

## AN ECONOMIC PERSPECTIVE ON THE LEGALISATION DEBATE: THE DUTCH CASE

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### Introduction

Understanding the consequences of drug legalisation versus prohibition is important for policy. Most recently this subject has gained much political attention not only globally, but specifically in the Netherlands.<sup>1</sup> This study will provide a contribution to the legalisation debate based on a microeconomic analysis of the effects of illegal markets. The research question is how to design a coherent soft drugs policy framework that maximizes social welfare within the Netherlands that precludes most historical, sociological and political debates. In particular, attention is restricted to ‘soft drugs’ better known as cannabis derived products like hashish and marijuana.<sup>2</sup>

The focus is on the Dutch case, since traditionally the Netherlands has been a forerunner in terms of drug-related policies, as exemplified by coffeeshops. In a country with a population of 16 million about 1 million indicate to use soft drugs on a regular basis. Almost all consumers buy soft drugs in coffeeshops.<sup>3</sup> Interestingly, there is no stereotypical Dutch soft drug consumer, since users are representative of the Dutch population, for example in terms of education levels. Prices vary between 150-250 euro per

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<sup>1</sup> This year the President of the court in Maastricht argued that soft drugs should be legalized in the Netherlands. He said that judges are wasting time on drug cases and cannot work on more important cases. A quarter of all Dutch prisoners is convicted for drug offenses. His remarks caused upheaval, putting the legalization debate high on the political agenda.

<sup>2</sup> Our economic methodology disregards most international governmental issues, ethical and health-related aspects as well as legal interpretations in comparison to most studies in this field. However, one should note that the utilitarian perspective offered here indirectly incorporates such themes in abstract form. A limitation is that the international dimension arguably influences Dutch drugs policy. For instance, in cooperation with the Ministry of Foreign Affairs the T.M.C. Asser Institute released an analysis that showed that European laws offer neither possibility for regulated cannabis production by the state or municipalities nor for general legalization. A backdoor may be provided by the United Nation Drugs Treaties which overrule European restrictions on drugs production if shown that individual rights are at stake. Countries that have pushed for *decriminalization* of cannabis include Argentina, Australia, Belgium, Czech Republic, Ecuador, Germany, Luxembourg, Mexico, Pakistan, Peru, Portugal, Uruguay, and Venezuela.

<sup>3</sup> M. van Laar *et al.*, *Hulp bij probleemgebruik van drugs: stand van wetenschap voor behandelingen en andere interventies*, Utrecht: Bureau NDM 2004.

ounce, or equivalently, 5 to 9 euro per gram and are below the European average.<sup>4</sup>

Another reason why the Dutch case is outstanding is because there are no other countries that have coffeeshops. Rather surprisingly given the ease of access in the Netherlands, soft drug consumption with its 6 percent on regular basis is below European average.<sup>5</sup> Within Europe, more than 50 million persons have experience with soft drug consumption, implying about 15-20 percent of the population between 16 and 65 years. Recent data from the United States finds that 25 million people report soft drug usage in 2007, which is relatively higher than in Europe, although enforcement is much higher in America given nearly 1 million arrests for possession of marijuana in 2007.<sup>6</sup>

In the Netherlands cannabis derivatives are currently illegal, yet since the 1970s soft drugs have become available to consumers in coffeeshops where they can buy cannabis products in small amounts without fear of prosecution. Officially, possession and production for personal use are both misdemeanours, but these laws are not enforced in Dutch society; a situation known as *gedogen* - to tolerate or *gedoogbeleid* - tolerance policy. As a consequence, neither possession of up to five grams of cannabis nor growing up to five plants is prosecuted.

#### **Box 1: Four pillars of the Dutch soft drugs policy**

- |    |                                     |
|----|-------------------------------------|
| 1. | Prevent usage and provide treatment |
| 2. | Reduce harm to users                |
| 3. | Minimize public nuisance            |
| 4. | Combat production and trafficking   |

The original purpose of the policy of *gedogen* is to divide the drug market into 'hard' and 'soft' drugs. Traditionally, dealers sell a wide assortment of drugs, which in certain cases can lead potential soft drug buyers to shift to hard drugs. With the separation under *gedoogbeleid*, where the law is effectively not enforced, the government allows coffeeshops to sell cannabis derivatives and consumers to buy them. In this way, consumers of soft drugs are not likely to become involved with the hard drugs market. Also, a very limited number of consumers become involved with the law, allowing agents of the law to focus more on crimes related to hard drugs. One drawback of *gedoogbeleid* is that it does not consider the production side, meaning that the supply and

<sup>4</sup> United Nations Office on Drugs and Crime (UNODC), 'World Drug Report 2010', pp.194-195; C. Costa Storti & P. De Grauwe, *Globalization and the Price Decline of Illicit Drugs*, CESifo Working Paper 1990, 2007.

<sup>5</sup> *Ibid*; H. Rigter, M. van Laar, & B. Kilmer, 'Cannabis: Feiten en Cijfers 2003', *Achtergrondstudie Nationale Drugmonitor*, Utrecht: Bureau NDM, 2003

<sup>6</sup> R.L. Pacula, B. Kilmer, J.P. Caulkins, R.J. MacCoun & P.H. Reuter, 'Altered State? Assessing how Marijuana Legalization in California Could Influence Marijuana Consumption and Public Budgets', *RAND Corp. occasional paper*, 2010.

distribution to coffeeshops often goes through backdoor channels. As such, production is considered to be a criminal activity. Not surprisingly, the Dutch government still executes a war on soft drugs production against hemp farmers, and respective importers and exporters at a yearly cost of 150 million euro. Note that these enforcement costs related to soft drugs are very low by international standards.<sup>7</sup>

## I. Economic Presentation

An analytical model of the drug market in terms of supply and demand allows for a cost-benefit analysis under different regimes with the focus on the impact of legalisation of soft drugs. We describe a simple economic toolkit, where consumers and producers behave rationally so as to optimize avoidance of government enforcement and the subsequent probability of being caught. In essence, our social welfare function follows the Aristotelian idea that small pains for some can outweigh large gains for others. Note that this utilitarian method differs from the Pareto efficiency property commonly applied in economics, where one looks for a situation where there are no further improvements possible for a single individual without creating certain losses for any other person. In this way a cost-benefit analysis can be executed, comparing the social welfare levels derived from legalisation versus prohibition, as well as considering the in-between stance of *gedogen* or decriminalisation. The aim of the study is to review well-known illegal market models.

The emphasis is placed on various policies that may discourage consumption, such as enforcement against production as well as taxation on legal supply. Both policies add costs to consumption since they increase price levels of soft drugs. The model presented follows that of 1992 Nobel Laureate Gary Becker and others, presented in 2006<sup>8</sup> and stresses the importance of demand elasticities. Other experts in this field include Henderson, Miron and Zwiebel, who favour legalisation due to market imperfections, and Cleveland,

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<sup>7</sup> P.H. Reuter, 'Marijuana Legalization: What Can Be Learned From Other Countries?', *RAND Working Paper* (771) 2010. The United Nations World Drug Report explains that the production of soft drugs has no barriers. For instance, cannabis is cultivated in more than 170 countries. Therefore, it becomes difficult to measure worldwide production and market size. Nonetheless, the supply side of the market is estimated to have been steadily growing since the 1980s while prices have remained relatively constant. [UNODC, 2010, *supra* note 4, p. 103]. In their study on recent price declines of drugs in general, Costa Storti and De Grauwe note that global production of cannabis has grown about 2 percent per year over the past two decades, which implies a total growth of about 50-60 percent in cannabis production over that period. Given that the price of most illicit drugs has declined it is not surprising that consumption has increased, although the numbers of the United Nations indicate minor changes for cannabis in Europe as well as worldwide. Costa Storti and De Grauwe argue that the decline in drugs prices offsets the effectiveness of enforcement, although their main argument is that globalization is likely to increase the impact of enforcement. [Costa Storti and De Grauwe, *supra* note 4].

<sup>8</sup> G.S. Becker, K.M. Murphy & M. Grossman, 'The Economic Theory of Illegal Goods: the Case of Drugs', *Journal of Political Economy*, 114 (1), 2006, pp. 38-69.

who emphasizes the costs of the war on drugs. Thornton examines the issue further by showing that 73 percent of economists favour legalisation over prohibition.<sup>9</sup> In general, economists prefer legalisation because enforcement bears many unintended consequences such as criminal activity and corruption apart from public spending on combating drug trade. The aim of the current model is to explain the core mechanisms behind these relatively advanced economic approaches and apply them to the Dutch context.

## **II. Drug Markets from an Economic Perspective**

The basic approach presented here explains the tradeoffs between the costs of enforcement to reduce production and consumption and the externalities associated with private consumption. After a brief introduction about the implications of enforcement costs and externalities, the core economic model is presented.

### **II.1 A Story of Markets, Taxation and Enforcement**

Put simply, in a competitive market, supply equals demand and an equilibrium price is established. Since competitive markets result in the lowest possible price, producers do not profit and consumption is maximized. However, there are reasons to limit the consumption of drugs because private usage may create negative externalities to society at large. A typical mechanism to reduce consumption is taxation, whereby the government imposes a price premium to discourage consumption. When a good is made illegal, there are direct social costs involved in enforcing the law. Indirectly, higher enforcement makes production more costly, which potentially raises the unit price of supplying the drugs. The idea behind enforcement from an economic point of view is not necessarily to eliminate production but rather to add costs which hopefully decrease consumption.<sup>10</sup>

### **II.2 The Cigarette Market**

A good example to clarify the reasoning behind the economic analysis is the current cigarette market. In a competitive market the price of cigarettes will equal the costs of production, otherwise there is a small rent left and a new producer will enter to capture this leftover profit. As such, it is not possible to lower the price; the consumption of cigarettes is thus maximized and consumers are best off. However, if one believes that the consumption of cigarettes adds costs to society, such as health costs, then the competitive price is inefficient from a social welfare perspective. The consumer of

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<sup>9</sup> M. Thornton, 'Prohibition vs. Legalization: Do Economists Reach a Conclusion on Drug Policy?', *The Independent Review*, 11 (3), 2007, pp. 417-433.

<sup>10</sup> Taxation of a good is not the same as making a good illegal. The former raises the price level which discourages consumption. Likewise, prohibition makes it more difficult to obtain the good (and adds implicit private costs like conviction), and therefore also makes it more expensive. This could result in lower consumption.

cigarettes does not pay the ‘social premium’ of usage, although smoking will add future costs to others. This is described as an *externality*, because one’s behaviour hurts third parties, without compensating them.

To mitigate the social costs of smoking, the government can impose a tax, which is equal to the marginal social costs of consumption. It can be inferred that if one pack of cigarettes creates two euro ‘health costs’, it is optimal to ask a transfer from the consumer to society of a similar amount by adding a tax per unit. If the social costs of smoking are very high it can even become efficient to simply make it illegal, as it is the case with hard drugs. In this way production and supply become difficult, yet more profitable, because of a price increase due to entry barriers. The latter will bring about social costs due to enforcement, although it reduces the externality of health costs, because, like taxation, illegal status reduces consumption and has no transfer.

Both policies – taxation and prohibition – create social benefits, yet they will hurt the consumers of cigarettes by raising the price. Under taxation, society gains from a new source of government income and reduced consumption. Under prohibition, the illegal status of cigarettes may actually create rents for producers because the revenues involved in the market increase. At first, society loses because they pay the costs for law enforcement. This enforcement is anticipated by producers who invest in hiding production and gain from the higher price levels in illegal markets compared to the competitive markets. Producers earn more profits and are better off than under free competition where profits are zero. So, if cigarette producers can suddenly earn higher profits because of prohibition, more is at stake, and the costs of enforcement are not only offset by more investment in production efficiency, but more likely in means to protect the privilege (rent) of the producer through the use of force. Under certain circumstances, prohibition is favoured over taxation because it may discourage consumption more strongly which could benefit society at large. Again, in both scenarios society benefits from reduced consumption level because of the externalities like health costs associated with smoking.<sup>11</sup>

### III. Core Model of Drug Markets

With this outline of ‘competitive’ markets and a brief explanation about externalities in mind, this section proposes the basic analytical model of the soft drugs market. Let  $\mathbf{P}$  be the price of soft drugs for consumers. As explained, this price is equal to the marginal unit costs of production  $\mathbf{c}$  in a competitive market. Furthermore either taxation  $\mathbf{T}$  or enforcement  $\mathbf{E}$  add costs to the production and increase price levels.

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<sup>11</sup> There are two technical issues with this story. Firstly, the cigarettes market is an oligopoly. There are relatively few suppliers and as such they all earn profits and drive up the prices. Secondly, a tax creates a small wedge in the supply and demand which is inefficient. However, in practice we know that this effect is minimal and as such we do not discuss this here.

$$(1) \quad P = c(E) + T$$

In perfect competitive markets  $T$  and  $E$  are equal to zero, such that  $P = c$ . It follows that drug producers do not profit because for each unit they sell they get  $P$ , yet also incur costs  $c$  to produce the good. A tax ( $T > 0$ ) translates into an increased price. Likewise, we can see that a ‘war on drugs’ ( $E > 0$ ) raises the price.

*Proposition 1: Under perfect competition with no taxation or enforcement, consumer welfare is maximized and drug producers earn zero profits because the price is equal to marginal production costs.*

In the example of the cigarette market, it was argued that enforcement unintentionally gives incentives for producers to invest more in their supply by, for example, hiding or protecting their supply in a forcible manner as they want to protect their production profits, which they did not have under perfect competition. This adjustment on the supply side – derived from enforcement efforts – depends on how consumers react to price changes, the demand side.

Next, the total costs exerted by drug producers are defined as  $R$ . To capture a change in any variable,  $\Delta$  (delta) is used. The additional costs drug producers incur as a reaction to enforcement depend on demand considerations. Price elasticity of soft drugs is defined by  $\epsilon < 0$ , and is inelastic for  $\epsilon > -1$ . If consumer demand is very price sensitive - price elastic - then it means that a small increase in price will strongly decrease the demand for soft drugs. Let's define total consumption  $Q = D(P)$ , where consumption is an equivalence of total demand  $D$  at the given price  $P$ . Hence the following result:<sup>12</sup>

$$(2) \quad \Delta R = (1 + \epsilon) \Delta c$$

The hypothesis is that the demand elasticity of soft drugs is price insensitive.<sup>13</sup> The above expression shows that the total cost of drugs production increases, given inelastic demand. In other words, investment in drugs production rises with more enforcement. The paradoxical conclusion is that when total resources devoted to ‘hiding and protection’ increase, and as enforcement intensifies, consumption falls. As explained in *The Economic Theory of Illegal Goods: the Case of Drugs*, “with inelastic demand, resources are

<sup>12</sup> Becker *et al.*, 2006, *supra* note 8.

<sup>13</sup> DeSimone & Farrelly analyze cannabis consumption among 12 to 39 year old individuals in the United States over a period from 1990 to 1997. Based on a sample of more than 130.000 persons they find that soft drugs consumption in the United States is not much affected by price difference, which directly indicates demand inelasticity. [DeSimone, J. & Farrelly, M.C., ‘Price and Enforcement Effects on Cocaine and Marijuana Demand’, *Economic Inquiry* 41 (1), 2003, pp. 98-115.]

actually drawn into the drug business as enforcement reduces consumption.”<sup>14</sup> Since drug enforcement affects production costs and despite the subsequent fall in consumption, it is demonstrated that producers exert more effort and incur in higher costs than would be the case under competitive markets. The demand elasticity of soft drugs with respect to prices is “a key determinant of the effectiveness of illegal drug enforcement policy.”<sup>15</sup> If there are no externalities involved with consumption, enforcement is meaningless since enforcement adds social costs in the form of public spending and raises both the price of production and consumption, which in turn reduces consumer welfare.

*Proposition 2: Higher enforcement increases the price of drugs, which decreases consumer welfare and creates profits for producers. If demand is (in)elastic then (more) fewer resources are devoted to production.*

Enforcement targets both supply and demand. Government agencies seek to find producers. This increases the probability of being caught, raises production costs and shifts the supply curve up. Prosecution of consumers acts as a deterrent on potential buyers and reduces demand, shifting the demand curve down. The focus is now on producers. As argued by E. Zeusse, enforcement affects mostly the supply side as it does not discourage consumption, which is highly inelastic.<sup>16</sup> The anticipated behaviour of consumers under enforcement (prohibition) is thus not examined here.

More details on enforcement are introduced to the formula, in terms of responses to the severity of the punishment and the effort of producers to avoid getting caught.  $F$  defines the costs of punishment for producer conviction.  $A$  denotes the private expenses on avoidance of the enforcement (per units of output). The odd ratio of being caught is defined by  $\Theta(E, A)$ , which can be thought of as the probability of prosecution of the supplier that changes with the arguments enforcement  $E$  and avoidance effort  $A$ . The expected unit costs  $E[c]$  are:

$$\begin{aligned} (3) \quad E[c] &= c + A + \Theta c + \Theta A + \Theta F \\ &= (1+\Theta)(c+A) + \Theta F \end{aligned}$$

The definition shows that the expected unit costs are linearly dependent on the odd ratio of being caught per unit  $\Theta$ , and are also determined by the expected costs of conviction  $F$ . Here the results indicate that the effect of enforcement depends on how much disutility a producer believes it will experience once caught. For simplicity it is assumed that if a producer is caught, all products are seized. It is clear that higher punishment increases the costs of illegal production. Furthermore, higher avoidance effort  $A$

<sup>14</sup> Becker *et al.*, 2006, *supra* note 8, p. 42.

<sup>15</sup> DeSimone and Farrelly, 2003 *supra* note 13, p. 98.

<sup>16</sup> E. Zuesse, ‘An Hypothesis Regarding Pricing of Black-market Goods’, *Journal of Economic Behavior and Organization*, 34 (3), 1998, pp. 499-504.

increases unit costs and interacts with the degree of enforcement as captured by  $\Theta$ . More precisely, by looking at the change in the odd ratio of being caught over changes in avoidance, based on the partial derivative of expression (3), the Becker model gives as a result:<sup>17</sup>

$$(4) \quad -\partial\Theta / \partial A (c+A+F) = (1+\Theta)$$

The formula shows that in line with higher producer costs, an increase in F and A (or c) reduces profits for producers. Notice that an increase in punishment-F will affect the avoidance behaviour-A of producers. Zeusse demonstrates that with higher penalties producers have higher incentives to put efforts into stronger means of avoidance.<sup>18</sup> The higher the F variable the fewer individuals produce in the market, which can mitigate the effect of F on producer profits. Only less risk averse producers remain active in the market; precisely those individuals that do not shred away from violent means to protect local monopolies. Tougher penalties also create higher entry barriers, which decrease social welfare. Authors such as Cleveland and more recently van Ours and Williams argue that drug markets are very dangerous and therefore attract troubled young people with limited opportunities.<sup>19</sup>

In sum, greater enforcement is anticipated by producers. As a consequence there is a rise in criminal activity. Government policies against producers give rise to a selection mechanism that can increase the profits of remaining producers. It can be even shown that higher enforcement reduces supply and raises prices, which makes it more likely that consumers will also be averse to criminal activity or suffer from negative stigma once associated with those involved with the drug trade.<sup>20</sup> This does not account for the possibly mitigated externalities stemming from enforcement and reduced consumption.

*Corollary: Under government enforcement, an increase in producer punishment reduces the drug market size. Consequently, remaining producers increase avoidance efforts, increase their profits and cause additional negative externalities.*

### III.1 Externalities

<sup>17</sup> Becker *et al.*, 2006, *supra* note 8.

<sup>18</sup> Zuesse, 1998, *supra* note 16.

<sup>19</sup> J.C. van Ours & J. Williams, 'Cannabis prices and dynamics of cannabis use', *Journal of Health Economics*, 26 (3), 2007, pp. 578-596; M. Cleveland, 'Downsizing the Drug War and Considering 'Legalization: An Economic Perspective' in J. Fish, *How to Legalize Drugs*, Northvale, NJ: Jason Aronson, Inc. 1998, pp. 547-577.

<sup>20</sup> P. Chris & A. Wilhite, 'Illegal markets and the social costs of rent-seeking', *Public Choice* (79) 1994, pp. 105-115; C. Wilkins & S. Casswell, 'The Cannabis Black Market and the Case for Legalisation of Cannabis in New Zealand', *Social Policy Journal of New Zealand* (18) 2002, pp. 1-13.

In a free market prices are minimized, consumer welfare is maximized and producers earn no profits. Government enforcement raises prices, discourages consumption and lets producers earn profits while they increase avoidance efforts.

The impact on demand depends largely on price elasticity. Following proposition 1 and 2 (and its corollary) one must offer good reasons for government enforcement; since limited externalities always lead to a worse situation than under free markets, and prohibition only benefits certain producers.

### **Box 2: Core externalities associated with drug markets**

1. Crime
2. Health
3. Education
4. Moral stigma

The most widely discussed externality from the drug market is criminal activity, as producers want to protect their profits by all means. Also, as shown in the corollary, the more risk-seeking producers and consumers remain active in the market, the more they tend to use violence to protect the rents or demand their drugs. Because suppliers and consumers in drug markets cannot rely on the legal system, the marginal benefits to use violence to resolve disputes increases.<sup>21</sup> Finally, consumers can be affected by drug usage and cause problems for society. However, research indicates soft drug users are not likely to become more aggressive. Some authors even show that cannabis users become more relaxed and less violent and that others do not necessarily hold a negative view of consumers under influence.<sup>22</sup>

A second area where externalities derived from drug consumption can be observed is health. A crucial aspect is the addictive quality related to consumption. As a substance becomes more addictive, demand becomes more price inelastic. Although soft drugs are rather inelastic goods, there is no general consensus on the addictive properties of cannabis. Also the more addictive the drug, the more negative externalities to the public health sector are created. It can be concluded that the more addictive the substance, the greater the externalities involved. This calls for widespread public campaigning to discourage consumption or stronger enforcement.<sup>23</sup> Another aspect is the fact that illegal markets create uncertainty about the quality of the drugs, which would in fact increase health costs, even under lower

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<sup>21</sup> J.A. Miron & J. Zwiebel, 'The Economic Case Against Drug Prohibition', *Journal of Economic Perspectives* 9 (4), 1995, pp. 175-92.

<sup>22</sup> B. Plancherel *et al.*, "Adolescents Beliefs about Marijuana Use: A Comparison of Regular Users, Past Users and Never/Occasional Users", *Journal of Drug Education* 35 (2), 2005, pp. 131-146.

<sup>23</sup> J.A. Miron, 'The Economics of Drug Prohibition and Drug Legalization', *Social Research* 68 (3), 2001, pp. 835-855.

consumption rates.<sup>24</sup> In this shadow market producers are not protected by the rule of law and the quality of soft drugs is obscured and non-verifiable.<sup>25</sup>

Thirdly, consumption of soft drugs may decrease learning efficacy. A relatively large group of cannabis users at young age have trouble at school. Consumption may hamper concentration capabilities and could impair short-term memory.<sup>26</sup> As such, increased consumption by adolescents results in less efficient use of educational spending.<sup>27</sup> The overall evidence remains suggestive. Jofre-Bonet and Sindelar show that treatment groups are highly effective for juveniles. They find that a decrease in drug consumption attributable to preventive care increases school performance reduces health risks and is associated with 54 percent fewer days spent on criminal activities.<sup>28</sup> As such, treatment may be an efficient tool to reduce externalities. Still, when discussing legalisation and prohibition, there are no parties that favour free access to soft drugs for non-adults, like in the cigarettes example. Therefore the real question is to what extent consumption by juveniles will change with certain policies.

Evidence from the Netherlands is encouraging: given the availability of soft drugs at coffeeshops, Dutch juvenile consumption rates are comparable to other European countries, which may be an indication that legalisation will not alter the usage rate among adolescents.<sup>29</sup>

One externality that receives little attention is the fact that many people reject drug consumption on moral grounds.<sup>30</sup> Some academics find evidence that even in the Netherlands people worry about consumption and feel unsafe.<sup>31</sup> The paradox is that those who are less experienced or less likely to meet drug users or who live further away from coffeeshops are more frightened and believe drugs cause more public nuisance and general disturbances. In reverse, if social norms are strongly against consumers, they will experience negative externalities because of the moral stigma involved with

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<sup>24</sup> B.S. Frey, 'Drugs, Economics, and Policy', *Economic Policy*, 12 (25), 1997, pp. 387-398.

<sup>25</sup> C. Wilkins & E.M. Scrimgeour, 'Economics and the Legalisation of Drugs', *Agenda* (7) 2000, p. 341.

<sup>26</sup> R.H. Schwartz, P.J. Gruenewald, M. Klitzner & P. Fedio, 'Short-term Memory Impairment in Cannabis-Dependent Adolescents', *American Journal of Diseases of Children* (143 (10)) 1989, pp. 1214-1219; M.A. Harvey, J.D. Sellman, R.J. Porter & C.M. Frampton, '[The Relationship Between Non-Acute Adolescent Cannabis Use and Cognition](#)', *Drug and Alcohol Review* (26 (3)) 2007, pp. 309-319.

<sup>27</sup> K.V. Finn, C. Lopata & M. Marable, '[Marijuana Use in Suburban Schools Among Students With Learning Disabilities](#)', *The Educational Forum* 74 (4), 2010, pp. 278-288.

<sup>28</sup> M. Jofre-Bonet & J.L. Sindelar, 'Drug Treatment as a Crime Fighting Tool', *NBER Working Paper Series* No. 9038, 2002. National Bureau of Economic Research, Cambridge Paper.

<sup>29</sup> UNODC, 2010, *supra* note 4, pp.194-202; R.J. MacCoun, 'What Can We Learn from the Dutch Cannabis Coffeeshop Experience?', *RAND Working Paper* 768.

<sup>30</sup> Wilkins & Scrimgeour, 2000, *supra* note 25.

<sup>31</sup> T. Boekhout van Solinge, *De Besluitvorming rond Drugs in de Europese Unie*, Amsterdam: Credo/Mets en Schilt 2000, p.103.

consumption.<sup>32</sup> Still, the market model shows that consumption cannot be eradicated by enforcement. Frey further discusses how consumption can create externalities to the user due to dynamically inconsistent behaviour.<sup>33</sup> If consumers become addicted and are unable to quit there is a private costs that is not accounted for in the first units of consumption. This intertemporal problem calls for regulation.

One interesting externality of the liberalisation of soft drugs stems from the separation of soft and hard drugs markets. If one assumes some consumers may shift between the two goods and that, as generally assumed, the loss function for society is much steeper for hard drugs consumption, then the marginal deterrence effect that prevents soft drugs consumers from hard drugs usage is welfare improving. However it is difficult to calibrate at which point the provision of soft drugs and repression of hard drugs are useful.

So the fundamental trade-off seems to be the choice between free markets with high consumption rates and a smaller drug market where producers earn profits. Either we reduce consumption externalities like decreased education, worker motivation, psychological symptoms, other health issues and criminal activity, or we reduce production externalities including criminal violence and higher prices. Another option as shown in equation (1) is to install a Pigouvian tax, or a tax on particular behaviour in the market that generates negative externalities, on cannabis products to discourage consumption.<sup>34</sup>

The effects of externalities are now placed in the model. Suppose that the consumption of drugs creates negative spill over to society at large. Social costs **SC** are defined as the gross marginal damage to social welfare from one unit of consumption of soft drugs, without accounting for the benefits to producers or consumers, or possible transfers from taxation. In this sense, it seems reasonable that the first unit of consumption has fewer negative externalities than the second unit, and so on. Therefore a quadratic loss function is built for society associated with the marginal individual amounts of consumption. The problem is that in the previous situation total consumption was defined by  $Q$ , whereas now the social costs depend on the distribution of individual consumption patterns, given by  $q_i$ , where  $q_i$  can be heterogeneous between consumers. Note that  $Q$  equals the sum of  $q_i$ , where the sum represents all soft drugs consumers, which equals  $n$ .

$$(5) \quad SC = \sum_{i=1}^n q_i^2$$

So, by definition, the social costs are smaller when fewer persons consume drugs; that is,  $dSC/dQ > 0$ . Likewise, social damage is limited if consumers

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<sup>32</sup> Chris & Wilhite, 1994, *supra* note 20.

<sup>33</sup> Frey, 1997, *supra* note 24.

<sup>34</sup> Wilkins & Scrimgeour, 2000, *supra* note 25.

restrict their consumption levels and restrain themselves from ‘over consumption’. This can be thought of as the point where the individual benefits are smaller than the externality created from consumption.<sup>35</sup>

In such situations the social costs related to consumption are not covered by the private costs (the price level). In order to adjust this inefficiency, economists advocate a Pigouvian tax to reduce this market outcome. The external costs of drug consumption are costs imposed on third parties for private consumption, which causes a divergence between privately and socially optimal drug consumption. The tax re-aligns the social costs or externalities of consumption with the benefits of the activity, such that the consumer ‘pays society back’ while still benefitting from private utility derived from consumption.

Without a tax, consumers use an inefficient high level because they do not bear the full costs of their consumption. In the current framework, a standard tax can be inefficient because the goal is to target large-scale consumers rather than those who use drugs only recreationally. Another way to yield this effect is direct regulation on the concentration of THC and register consumption amounts. In this way the government can demand that high frequent users are offered consultation. More stringent measures such as denying high frequency users access to certain insurance schemes can even be set in place. This ordering follows from equation (5) which emphasises the non-linear rising social costs of consumption. In the end, the more fully private consumers bear the costs of their use, the stronger their private incentives to reduce drug consumption to a socially efficient level become.

### **Box 3: Legalisation of soft drugs in California 2010 (Proposition 19)**

On 2 November 2010 the people from the State of California vote for the Regulate, Control and Tax Cannabis Act. If adopted, marijuana will basically be legalized, allowing local governments to regulate related activities, including fees and taxation. The total market size is about USD 15 billion a year. The potential impact of the bill is to reduce enforcement costs up to USD 300 million a year and would result in more prison space.<sup>36</sup> Due to the lower private expenses on avoidance of the enforcement, consumption is expected to rise, although taxes may offset part of this effect.

If the bill is supplemented with a USD 50-per-ounce tax to be fulfilled at retail, more than USD 1.4 billion a year is raised to fund exclusively for “drug

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<sup>35</sup> Frey presents figures from Germany and Switzerland that indicate most consumers of hard drugs use these substances only a few times in their lifetimes and then remain abstinent. This confirms that very small groups of consumers may become addicted and regress into dependent consumption patterns that create high social costs. [Frey, 1997, *supra* note 24, p. 391]

<sup>36</sup> Pacula *et al.*, 2010, *supra* note 6.

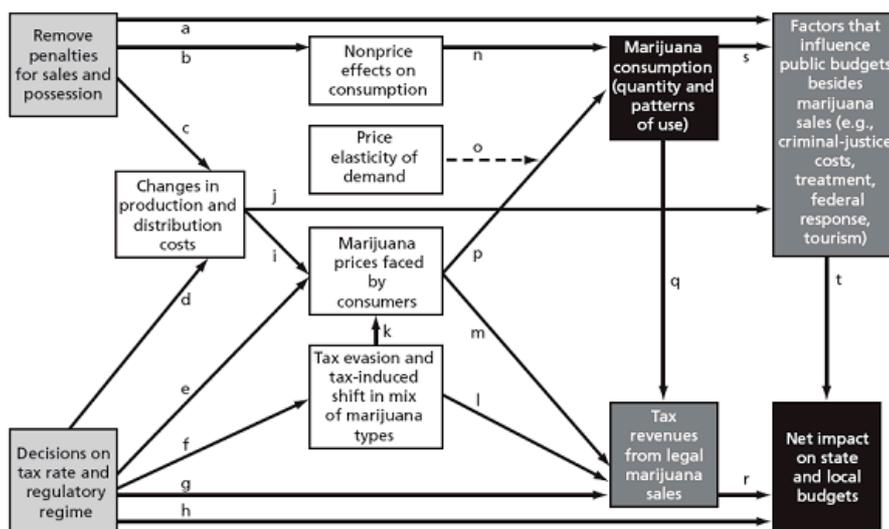
education, awareness, and rehabilitation programs under the jurisdiction of the State Department of Alcohol and Drug Programs.”<sup>37</sup> Overall, prices are expected to drop, consumption may increase up to 10 percent and a budget profit of nearly USD 2 billion a year is expected, which includes fewer significant negative externalities of crime and moral stigma. Effects on education will be neutral as only persons older than 21 years qualify for consumption. The reduced costs and increased earnings outweigh the likely increased health expenditures.<sup>38</sup>

#### IV. Conceptual Model and Calibration for the Netherlands

The mathematical representation used in this paper is comparable to a recent study by RAND, whose researchers try to estimate the impact of the legalisation of cannabis in California (see box 3).<sup>39</sup> The conceptual model presented by RAND is related to the current representation, which was based on a conceptual model from a 2006 working paper.<sup>40</sup>

Figure 1: Conceptual model by Kilmer et al. (2010)

How Marijuana Legalization Could Influence Consumption and State and Local Budgets



The conceptual model tries to tackle the relationship between tax and regulation or enforcement on consumption and the public budget. In the model proposed in this paper similar exercises were used, although mostly

<sup>37</sup> T. Ammiano, *Marijuana Control, Regulation, and Education Act*, Bill no. AB 2254, 2010.

<sup>38</sup> Pacula *et al.*, 2010, *supra* note 6.

<sup>39</sup> *Ibid.*

<sup>40</sup> This research is a translation from Boermans (2006) and has incorporated some updates. The prior study is in Dutch and is available at: <http://issuu.com/martijnboermans/docs/legaliseren>

based on mathematical relationships. The only part not considered, and which is not part of this conceptual model, are the costs of enforcement incurred by the government. It has been argued that in the Netherlands these costs are mostly derived from prosecution of big criminals due to the presence of coffeeshops. The yearly costs of enforcement costs reach up to 150 million euro.<sup>41</sup> In the conceptual model these costs can be found in the light grey boxes most left in the figure (as well as the dark grey box in the upper right). After the government has incorporated its policies, the drug market reacts given consumer preferences and the level of tax. Finally, the government incurs costs and may receive tax revenue, which creates a ‘net impact’ on the state and local budgets.

Now the core model in this paper is compared to Figure 1, where one may find many similar components. Firstly, similar to this paper’s representation, the price elasticity of demand  $\epsilon$  drives the total consumption  $Q=D(P)$  and is exogenously given (see dotted arrow  $\rho$ ). Secondly, in this paper’s model the price  $P$ , which results in ‘marijuana consumption (quantity and patterns of use)’, is determined by production costs  $c$ , enforcement  $E$  and regulation  $T$  (tax) (see arrows  $c$ ,  $d$ ,  $i$  and  $e$ ). The indirect relationships can be compared to the producer incentive effects and the consumer avoidance behaviour. The model below shows that the ‘marijuana prices faced by consumers’ are also derived from changes in production and distribution costs  $c$  and the decisions on tax rate and indirectly the regulatory regime ( $T$  and  $E$ ) (arrow  $i$  and  $e$ ). Thirdly, in the core model the enforcement or regulatory regime can determine how to punish producers  $F$  and how to convict private consumption  $A$ , where this enforcement can be summarized as  $E[c] = c + A + \Theta c + \Theta A + \Theta F$ . The figure below shows that the removal of penalties for sales and possession ( $F$  and  $A$ ) indeed affects production costs and hence the prices faced by consumers (see arrow  $c$ ,  $\lambda$ ). Also, there is no price effect on consumption, which was previously termed an externality from enforcement and which resulted in a moral stigma. It is interesting to note that the RAND group research simplifies how consumers and producer react to government policies, since they give a one-way representation.<sup>42</sup> In the current model there is also a direct relationship between the behaviour of consumers and producers who may buy guns to protect their property or demand their goods. The only different channel examined in their research is tax evasion. The reason why this may be less relevant to the Dutch case is the existence of coffeeshops.<sup>43</sup> As argued, it is highly unlikely that consumers will avoid these established retailers where a possible tax can be levied. Nonetheless, the parameter  $\square$  can be added to capture an efficiency loss in tax collection, such that the total tax income is not equal to  $T$ , but is given by  $(1 - \square)T$ .

#### **IV.1 Calibration of Dutch Legalisation: Yearly Benefits up to 850 million**

<sup>41</sup> Ministry of Finance, *Brede Heroverwegingen: Studiegroep Begrotingsruimte*, Den Haag 2010.

<sup>42</sup> Pacula *et al.*, 2010, *supra* note 6.

<sup>43</sup> van Laar *et al.*, 2004, *supra* note 3.

In the next section a preliminary ‘back of the envelope’ estimate is proposed to show the impact of legalisation of soft drugs in the Netherlands, comparable to that of Kilmer and RAND. Given the presence of coffeeshops and the current *gedoogbeleid* or tolerance towards consumption, the enforcement costs of the Dutch government are rather low. The Ministry of Finance has estimated a yearly expense of 150 million euro related to enforcement directed at producers (F).<sup>44</sup> In total, they expect yearly gains from legalisation to amount 450 million euro.<sup>45</sup>

Given the nearly 1 million consumers in the Netherlands, the avoidance costs *A* are negligible. Similarly, because the odd ratio of being caught is only relevant to large scale illegal producers and may remain in force under legalisation, these costs are likely to stay fixed. The real benefits from legalisation therefore stem purely from taxation. One of the unique features is that the prices in the Netherlands are already low by European standards such that, as pointed out by this paper’s model, prices may not increase under legalisation.

If it were possible to install a tax rate that keeps retail (coffeeshop) prices constant, there would be no further impact on total demand and no associated externalities. Without a (Pigouvian) tax, legalisation would drive up consumption. Given the social cost function (5) this is inefficient, since the consumers do not bear the costs of the externalities they create. Therefore, it is better to opt for legalisation complemented with taxation and propose a scheme to minimize the social costs from consumption.

Under legalisation perfect competition of small-scale producers can be assumed, up to the point where price levels are halved. As such, if a tax is then installed that will not affect the retail price consumers are not hurt by the tax scheme. Producers may lose some of their profits, although the legal status could boost position of producers as well. Therefore, the pure effect of legalisation under this regulatory regime is public income from taxation. Tax benefits of about 100 to 150 euro per average consumer can be estimated. This estimate is based on the following conservative approach: an average cannabis consumer smokes one to two joints per week. The potential tax income per joint is about 1.50 to 3 euro. If it is assumed that the average number of regular users in The Netherlands amounts to 1 million, and that they consume in average between 1 and 2 joints per week, the total tax income for the government after the measure is passed would amount to 75 to 300 million euro (no. consumers \* 50 week \* marginal tax). In addition, half of the sales of coffeeshops stem from tourism, which thus adds a similar

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<sup>44</sup> Ministry of Finance, 2010, *supra* note 41.

<sup>45</sup> We can compare the estimate to the cigarettes market, where a similar tax is levied. The tax income is 9 billion euro on a yearly basis, given consumption by about 4 million people, four times as much as soft drugs, while the tax income is 20 times larger (see *ibid*).

amount. Given the current situation it can be expected that the cost savings of enforcement can be 150 million at maximum. The increased costs related to health and prevention are minimal, unless the government chooses fierce policy options. In total, net gains are estimated to be yearly 300 to 850 million euro.<sup>46</sup>

It is important to note that this consumption pattern estimation is rather conservative. Certain studies show how consumption can vary in different countries. Consumers in Quebec, on average, use 93 grams of cannabis. This is consistent with studies from other countries.<sup>47</sup> In the United States researchers estimate average consumption to be nearly 92 grams,<sup>48</sup> and in New Zealand the number is closer to 98 grams.<sup>49</sup> All these studies favour 100 grams as a consumer benchmark. Likewise, UNODC classifies marijuana users into four groups: casual, regular, daily, and chronic users.<sup>50</sup> In line with UNODC thinking, the weighted average for any past-year user is 116 grams per annum.<sup>51</sup>

In the Netherlands one gram of soft drugs costs between 5 and 9 euro, depending on the amount of THC and whether it is marijuana or hashish. Using the benchmark approach, the total market size based on Dutch consumption only, is between 500 and 900 million. With the number of coffeeshops being under 1000; the average revenue per retailer is about 500.000 to 900.000 euro, which indeed seems rather high. Nonetheless, the benchmark approach would result in a tax income of 250 to 450 million per year, and a similar amount derived from tourism. In total, the expected net benefits range from 650 million to nearly 1.05 billion.

Under legalisation it is much easier to find high frequency users. In this way special care can be provided for this group, e.g. by registration and use of ID cards at selling points. Furthermore, legalisation can allow for quality controls which further reduce the harm to consumers. This positive externality is not captured in the analysis, since it may be argued that the costs of enforcement such as regulatory quality inspections could equal the health gains for consumers. Also, the legal status of coffeeshops and soft drugs makes clear to the public what is allowed and what isn't, therefore

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<sup>46</sup> Compared to the cigarettes market income of 8 billion this may seem little, but we know that the health costs (externalities) of cigarettes are very high, and much higher than those of soft drugs consumption.

<sup>47</sup> M. Bouchard, 'Towards a realistic method to estimate cannabis production in industrialized countries' *Contemporary Drug Problems* 35 (2/3), 2008, pp. 291-320; B. Kilmer & R. Pacula, 'Estimating the Size of the Global Drug Market: A Demand-Side Approach', RAND Working Paper (711) 2009.

<sup>48</sup> Pacula *et al.*, 2010, *supra* note 6.

<sup>49</sup> A. Slack, D. O'Dea, I. Sheerin, G. Nana, J. Wu & D. Norman, 'New Zealand Drug Harm Index: Report to the New Zealand Police,' Wellington: Business and Economic Research Ltd 2008.

<sup>50</sup> UNODC, 2010, *supra* note 4.

<sup>51</sup> Pacula *et al.*, 2010, *supra* note 6.

public nuisance can be efficiently prevented. Since coffeeshop owners will earn less rent, they are also less likely to invest in criminal activities. Finally, hard drugs still have to be fought and border control needs to continue. As such, the four pillars of the Dutch drug policies are unaffected (see box 1).

## Conclusion

The propositions presented above provide us with a common understanding of the economic forces within the drugs market. This paper focused on a tentative interpretation of the Dutch drug policy. Key assumptions driving any policy recommendation from an economic perspective are the price elasticity of demand and externalities involved with consumption. A key point many economists have made is that the market structure causes most of the negative externalities, and not necessarily drug consumption; this is obvious in the Netherlands where consumers generally do not fear prosecution.<sup>52</sup>

Two propositions derived from the core model are that i) prohibition hurts consumers and leaves rents to producers, ii) enforcement not only increases the price of drugs but under inelastic demand, enforcement pumps disproportionately more resources into the drug market because consumers and producers alter their behaviour in illegal goods markets. A corollary shows that higher punishment causes an adverse selection process, where only the 'toughest' producers remain while earning even more profits and causing greater negative externalities such as increased criminal activity. In other words, prohibition of drugs shifts the supply curve upward. Enforcement and punishment are effectively a tax on suppliers, which raises their production costs and allows them to profit. Prohibition shifts the demand curve downward and lowers consumption, although it was discussed why this deterrent effect is arguably small. Taking these factors into account together implies higher drug prices under prohibition, which is a disadvantage for consumers.<sup>53</sup> Under prohibition the producer surplus results in negative externalities including criminal activity, health problems, distorted education and moral stigmas.

In legalized markets, producers lose the possibility of profits and prices drop to a competitive level.<sup>54</sup> In order to balance the possible rise in consumption, government can apply a Pigouvian tax system to raise prices, lower consumption and obtain income transferred from consumption; yet, only up to the point where externalities from consumption can be paid back for. Hence, under legalisation the government earns some income and saves in costs typically put towards enforcement, while compared to prohibition, consumers are better off and producers cannot profit.

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<sup>52</sup> Becker *et al.*, 2006, *supra* note 8; and Miron, 2001, *supra* note 23.

<sup>53</sup> Miron & Zwiebel, 1995, *supra* note 21.

<sup>54</sup> Becker *et al.*, 2006, *supra* note 8.

In order to estimate the impact of legalisation in the Netherlands a simple mathematical and conceptual model was demonstrated. As there is so much uncertainty about possible policy implications, it is proposed first to levy a tax on drugs that does not extensively affect the current price level.<sup>55</sup> Based on preliminary back-of-the-envelope calibrations one can expect a yearly ‘net’ tax gain of up to 850 million euro in the Netherlands. It is not a concern that legalisation of soft drugs may cause a rapid rise in consumption, because the good is already widely available and prices are kept constant. Regulation and taxation can mitigate consumption and negative externalities through price effects and tax income. The core pillars of Dutch drug policy should remain and they would be strengthened under legalisation.<sup>56</sup>

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<sup>55</sup> Wilkins & Scrimgeour, 2000, *supra* note 25.

<sup>56</sup> Future research can be directed at providing a better estimation of the costs of enforcement and how much would be saved under legalization. At the same time, most politicians want to increase spending on information dissemination and health care (e.g. see box 3). A second line of research is needed that looks how society should take care of high frequency users. This group, albeit small, causes externalities and a cost-benefit analysis should be done to estimate policies to follow in this case. If a society decides that all consumers of soft drugs are denied access to certain insurances, then this could be efficient if the consumers are aware of this and can choose not to consume. There already exist comparable “punishments” that indirectly try to incorporate social costs from consumption. For example, a policeman in The Netherlands is not allowed to consume soft drugs, so indirectly any consumer loses this option for a job (which is a cost).