care of the distribution. Selling mild drugs at a price dictated by the costs of organizing private markets

eliminates the latter and rations demand by the maximum amount. Interesting enough, what this price dispersion means is nothing more than the Ramsey-rule, though on its head. One additional limitation for pricing to be recognized, however, is the potential for home production by the consumers. This discussion suggest that a natural solution to the U.S.-Columbia problem has the following ingredients: the Columbian government sets up its own production of cocaine, sells the output to the U.S.government, and the latter organizes the retail market in the U.S. cities.

The social benefits of the allocation scheme described above should be clear. The addicts could get the required help if they decide to break their dependence. The spread of the virus deseases would be effectively reduced. The private markets would collapse because there would be no customers. The crime rates in major cities would drop dramatically. In a sense, the program above would turn an externality-creating private good into a more or less externality-free public good.

Footnotes:

1. If only the personal costs of drug consumers are taken into account, the societies should pay much less attention to drugs than to, say alcohol or smoking. Wagstaff and Maynard (1984) report that in 1982 only 142 died due to misuse of drugs in the UK. At the same time, 5000 people died because of alcoholism while about 100.000 died prematurely from cigarette smoking.

2. One should point out that Friedman (1983) is not very explicit in what his proposal actually means as far as the implementation is concerned. He makes highly valid points about improving the quality of drugs entering the market, reducing the pushes, reducing the attractiveness of forbidded fruit, reducing the risks for the users etc. But his main theme about uncontrolled liberalization has an ambiguous effect on the equilibrium price because liberalization means a reduction both in the risks of suppliers and demanders. Thus, the impacts on the supply price and on the demand price are the opposite. It will turn out that where our avenues part is in the desired role of the government.

3. To make it more precise, the term stable society means stable preferences. Hence, the focus is on steady state allocations. "Migration" between the two groups would reflect time-dependent preferences. Indeed, as suggested by Atkinson (1973) in another context, future preferences may depend upon

current consumption decisions. In the case of drugs, this effect is more relevant than perhaps anywhere else. Moreover in a multi-period setting, the future labor productivity depends adversely on current drug consumption.

4. Most people would presumably argue strongly in favor of a paternalistic welfare criterion based on the merit good argument (cf. Besley (1988)). This is a special case from our utilitarian approach and is obtained by imposing $\alpha = 1$.

5. The microeconomics of the drug consumption might want to view the theft technology as a labor and time intensive one with public controls interferring as a negative externality. The approach adopted here, however, emphasize the ineffeiciency of public controls and this does not seem to make too much violence for the reality.

6. An additional source of sub-optimality of the market solution is created if the non-user segment of the population is assumed to devote some of its own resources for safety and personal protection. It is only for the reasons of simplicity that this additional distortion is not introduced in the current model.

7. The striking aspect of drug production is that the producers' risks are rather limited. First, demand is completely free of cyclical risks and totally uncorrelated with the rest of the markets. Second, though some forms of drugs are sensitive to

weather conditions, the technological shocks are almost non-existent. Would a production unit be required to be established, the capital costs would hence require no risk premium; the required rate of return would closely match that of a risk-free asset. In terms of the CAPM, the beta coefficient is zero.

8. At the top of the increased business risk one should add the potential bribes collected by the officials.

9. Wagstaff and Maynard (1988) report that the demand structure of different types of groups is to some extent price elastic. It does not, however, follow that the price elasticity of the aggregate demand for drugs would be high.

10. Polich et. al (1984) concludes that in the U.S. even large increases in drug enforcement expenditures would be unlikely to reduce consumption of cocaine and marijuana.

11. As in the Ramsey-rule, the price elasticity of demand is here central. Our rule, however, is: The more inelastic is the demand for the normal good, the larger is the optimal subsidy on the good causing externalities.

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