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ABSTRACT

Heroin has been a prohibited substance in Australia since the early 1950s. Prohibition, combined with a continued demand for the drug, has spawned a profitable black market. This paper presents a framework for evaluating the net welfare effects of heroin consumption under prohibition, a task made more difficult because of the co-existence of addicts and casual users. It is assumed that both groups enjoy positive net benefits from their heroin consumption, but the former impose external costs which derive from their addiction. Prohibition reduces heroin addiction but also the surpluses of both groups. Furthermore, whilst prohibition may reduce quantity related social costs, it may increase price related social costs.

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"Social policy may be making the price of heroin too high"

(Erickson, 1969).

I INTRODUCTION

Heroin has been a prohibited substance in Australia since the early 1950s. That is its importation, production[1], supply and consumption are proscribed by law and punishable by sanctions which include lengthy prison sentences. Of course Australia is not alone in its fight against heroin as similar policies exist in many other countries. The objective of this policy is to protect consumers from a commodity which is addictive and considered inherently dangerous. However, standard welfare theory suggests that all consumers enjoy positive net benefits from consumption[2], in the form of consumer surplus[3]. Determining the welfare effects of heroin consumption is complicated because of the existence of casual users as well as addicts, and because of the effects of the prohibition.

Casual users of heroin may be defined as consumers who can control their use of the drug, perhaps going on an occasional consumption spree. In many respects they may be regarded as analogous to social alcohol drinkers. On the other hand addicts may be defined as consumers with a behavioural pattern characterised by an overwhelming preoccupation with the use of the drug and the securing of its supply. From the point of view of maximising social welfare, addicts are a complicating factor because whilst they may be benefiting personally from their consumption of heroin, they may also be imposing costs on society which derive from their addiction. Reducing the consumption of heroin by addicts may reduce these external costs but will also reduce their surplus. If the consumption of heroin by addicts is to be reduced by a policy of prohibition then the consumption, and thus surplus, of casual users will also be diminished. Furthermore, whilst prohibition may reduce total heroin consumption and so quantity related external costs, it also results in a higher black market price for heroin and so may increase price related external costs. Thus the net social cost effect of the prohibition is *a priori* ambiguous.

This paper presents a framework for evaluating the net welfare effect of heroin consumption under prohibition, following closely but modifying the work of Pogue and Sgontz (1989) for alcohol. Section II presents the basic model which is then used to establish the equation for determining the social welfare optimising per unit price of heroin in Australia. Section III presents estimates of the various parameters involved and the resultant optimal prices. Section IV discusses the sensitivity of the results to changes in the parameter estimates whilst criticisms and concluding comments are presented in section V.

II THE MODEL

Calculating the net social welfare effect arising from the consumption of heroin under a policy of prohibition is a difficult task. As a first step, suppose that the consumption of heroin is not prohibited and there exists two types of heroin consumer, addicts and casual users, who are identical in all respects except for their demand for heroin. In Figure 1 the demand curve for the typical addict is D_A whilst that for the typical casual user is D_N. Suppose also that heroin is a homogeneous product available in unlimited quantities at a constant per unit price equal to long run marginal and average cost, p.

Heroin consumption by casual users is assumed to result in no costs additional to the value of production and distribution. However, that by addicts is assumed to result in additional internal and external costs. The former may include increased morbidity and private medical expenses, emotional and physical pain, and lost income. The latter may take the form of injury to others and losses of or damage to their property, increased social welfare payments and reduced industrial productivity.

The demand curve D_A assumes that the addict correctly accounts for all internal costs of excessive consumption, that is the effect of heroin consumption on her well-being. These costs are not welfare relevant. However, external costs resulting from property losses, social welfare payments and reduced industrial productivity are welfare relevant. For instance, increased social welfare payments, although pure income transfers, are welfare relevant if they result in increased rates of current or future taxation. Browning (1987) shows that the marginal welfare cost of taxes on labour earnings, whilst difficult to estimate accurately, are nevertheless positive. Tullio (1987) reaches a similar conclusion whilst King and Rebelo (1990) conclude that the "...influence of taxation on the rate of economic growth has important (negative) welfare implications" (p.s 126, brackets ours). If, on the other hand, the government were to fund the increased social welfare payments by reducing their financial commitments to other programs, this would cause hardship to the beneficiaries of these programs and so welfare losses would still accrue.

Losses to industrial productivity due to heroin addiction are also welfare relevant if wages are less than marginal productivity. However, even if this were not the case, where positive production externalities exist between employees, losses from chronic absenteeism on the part of the addict may be greater than merely the value of her marginal physical product.

The summation of these external costs are represented in Figure 1 by the vertical distance between the p and (p+e) schedules, such costs approaching zero at lower levels of consumption. This magnitude, shown as e in Figure 1, is the marginal external cost imposed on society at each level of consumption. Under these assumptions the typical casual user consumes q_n per unit time whilst the typical addict consumes q_a per unit time and imposes on society a marginal external cost equal to $YE per gram of heroin per unit time.

Now suppose that heroin is declared a prohibited substance and that, for simplicity, the cost of enforcement is negligible. According to Miron and Zwiebel (1991),

> There are several channels through which prohibition may affect....consumption. First, prohibition increases supply costs, as these must include the cost of evading detection and the potential cost of punishment...Second, prohibition inhibits consumer access...by raising search costs, making quality dubious, and increasing the possibility of being cheated. Third, prohibition may create a prevailing sentiment that a certain commodity is 'bad' or 'immoral', thereby decreasing consumer demand. Finally, prohibition may deter some individuals' consumption because of 'respect for the law' (p.245).

The first of these is a supply-side price effect. In Figure 1 this increases the retail price of heroin by h per unit, to (p+h) per unit. The other three effects are on the demand-side, have been summed and classified a deterrent effect, and so result in a leftward shift of the demand curves in Figure 1 to D_A^* for the addict and D_N^* for the casual user.

A further impact of the prohibition is to increase marginal external costs. This is so because the higher, now black market price of heroin increases the pecuniary costs of addiction and may thus induce addicts to commit crimes to finance their addiction. Becker (1968) has shown that crime is welfare relevant as the estimated value of resources used up in crime is not identical to their net social cost because "...the cost of 'transfers' like burglary and embezzlement excludes social attitudes toward forced wealth redistribution and also the effects on capital accumulation of the possibility of theft" (p.174).

Furthermore, prohibition of heroin supply is likely to generate supply-related crimes. These could involve official corruption, violence among heroin suppliers struggling for market domination, etc. These are welfare relevant because they

> "... lead to a loss of certainty and fairness in the administration of law, which is a real and significant cost" (Baldry 1993).

The prohibition may also result in greater losses of industrial productivity as addicts spend more time looking for heroin on the black market and/or committing crimes to finance their addiction, thus spending less time in legal productive activities. These effects are represented in Figure 1 by an upward shift of the marginal external cost curve to $(p+e)_p$.

The first issue to be resolved is the net effect of the prohibition on the consumer surplus of casual users whose surplus prior to the prohibition is pAK. Under prohibition the price effect raises the retail price of heroin to (p+h) per unit with consumer surplus falling to (p+h)FK. The deterrent effect reduces surplus further to (p+h)DL. The price effect results in a loss of surplus equivalent to FAR. The deterrent effect further reduces surplus by an amount equivalent to FKLD. Both of these prohibition induced losses are welfare relevant. However, in the interests of simplicity, we assume that the net impact of the prohibition on casual users is to reduce their consumer surplus by FAR only[4]. An analogous argument can be made in the case of the heroin addict, the welfare relevant loss of surplus in this case being MEP only.

The second effect which needs to be considered is the impact on total external cost, firstly due to the decreased heroin consumption of addicts, and secondly due to the increased marginal external cost curve. Prior to the prohibition, the addict was in equilibrium at E, imposing a marginal external cost on society of $YE per gram of heroin consumed per unit time. The prohibition moves the addict to C, with marginal external cost now $IB. The prohibition has thus reduced total external cost by (XYEB) - Δe. The shaded area Δe represents the partial increase in total external cost, both consumption and supply related, due to the prohibition induced price increase for heroin.

The net welfare gain from prohibition, W, thus equals the net reduction to external cost less the reductions to the consumer surpluses of casual users and addicts. That is, from Figure 1:

$$W = (BXYE)N_A - (eN_{A*} - (MEP)N_A - (FAR)N_N \qquad (1)$$

where N_A is the number of addicts pre-prohibition, N_{A*} is the number of addicts post-prohibition and N_N is the number of casual users pre-prohibition.

Two further issues must now be considered. Firstly, to estimate the size of BXYE in Figure 1 the total reduction in addict consumption, q_a-q_a^*, must be known. The reduction due to the price effect alone, q_a-q_a', can be estimated using the percentage price change and the relevant elasticity. Figure 1 has been constructed so that the reduction due to the deterrent effect alone, q_a'-q_a^*, is exactly equal to that due to the price effect, q_a-q_a'. In general this will not be the case, rather $(q_a'-q_a^*) = n\ (q_a-q_a')$ with $n \geq 0$[5]. Figure 1 depicts the special case where n=1.

The second issue concerns the relative size of Δe. In general it will be the case that $\Delta e = m\ (BXZP)$ with $m \geq 0$. That is, the partial increase in external cost due to the prohibition induced higher price of heroin will be some proportion m of the partial decrease in external cost due to the prohibition induced deterrent effect.

Given these simplifying assumptions, equation (1) may be re-written as follows:

$$W=E_1[(h/p)\eta_A Q_A]+E_2[(nh/p)\eta_A Q_A]-m[E_2[(nh/p)\eta_A Q_A]]-$$

$$0.5[(h/p)\eta_A Q_A]-0.5h[(h/p)\eta_N Q_N] \qquad (2)$$

where E_1 and E_2 are the marginal external costs per gram of heroin per unit time *averaged* over the change in consumption from q_a to q_a' and q_a' to q_a^* respectively, η denotes the relevant own price elasticity of demand, $Q_A=q_aN_A$, $Q_N=q_nN_N$, and h, p,n and m are as previously defined.

The first order condition for maximising W with respect to h is:

$$\delta W/\delta h=E_1/p(\eta_A Q_A)+n(1-m)E_2/p(\eta_A Q_A-$$

$$h/p(\eta_A Q_A)-h/p(\eta_N Q_N)=0 \qquad (3)$$

Solving (3) for h/p gives the welfare maximising *ad valorem* price increase for heroin under a policy of prohibition:

$$h/p=[E_1+n(1-m)E_2)/p][1/1+(n_N Q_N/\eta_A Q_A) \qquad (4)$$

III ESTIMATING THE OPTIMAL PRICE OF HEROIN IN AUSTRALIA

In order to calculate (p+h) from (4) we need estimates of p, n, m, E_1, E_2, η_N/η_A and Q_N/Q_A. Unfortunately little reliable data exists with regard to heroin under prohibition because of the clandestine nature of the market. Hence the parameter estimates discussed below and presented in Table 1 should be treated with considerable caution.

Table 1
Optimal Prices of Heroin Under Prohibition and Alternate Parameter Assumptions

p	n	m	E_1	E_2	eln/ela	Qn/Qa	H/P	H+P
12	0.1	0.1	20	20	1	0.31	1.39	28.64
12	0.1	0.1	20	20	2	0.31	1.12	25.46
12	0.1	0.1	20	20	4	0.31	0.81	21.73
12	0.1	1	20	20	1	0.31	1.27	27.27
12	0.1	1	20	20	2	0.31	1.03	24.35
12	0.1	1	20	20	4	0.31	0.74	20.93
12	0.1	10	20	20	1	0.31	0.13	13.53
12	0.1	10	20	20	2	0.31	0.10	13.23
12	0.1	10	20	20	4	0.31	0.07	12.89
12	1	0.1	20	20	1	0.31	2.42	41.01
12	1	0.1	20	20	2	0.31	1.95	35.46
12	1	0.1	20	20	4	0.31	1.41	28.96
12	1	1	20	20	1	0.31	1.27	27.27
12	1	1	20	20	2	0.31	1.03	24.35
12	1	1	20	20	4	0.31	0.74	20.93
12	1	10	20	20	1	0.31	-10.18	-110.14
12	1	10	20	20	2	0.31	-8.23	-86.77
12	1	10	20	20	4	0.31	-5.95	-59.43
12	10	0.1	20	20	1	0.31	12.72	164.67
12	10	0.1	20	20	2	0.31	10.29	135.46
12	10	0.1	20	20	4	0.31	7.44	101.29
12	10	1	20	20	1	0.31	1.27	27.27
12	10	1	20	20	2	0.31	1.03	24.35
12	10	1	20	20	4	0.31	0.74	20.93
12	10	10	20	20	1	0.31	-113.23	-1,346.78
12	10	10	20	20	2	0.31	-91.56	-1,086.77
12	10	10	20	20	4	0.31	-66.22	-782.64

Note: when E_1=25 and E_2=100, h/p=0. This is an unlikely case and so has been omitted.

To determine p, the per gram retail price of heroin, one must consider the type of market which is assumed to exist pre-prohibition. Many possibilities exist. In this paper it is assumed that a pre-prohibition market is one where no controls exist on the supply of, and demand for, heroin.[6] In such a market p represents the long run marginal and average cost of production in a competitive market. Because of the prohibition, direct data on heroin production costs in a free Australian market do not exist. Perhaps a reasonable estimate of p may be obtained from information of the 'landed' price of heroin in Sydney, most of which originates from East Asian countries where it is purchased by importers and then on-sold to domestic wholesalers.

According to Dobinson and Poletti (1988), the purchase price of 1 kg of 85% pure[7] heroin in Bangkok was $12000-$15000, or $12-$15 per gram. The importer would then sell this kilogram of heroin 'uncut' to a wholesaler in Sydney for $200-$250 per gram. This massive gross return on the importation of heroin into Australia most likely reflects both the risk premium which is imposed by the importer and the preparedness of heroin consumers, captured by their addiction, to pay.

The purchase price in Bangkok is also most likely inflated because of the risks faced by the cultivators of opium and the manufacturers of heroin. In a free Australian heroin market, production would be unencumbered by such risks. Suppliers would be free to use the lowest cost production methods and transportation costs to the major population centres would be negligible. The efficiency gains available to domestic producers, over those of South East Asia, due to the availability of technologically advanced production methods and equipment would probably outweigh the losses due to higher labour costs. Hence we could expect that the wholesale price in a free domestic market would be less than $12 per gram. However, without more specific information, we assume that p=$12 per gram.[8]

The parameter n represents the reduction in heroin consumption due to the deterrent effect relative to that due to the price effect. In Figure 1, $n \equiv (q_a'-q_a^*)/(q_a-q_a')=1$. As mentioned previously this has been done for illustrative purposes only. If it were the case that $n<1$, that is that the deterrent effect is less than the price effect, then individuals would respond more to price considerations than to moral/legal ones[9]. The converse would be the case if $n>1$. Little reliable information exists regarding the strength of the deterrent effect relative to that of the price effect for heroin. For estimation purposes we make three assumptions in turn, that the deterrent effect is much weaker/the same as/much stronger than the price effect, that is that $n=0.1/n=1/n=10$ respectively.

The parameter m represents the increase in external costs caused by the prohibition induced price increase for heroin relative to the decrease in external costs caused by the prohibition induced deterrent effect. In Figure 1 $m= \Delta e/BXZP$. Once again little reliable information exists regarding the magnitude of m. If it were the case that $m>1$ then the increase in external costs caused by the prohibition induced price increase would be greater than the decrease in external costs caused by the deterrent effect. Conversely for the case of $m<1$. The magnitude of the heroin price increase caused by the prohibition probably results in a large increase in the number of crimes committed to finance addictions, with associated spin-offs into police corruption, etc. Hence it is plausible that m is greater than one. Nevertheless for estimation purposes we again assume in turn that $m=0.1$, $m=1$ and $m=10$.

The parameters E_1 and E_2 represent the marginal external cost of heroin addiction per gram of heroin per unit time pre-prohibition, averaged over q_a to q_a' and q_a' to q_a^* respectively. A number of studies have attempted to quantify the external costs of heroin consumption[10]. Unfortunately these studies relate to heroin consumption under prohibition and so are not particularly useful here. Marks (1992) notes that the typical heroin addict consumed approximately 98 grams of heroin in 1981. Naturally this would have been at a relatively high per unit price. Nevertheless if the demand for heroin is own price inelastic then we may expect that the consumption level of a typical addict faced with a free market price of $12 per gram might not be proportionately greater. This point is reinforced by the fact that whilst there must exist some minimum quantity of heroin which must be consumed by an addict per unit time to satisfy her addiction, there must also exist a maximum quantity compatible with continued life. If it is the case that most addicts currently consume quantities of heroin which are close to the minimum, and if the gap between the minimum and maximum is not too great then total heroin consumption levels may not increase substantially with a free market for heroin.

This is supported by the findings of Miron and Zwiebel (1991) concerning alcohol consumption in the United States during prohibition. They conclude that "...while alcohol consumption declined sharply at the onset of Prohibition, within several years it rebounded to 60-70 percent of its initial value *and did not increase substantially immediately following the repeal of Prohibition*", (p.246, italics ours).

If this is the case then the typical heroin addict in a free heroin market would be faced with an annual consumption cost which would be quite comparable to that currently incurred by some alcohol or tobacco consumers. Hence it is conceivable that the crime component of recent estimates of the social cost of heroin consumption would be greatly reduced[11]. This leaves external costs associated with heroin overdoses[12], automobile accidents, reduced industrial productivity and the like. In this sense then it is conceivable that the external costs of heroin consumption per addict within a free heroin market would be comparable to that of a typical alcohol abuser.

Pogue and Sgontz (1989) conservatively estimate that external alcohol abuse costs in the United States totalled \$26.1 billion in 1983, an average of \$127 per gallon of ethanol. This implies that approximately 205.5 million gallons of ethanol were consumed by alcohol abusers in 1984, who amounted to about 10% of the adult population. Hence in 1984 there were approximately 18 million alcohol abusers in the United States who each consumed approximately 11.4 gallons of ethanol and hence imposed, on average, \$1450 of external costs on society. If this figure is applicable to the typical heroin addict in a free Australian market consuming approximately 100 grams per year then, after adjusting for inflation, E_1 would be approximately \$20[13]. Again for the sake of simplicity we assume that $E_1=E_2$.

A number of researchers have attempted to estimate the own price elasticity of demand for heroin (see, for example, White and Luksetich (1983) and Silverman and Spruill (1977)). It appears that no generally accepted figure exists, although in a recent study C. van Ours (1995) finds that the long term price elasticity for opium use in the Dutch East Indies in 1923-38 was about -1.0. Similar figures have been obtained with regard to the demand for tobacco and heavy gambling (see Becker, Grossman and Murphy (1990) and Mobilia (1990) respectively). Whilst it is possible that addicts and casual users are equally responsive to price changes, it is likely that the latter are more responsive than the former. We thus follow the approach of Pogue and Sgontz (1989) with regard to alcohol and allow, in turn, η_N/η_A to take three possible values in absolute terms: 1.0, 2.0 and 4.0.

Marks (1992) suggests that addicts consumed 2940kgs of heroin whilst casual users consumed 900kgs of heroin (p.539). Whilst these estimates were made with a prohibition in force, we assume that the proportional consumption of casual users to addicts would be unchanged without prohibition. We thus assume that $Q_N/Q_A \cong 0.31$.

These parameter estimates, and the subsequent calculations presented in Table 1, must be treated with considerable caution because of the many uncertainties and simplifications which the preceding brief discussion has highlighted. Nevertheless, the resultant values of h/p and h+p are presented in Table 1 where the column heading for η_N/η_A is eln/ela.

The results of Table 1 suggest that the optimal per unit price for heroin under prohibition lies in the range \$165 to \$-1347, depending on the assumed values for the various parameters in equation (4). The lower bound of this range in particular requires explanation. Also, it is important to ascertain the magnitude and direction of the effects of variations in the parameter estimates on the optimal price for heroin.

Firstly, $\delta(h/p)/\delta(\eta_N/\eta_A)<0$, that is the more responsive to heroin price changes are casual users than addicts, the lower the optimal price. This is so because the greater the relative response of casual users to heroin price increases, the greater the net loss of consumer surplus and thus welfare because of prohibition induced heroin price increases. Thus the greater this ratio, *ceteris paribus*, the lower the optimal price.

Secondly, the greater the relative size of the price induced increase in the external cost curve, m, the lower the optimal price, *ceteris paribus*. This is so because a higher value for m implies that price induced external costs of addiction, in the form of official corruption and violence, etc., are higher for any given price increase following the imposition of prohibition. Thus the optimal price is lower.

Thirdly, the greater the relative size of the deterrent effect, n, the greater the optimal price, *ceteris paribus*. This is so in this model because the deterrent effect is assumed to have no consumer surplus implications. That is, consumer surplus losses because of inwards shifts of the demand curves following prohibition have, for the sake of simplicity, been ignored. Thus in this model the deterrent effect is welfare enhancing because it results in less consumption by addicts and hence less external costs.

Finally, negative optimal prices, indicating that heroin consumers should be subsidised, appear in the case of a very large price induced shift in the external cost curve, that is when m=10. This result should not be taken literally. Rather, it suggests that, in the case where the propensity of addicts to commit crimes to finance their addiction per unit heroin price increase is large, and where much official corruption, etc., is likely to occur per unit heroin price increase, heroin prices ought to be kept as low as possible.

V POLICY IMPLICATIONS AND CONCLUDING COMMENTS

In an attempt to arrive at a policy relevant conclusion, we make some educated, perhaps conservative assumptions. Suppose that the vast majority of people respect and support official policy regarding heroin, so that the deterrent effect is very strong (n=10). Suppose also that our law enforcement officials are also largely incorruptible and that crimes committed by addicts are minor in consequence (m=0.1). Finally, suppose that casual users are very much more responsive to heroin price changes that are addicts (η_N/η_A=4). In this hypothetical situation the above analysis suggests that the optimal price of heroin under prohibition in Australia would be approximately $101 per gram. Recent black market prices, whilst fluctuating significantly, seem to have averaged approximately twice this figure. If this is the case then the analysis presented in this paper suggests that the current prohibition is being enforced too stringently, is creating an excessive price for heroin, and so is resulting in net social welfare losses[14].

The approach taken in this paper to analyse the social welfare effects of heroin consumption is necessarily simplistic and so many limitations exist. As already mentioned many of the parameter values used in the calculations of Table 1 are educated guesses at best and *ad-hoc* at worst. If actual parameter values are significantly different to those used in Table 1 then our conclusions will need to be modified accordingly.

Also, the analysis assumes that addicts receive positive net benefits from their heroin consumption in the form of consumer surplus. It is equally plausible, however, to regard heroin addiction as a disease. In this case the welfare of addicts would be increased by reducing their consumption and so the optimal price would be higher, *ceteris paribus*, than indicated in Table 1.

Another criticism concerns the notion of consumer surplus. If it is reasonable to argue that demand reductions due to an official policy of prohibition are welfare relevant then losses of consumer surplus are greater than suggested in the above analysis and hence optimal prices would be lower, *ceteris paribus*.

Perhaps the most important criticism is that our model is static and short run in nature. It thus takes no account of the dynamics of addiction formation and cessation as does the model of Becker and Murphy (1988) for instance.

Despite these and other limitations we have attempted to analyse the social welfare implications of heroin consumption under prohibition and conclude, tentatively, that the current (black) market price of heroin is too high if one's objective is to maximise social welfare.

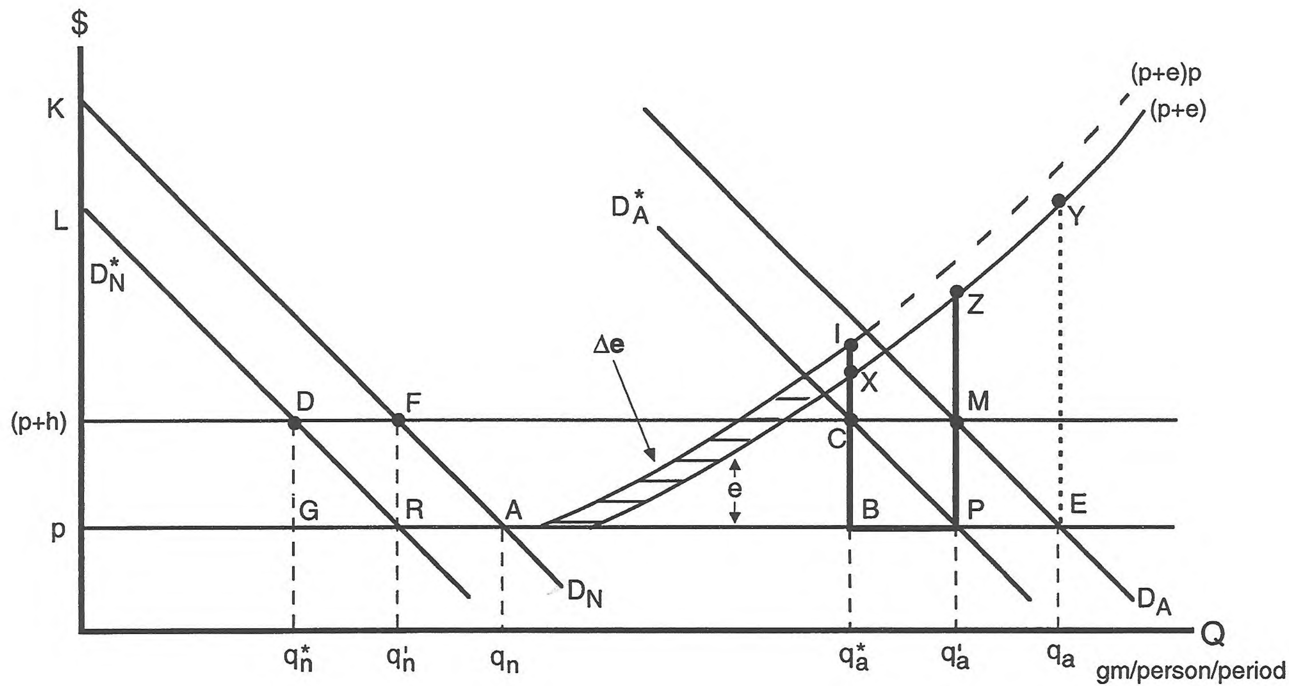

Figure 1: A stylised heroin market with prohibition

NOTES

[1] Medical authorities are permitted to manufacture or import small quantities of heroin for research purposes only.

[2] Another view is that heroin addicts are diseased and thus enjoy no consumer surplus. In this case reducing their heroin consumption would increase their welfare.

[3] Willig (1976) has shown that under certain conditions consumer surplus is a reasonable approximation of consumer welfare.

[4] This simplification will result in overestimates of the welfare maximising price of heroin.

[5] It may in fact be the case that by declaring heroin a prohibited substance the authorities actually make its consumption a more attractive activity for addicts who may, on the whole, be risk loving. In this case $n<0$.

[6] Other than the usual regulations protecting the interests of minors, etc. Other non-prohibition possibilities exist, such as a regulated market where heroin could be legally supplied only by physicians and legally consumed only by their patients. This sort of market for heroin existed in the UK during the 1950s.

[7] This purity figure is from Elliot (1982), p.16.

[8] We ignore the issue of current pricing as no appropriate heroin price deflator exists. In any case, given the size of the gross returns to heroin as it travels down the distribution chain, concerns on the part of heroin dealers regarding the erosion of purchasing power due to the general rate of inflation are likely to be minimal.

[9] See Cameron (1988) for a discussion of why the deterrent effect may be weaker than commonly thought.

[10] For instance, see Marks (1992).

[11] There is some uncertainty regarding the direction of causality between heroin addiction and crime. That is, whilst the common perception is that addicts commit crimes to finance their addiction, many were criminals prior to their addiction. Nevertheless it seems reasonable to assume that a significantly lower price for heroin would be associated with less crime, given that heroin is generally considered not to be criminogenic.

[12] Most current cases of addicts dying from heroin overdoses seem to be caused by uncertain heroin purity and/or quality. Presumably, in a free and open market, this would be less of a problem.

[13] We ignore exchange rate effects.

[14] This conclusion is reinforced if prohibition enforcement costs are positive and included in the calculus.

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