

# Legalization of Narcotics in Sweden

A Cost-Benefit Analysis



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# Abstract

The objective of this report is to estimate the full economic consequences of legalizing all narcotics in Sweden. This will be done with a cost-benefit analysis. The main parts examined is changes to crime and the criminal justice system, consumer surplus, government revenue from sales, costs to public services mainly in the form of health care, but also emergency services and institutional care and loss of production. The result of the analysis is dependent on how consumption of narcotics would change after a legalization. By looking at previous research, we find no clear evidence that a legalization would result in a significant increase in consumption, keeping the price level at the same level as before the legalization, with the help of taxes. We find that a legalization should result in discounted net benefits of 485 billion SEK or annual net benefits of 14.5 billion SEK. The main benefits are reduced expenditures to the criminal justice system and reduced cost to victims of crime because of less crimes in society. The conclusion of the report is that a legalization of narcotics in Sweden will increase overall economic efficiency, and the policy advice is therefore to legalize narcotics in Sweden.

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# 1. Introduction

## 1.1 Background

In view of the current debate on the legalization of drugs in Sweden and the world, it becomes increasingly important to know the full economic consequences of such reforms. The use of narcotics is associated with a high cost for the society, for both the health sector and the criminal sector. A legalization of narcotics could therefore result in reduced costs to the criminal justice system, allowing them to focus on other crimes, it can increase revenue to government if narcotics is taxed, and it can increase utility to consumers if more people decides to consume narcotics. However if consumption is increased, costs to health care, and other social services may increase, and the consumption may incur a loss of production to society, if more people begins to suffer from addiction.

A few studies have previously been made to estimate the cost of drugs in Sweden, including the The Official Reports of the Swedish Government (2011), the National Board of Health and Welfare (2010) and Ramstedt (2006). These studies, however, only look at the current costs of drugs in Swedish society. They do not discuss what effects a legalization would have. However, many international studies have been undertaken to investigate the effects of drug decriminalization in Portugal and Spain since their reforms, mostly focusing on the change in consumption, for example Laqueur (2014), Hughes, (2010), Quintas and Arana (2017), and Greenwald, (2009). The difference between a drug decriminalization and a drug legalization is that a legalization legalizes all aspects of the narcotics market including production, distribution and consumption of narcotics, while a decriminalization only legalizes consumption, or simply removes the penalty of consuming while still keeping it formally illegal (Greenwald, 2009). Studies have also been made on the effects of the prohibition of alcohol in the US, for example Dills, Jacobson, Miron, (2004), Miron and Zwiebel (1991). These studies also focuses on the changes in consumption, but in this case on alcohol.

Clark (2003) provides an economic analysis of a hypothetical legalization of drugs in his article "The economics of drug legalization". In this article he tries to reason how a legalization of drugs might affect social welfare in different ways depending on factors like market structure and government policies etc.

No studies have been made to try to estimate the full economic effects of a legalization of narcotics empirically, with actual numbers of potential costs and benefits. This will be the purpose of this study, to know if it would be economically efficient for the society to legalize narcotics, and if so how big the benefits would be. This would be relevant for policy makers discussing the topic of a legalization of narcotics. The reason why we focus the study on a legalization and not a decriminalization is foremost because the effects of a decriminalization is better known, thanks to previous studies already mentioned. Doing a full economic analysis of decriminalization would therefore not contribute as much as doing an analysis of a legalization.

## 1.2 Method

The method used will be an ex ante cost-benefit analysis, since the cost-benefit analysis in this report evaluates a policy that has not yet been implemented. The policies compared will be a full legalization of all narcotics, sold through the same system as alcohol in Sweden, which is a government monopoly with taxes to maintain a high price level, compared to the status quo, a criminalization of production, consumption and distribution of narcotics. The reason why we look at this kind of legalization is because it seems to be the most reasonable method in the Swedish context, since it can be assumed that alcohol in many ways affect the society in the same way as narcotics and Sweden has decided to deal with alcohol in this way. The alternative would be to legalize narcotics and leave distribution to private retailers with or without taxes. Benefits and costs will be calculated on a national basis, that is Swedish society.

A cost-benefit analysis is an economic method of systematically evaluating the effects of a previous or potential policy or project on society as a whole. The first step is to decide which different projects or set of policies that are compared (Boardman, Greenberg, Vining, and Weimer, 2014, p.6-7), in this report, it is as previously stated a legalization with a government monopoly compared to the status quo. This means that we look at the effects of a legalization, and only implicitly the status quo.

The second step is to decide the standing, meaning who's surplus matters for the conclusions (Boardman et al, 2014, p.7-8). As also previously mentioned, this is Swedish society, in other words all Swedish residents and Swedish government. By government we refer to all levels of government excluding the European Union including local, regional and national level.

The next steps are to find the impact categories, sort them and decide how to measure them (Boardman et al, 2014, p.8-9). This will be done in a later section (see 1.2.1 Impact categories). After this, the steps are to predict these effects, monetize them, and discount them (Boardman et al, 2014, p.9-12). These are the main results of the report. In the end of the results section the results will be summed and a net benefit of the policy will be calculated (See section 4.5).

The final step is called sensitivity analysis (Boardman et al, 2014, p.13-15). Since an ex ante-cost-benefit is done before the policy, all effects cannot be perfectly estimated. Some effects or correlations for example may even be undocumented completely, meaning assumptions are made throughout the report. To take this into account, for most assumptions, especially those with relatively big impacts on the results, we also calculate the results using other assumptions within a span of our main assumption. The less confident our assumption, the bigger the span. This part is also done together with the main assumptions in the results, meaning after a category we present the main estimate, but also a low estimate and a high estimate of the monetary impact. In the end of the results, we analyze if and how our conclusions change depending on if we use these other estimates to see how sensitive our conclusion is to our assumptions. After all this is done, the final step is to make a recommendation of which policy should be followed. (Boardman et al, 2014, p.15).

In theory what is measured in benefits can be three things: increase in consumer surplus, increase in producer surplus or increase in government revenue. The costs are decreases in consumer surplus, decrease in producer surplus or decrease in government revenue. For example, a policy that costs government A but increases consumer surplus by B (perhaps because the policy has the effect of lowering the cost of producing the good in the market in question), should be done if B which is the only benefit in this case is greater than A which is the only cost in this case. In other words the benefits are higher than the costs of the policy. Formally you subtract the costs from the benefits and see if the result, the net benefits are positive. If they are, the policy should be implemented (Boardman et al, 2014, p.78-110).

An issue with doing cost benefit analysis is that markets other than the market in question of regulation or deregulation, may be affected by the policy change. For example a policy like the one previously mentioned that reduces the cost of production in a sector, may lead to an increase in consumption of the good in question. This is a good thing considering people buy

things that they want, and is represented by the increase in consumer surplus. First of all this may lead to consumers buying less in other markets, where the goods are substitutes, or more of goods that are complements. This results in an increase or decrease in consumer surplus in these markets. This effect though is already assumed to be taken into account when deciding how much of the primary good to consume, and these other changes in consumer surplus is already represented in the primary market (Boardman et al, 2014, p.115-128). The issue is that the increase in consumption of the primary good may affect other markets not relevant for the primary consumer. Consumption of the good in question has externalities. The most commonly known is environmental externalities. Consumption of the primary good may for example result in pollution, making it harder for farmers in the area to grow crops. This will result in a decrease in producer surplus for the farmers in question. A decrease in producer surplus in a secondary market not taken into account by the primary consumer, is something that should be taken into account when doing a cost-benefit analysis of the policy in question. If we call this decrease in producer surplus C, the policy should now only be implemented if B is greater than both A and C together. This is the theoretical basis of the cost-benefit analysis and optimally any change in surplus in any affected market of the policy should be taken into account when calculating the net benefits and deciding if the policy in question should be implemented (Boardman et al, 2014, p.115-128).

In this report the primary market is the narcotics market, or specifically each market for every kind of narcotics consumed in Sweden. This means increase or decrease in consumer surplus in the narcotics market will be calculated, as well as increase or decrease in producer surplus. For this policy the producer surplus will fall to the government, and will instead be counted as increase in government revenue. Except for changes of surplus in these markets, (perhaps because of higher willingness to pay, when the product is legal), consumption of narcotics affects other markets as well. A lot of these externalities is dealt with automatically by the government because of legal responsibility. Examples are criminal justice and health care that government is responsible for the funding of. This means any change because of the policy to health related issues and crime will be counted as change to government revenue. Another important point regarding crime is that not only government bears the cost of increased crime. A victim of a crime suffers pain because of for example trauma, stress or loss of property. This may be seen as their consumer surplus in the market for safety is decreased or increased if crime is reduced. How to calculate this will be explained in 1.2.1. Victim cost of crime, for now it is enough to state that this reduction in



consumer surplus in a secondary market will be taken into account. Loss of production is also something affected by narcotics consumption in the way that heavy users may be completely unable to work, because of addiction. Formally it would be a reduction in producer surplus in the labour market, but we will refer to it as loss of production.

### 1.2.1 Impact Categories

The impact categories of this report will foremost be government agencies, local government and regional government. The effects of a legalization will be calculated by estimating how these government sections expenditures change after a legalization. This section will be divided into two parts, the criminal justice system and public services, including the health sector. This is done because we estimate that a legalization can affect the criminal justice system mainly with benefits (in the form of reduced expenditures), but the public services only with costs (increased expenditures). Since the policy involves a government monopoly, revenues following from this monopoly will also be calculated. The sum of these effects will be the estimate of the change to government revenue.

Besides this, consumer surplus in the narcotics markets will be calculated and an estimation of how much this will change will be used as an estimation of the change in consumer surplus in the primary market.

After that, change in producer surplus should come. However this will be disregarded.

Deciding the standing of illegal preferences in a cost-benefit analysis can be problematic. On one hand any reduced income to criminals because of reduced crime, should be viewed as a cost in a cost-benefit analysis. However since the retailing sector at present is criminalized and therefore generally viewed as morally wrong, this loss in producer surplus can also be argued to be discarded (Boardman et al, 2014, p.39-40). This latter approach is the one that will be used in this report. Therefore the cost in this category will be zero.

Other than these effects we estimate a legalization will affect mainly two other markets. The market for crime and the market for labour as previously mentioned. In the case of crime, we will use an instrument called shadow pricing. This means we estimate the cost to a victim of a crime, through previous research, and then estimate the increase in different crimes because of a legalization and then multiply the quantity with the cost (Boardman et al, 2014, p.406-442). The effects on the market for labour we estimate by the loss of production because of increased consumption.

## 1.2.2 Discounting and Inflating

The analysis is done on a yearly basis. Future yearly net benefits will be discounted with a social discount rate of 3%, which is recommended by The Dental and Pharmaceutical Benefits Agency (2007). The net benefits will be discounted for infinity, since the benefits should be relevant for as long as the policy is in place, which we assume it will be forever.

Monetary values that was gathered from older years will be inflated to get a more accurate value. For that purpose, the consumer price index in Sweden was used. The CPI for every year with the base year 1980 was gathered from Statistics Sweden (2018).

## 1.2.3 Data

Most of the data used in this report is taken from annual reports from Swedish governmental agencies for the year 2017 (written in 2018). In these reports numbers are usually presented and price inflated for the year in question and two years back. When we analyzed the data we used averages of these numbers to minimize any possible fluctuations, in other words the years 2015 to 2017 is used when estimating costs and benefits. When it comes to matters such as number of crimes, number of addicts, price and quantity of narcotics, and shares of crimes explained by narcotics, a number of specific governmental reports have been used in most cases. In those cases where relevant shares etc. have not been found in such reports, international scientific papers have been used to make estimations. Data from the Swedish municipalities and the Swedish county councils was gathered from the annual accounts for the municipalities and county councils, retrieved from the database of Statistics Sweden (2017), the official statistics agency of Sweden. All data have been analyzed in Google spreadsheet.

## 2. Previous Research

A theoretical approach to the legalization of narcotics is presented in the paper "The economics of drug legalization", written by Clark (2003). Clark presents in his paper a microeconomic analysis of how a legalization of narcotics would affect social welfare. The author discusses different market structures in the illegal and the legal market for drugs and tries to define these, as well as externalities arising from drug use. The method of measuring social welfare is done by creating a welfare function, with social welfare as the dependent variable, with consumer surplus, tax revenue and different types of externalities as explaining variables. Price theory is used to derive the optimal price setting of legal drugs. Clark then simulates the welfare function by giving relative strength to the different explaining variables under different simulations. The simulations result in what Clark explains as the optimal policy and the optimal price setting which differs depending on the relative strength of the explaining variables. 28 simulations with alternative assumptions are performed, resulting in different policy recommendations. The conclusion Clark reaches is that the effect on social welfare as well as the price setting of a legalization is dependent on the extent of externalities, the demand for drugs and consumer surplus of consuming drugs and how the price of drugs is set. This paper provides a theoretical background about the economic principles of the market of narcotics which is helpful for the performance of our analysis. Especially how different settings of the price affects the quantity of drugs consumed was helpful in evaluating our policy. Clark also introduces the problem on how to deal with consumer surplus in an arguably morally problematic market.

There are some reports analyzing the situation of narcotics in Sweden. The National Board of Health and welfare (2010), investigates the direct cost that was related to alcohol and narcotics for the Swedish society in the year of 2003. The report consists of an analysis of every authority in Sweden that is affected by alcohol and narcotics, and how big these authorities' expenditures on alcohol- and narcotics-related issues are. For those authorities that don't specify how big their expenditures are on alcohol and narcotics related issues, the National Board of Health and Welfare has created estimations on how big share of an authority's total expenditure that is related to alcohol and narcotics. The result of the report is a cost related to alcohol and narcotics in Sweden in 2003 of 29,621 million SEK. The Official Reports of the Swedish Government (2011) performed a similar report, with some differences. The biggest difference is that the Official Report of the Swedish Government

focuses on the cost of narcotics specifically. Another difference is that they analyze indirect cost as well as direct costs, for example loss of production. The result of this report is a total cost of 62,000 million SEK. Another report that's analyzing the cost of narcotics in the Swedish society is Ramstedt (2006), which discusses the cost of the Swedish narcotics policy in 2002, and discusses methods in how to measure the cost of narcotics to the Swedish society. The result of the paper is a cost of around 950 million Euro. These three reports provide a basis of information about the situation of narcotics in Sweden. Specifically, these reports were helpful to identify which authorities and agencies in Sweden that have costs related to narcotics. The reports were also helpful to solve some methodological problems in how to measure the cost of narcotics in Swedish society.

Hughes (2010) examines in her article "What Can We Learn From The Portuguese Decriminalization of Illicit Drugs?" the effects of decriminalization of narcotics in Portugal in 2001. She mainly focuses on how consumption of narcotics changes after the decriminalization. She compares the consumption patterns in Portugal with that of both Italy and Spain. While she accepts that consumption has increased after the decriminalization she concludes that relative to other nations it has not and suggests that the increase in consumption is explained by other factors. She also concludes that drug-related harm and problematic use has been reduced since decriminalization. Quintas and Arana (2017) examines in their article "Decriminalization: Different Models in Portugal and Spain" the effects of the decriminalization of narcotics in both Spain and Portugal. They discuss the concept of cannabis social clubs in Spain, where the clubs can register members and then legally consume cannabis at the club for example and their impact on Spanish society. In this article they also thoroughly discuss the different law changes that actually make up the "decriminalization". This article also claims that consumption has not been changed because of the decriminalization. Félix and Portugal (2016) analyzes the change to illicit drug prices in Portugal after its decriminalization of narcotics in 2001. They use a difference-in-differences approach and create a synthetic control group of 16 European countries to compare the post-decriminalization Portugal with. They conclude that the (illicit) prices on opiates and cocaine did not fall because of the decriminalization in Portugal, which they mean is an indication that the decriminalization caused no harm, since it did not lead to higher levels of consumption. This report indicates along with other previous research that the effects on the narcotics market, of moving towards less criminalization may not be as large as one might think.

Basov, Jacobson and Miron (2001) writes an historical overview of resources spent on prohibition of cocaine and heroin in the US during the 1900, mainly focusing on the last 25 years of that century. The authors present descriptive statistics on resources spent on police enforcement, the consumption level and the price level of cocaine and heroin. The goal is to evaluate if the increased resources spent on prohibiting use and distribution of these drugs had an effect on the consumption level and the price. The conclusion is that even though the amount of resources spent on prohibition increased in the late part of the 20th century, consumption if anything increased, together with a fall in price. The authors interpret that as prohibition not being the perfect tool to regulate consumption. This report indicates that prohibition might not affect consumption a great deal, which is something helpful for our estimation of post-legalization consumption levels.

Dills, Jacobson, and Miron (2004) uses drunkenness arrests statistics before and after prohibition of alcohol in the US as a proxy for alcohol consumption. This is because statistics of alcohol consumption is unavailable. They discuss the weaknesses of using the proxy, but also proves the strong correlation with alcohol consumption. They refer to previous studies that have used the number of cirrhosis cases as a proxy instead, but explains that drunkenness arrest is a more accurate proxy. They conclude that alcohol consumption probably did not change in the long term because of the prohibition, in accordance with the results of these other studies as well. Miron and Zwiebel (1991) also discusses how consumption was affected during and after prohibition of alcohol, and uses different variables, such as the number of cirrhosis cases, death rate of alcohol etc. as an estimate for alcohol consumption. The result was that alcohol consumption fell in the beginning of prohibition, but did not increase substantially after the prohibition was removed. The authors compare the removal of prohibition to a possible legalization of narcotics, which is also why we find this study relevant for our study, but they conclude that a more thorough analysis of the costs and benefits of such a legalization has to be made in order to reach a better solution to the issue of legalization of narcotics.

### 3. Microeconomics of the Swedish Narcotics

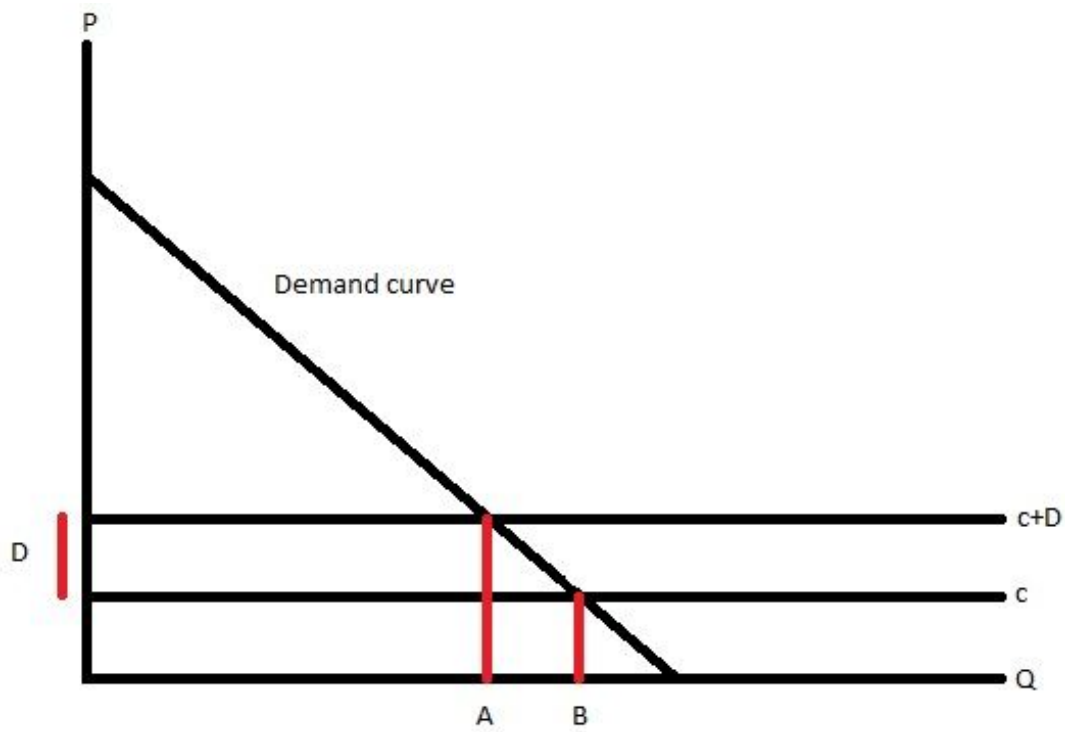
#### Market and its Future Price

To estimate the effects of a legalization on the consumption of narcotics, microeconomic theory will be used. Clark (2003) proposes that the way to analyze the narcotics market with respect to the effects of a legalization is to view narcotics bought legally and narcotics bought illegally as the same good but with different quality. This implies that a consumer is willing to pay more for a drug bought legally than one bought illegally. The differences between these two prices can be referred to as a premium which is this difference in quality. We call this premium  $D$ . This premium represents the fear or cost of arrest and the fear or cost of an unclean product for example.

According to Swedish National Council for Crime Prevention (2007) the current Swedish illegal retail market for narcotics is one of high competition and falling prices, with few signs of monopoly. Therefore we assume this market is one of perfect competition. Assuming this, the cost for a retailer is the current black market price. This price  $c$ , should be the wholesale price with addition of a risk premium (not to be confused with the premium  $D$ , which is the consumer premium). If the total price the consumers face, which is this cost  $c$  (the black market price) with addition of the premium  $D$ , is higher than the post-legalization legal price, consumers should prefer the legal product, because it gives them a bigger consumer surplus (Clark, 2003). Assuming a post-legalization government monopoly as a market structure as previously mentioned, the government can in practice regulate the price of the products which we as previously stated will be done with taxes. Setting a legal price marginally lower than to the sum of  $c$  and  $D$  should then in theory remove the entirety of the illegal market for narcotics (Clark, 2003). The assumption of perfect competition in the illegal market is not entirely realistic, but it will be used as an estimation for this report. If the post-legalization price will be set at the pre-legalization black market price with addition of the cost of  $D$ , consumption should in theory not increase. The cost of committing crime can differ between consumers, so the price should be set using the consumer with the lowest  $D$ . No estimation of the size of  $D$  has been made, and assuming there are individuals whose number of  $D$  are close to zero, perhaps because of severe addiction etc. the new legal price should instead be set at the black market price  $c$  and not  $c+D$ , to maximize the likelihood of eliminating the black market completely. This means that individuals with a high cost of committing crime,

but a low cost of using drugs, might increase their consumption because of a now lower total price  $c+D$ . This means we will end up in point B in figure 1 with a slightly higher level of consumption compared to point A. How big this change is then depends on the size of  $D$ , which will be discussed in results 4.1 Estimation of the change in consumption.

Figure 1. The narcotics market



## 4. Results

After estimating how consumption of narcotics would change after a legalization, the results of the cost benefit analysis is presented post by post. The first part covers the expenditures which affects government revenue. It starts with a discussion of the government authorities and agencies that has expenditures that is related to narcotics, and how these expenditures would be affected by a legalization. After that a presentation of possible revenue to the government of selling the product legally is presented. The next part reports the costs and benefits to consumers, in the form of consumer surplus of consuming the product, and also the cost of being a victim of crime. The last part of the result is then presented, which is how big the loss of production for consumers of narcotics who are being out of work due to sick leave, imprisonment or death etc. is. Results are after that summarized in table 9-11, together with a short comment of the result. The conclusion is that if consumption of narcotics were to increase by 10% after the legalization, the net benefits would be positive both when using a low and a high estimate of the net benefits.

### 4.1 Estimation of the Change in Consumption

Both Portugal and Spain has tried different methods of decriminalization of narcotics. The effects of this policy should be similar to a removal of a great part of the premium cost of buying narcotics illegally. Nevertheless consumption in neither of these countries has increased significantly compared to other countries (Hughes, 2010)(Quintas and Arana, 2017). In the Netherlands consumption of “soft drugs” has not increased significantly after the market for these drugs including cannabis, was legalized (Clark, 2003). In the US in the last 25 years of the 20th century, a harsher implementation of the prohibition laws against the use and production of narcotics did not reduce consumption of cocaine and heroin, in fact it increased (Basov et al. 2001). After the prohibition of alcohol in the US in the 1920s consumption of alcohol did not decrease significantly in the long term, rather it increased, after a small decrease right after the implementation of the prohibition, adjusting for changes in price (Miron and Zwiebel 1991) (Dills et al. 2004). These results implies that the size of the premium D might not be as large as one might expect, at least not in western nations.

With basis in this theory it could be argued that consumption should not increase at all because of a legalization with a kept price level. Nevertheless a full legalization may have



additional effects than these reforms, perhaps because of changing norms, making use more acceptable, therefore we will assume as a basis for our analysis that consumption of narcotics increase by 10 % as a one off response to a legalization. This number is just an educated guess, the only thing we can say is that consumption should not increase dramatically. As sensitivity analysis we will therefore also analyze how much consumption would have to increase to make the net benefits of a legalization negative.

## 4.2 Government Revenue

### 4.2.1 Criminal Justice System

Production, distribution and consumption of narcotics is today considered crimes. This category of crimes is big enough to be reported as a separate crime category in the the accounting of criminal justice agencies. This means a significant part of the criminal justice systems resources are used to maintain the criminalization of narcotics. Narcotics is also correlated to other crimes in three different ways. Use-related crime is crime committed because an individual is under the influence of drugs. It could be that a person because of being affected by a drug, abuses someone. Economic-related crime is crime committed because a user needs to finance his or hers drug addiction. It could be a robbery or a theft. System-related crime are crimes committed because of the fact that drugs are illegal. Gang conflicts or threats in combination with the sales count in to this category. (European Monitoring Centre for Drugs and Drug Addiction, 2007) Use-related crime could be affected if the legalization has an effect on the consumption of narcotics in society. Economic-related crime has the same logic, but could be lowered if society's ability to find and help narcotics addicts improves for example. Because of lack of data, we will disregard this second effect, but it should be kept in mind that this means we may underestimate the benefits of a legalization. System-related crime must by definition decrease by a legalization. Data on system-related crime is practically nonexistent, and thorough sensitivity analysis must be made. Crimes that may be system-related should foremost be violent ones, for example organized criminals in the narcotics business competing over territory. We assume this to be around 20 % of violent crimes as an educated guess (sensitivity analysis between 10% and 30%).

According to a prisoner survey presented by Miller (2006), in the US, 20% of homicide and 12 % of assaults are estimated to be committed by a perpetrator under the influence of narcotics, for another reason than to acquire money to buy narcotics. 4% respective 1% are

committed for money to buy narcotics while also under the influence of narcotics. 18 % of rapes and 4 % of child abuses are committed by someone under the influence of narcotics. 14 % of robberies, 5 % of larcenies, 12 % of burglaries and thefts and 16 % of motor vehicle thefts are committed by someone under the use of narcotics for another reason than to acquire money to buy narcotics. 25% of robberies, 18 % of larcenies, 24 % of burglaries and thefts and 7 % of motor vehicle theft are committed for money to buy narcotics. According to Swedish National Council for Crime Prevention (2015) in around 20 % of all deadly violence the perpetrator was affected by narcotics. In another report (Swedish National Council for Crime Prevention, 2005) they also claim that at least 2.7 % of perpetrators of sexual crimes are affected by narcotics, we assume that the share of rape is closer to this estimate, since it is a Swedish study.

Using the numbers above we estimate the share of murders that are use-related to narcotics to be around 20 % (sensitivity analysis of 15% and 25 %). The share of other violent crimes at 10 % (sensitivity analysis of 5% and 15 %). The share of rape around 5 % (sensitivity analysis of 2.5% and 7.5%), the share of child abuses at 4 % (no sensitivity analysis, insignificant cost) and the share of acquisitive crimes around 10 % (sensitivity analysis of 5% and 15%). We also estimate that around 20 % of acquisitive crimes to be economic-related to narcotics (sensitivity analysis of 15% and 25 %).

Table 1. *Main estimate of drug-related crimes.*

<b>Use-related</b>			
Crime	Main estimate	Low estimate	High estimate
Murder	20%	15%	25%
Other violent crimes	10%	5%	15%
Rape	5%	3%	7.50%
Acquisitive crimes	10%	5%	15%
Child abuse	4%	4%	4%
<b>Economic-related</b>			
Crime	Main estimate	Low estimate	High estimate
Acquisitive crimes	20%	15%	25%
<b>System-related</b>			
Crime	Main estimate	Low estimate	High estimate
Murder	20%	10%	30%
Other violent crimes	20%	10%	30%

Usually violent crimes are reported in annual reports as one category including murder, when this is the case, we assume none of the violent crimes are murders. This is because the number of murders yearly is around 100 (Swedish National Council for Crime Prevention, 2018a) and the number of serious assaults for example is around 150000 (Swedish National Council for Crime Prevention, 2018b) making the share negligible, in these cases we therefore assume 10 % is use-related (see table 1. Other violent crimes). Other crimes like frauds and environmental crimes etc. we assume to be uncorrelated with narcotics.

Other than the costs to the criminal justice system, crimes with a victim also incurs a cost to the victim, these effects will be analyzed in a later section (4.3.2 Victim cost of crime).

A legalization with the same legal price as illegal price should only remove the illegal market, that is products sold outside of the government monopoly, if the risk premium for the criminalized retailers (not D) remains the same in the narcotics market. If policing of narcotics crime is removed entirely, illegal narcotics retailers could lower their price significantly and retake parts of the market. We therefore assume that 5 % of the criminal justice systems expenditure concerning narcotics crime remains after legalization. Number in

parenthesis will represent the real numbers, and numbers next to a parenthesis 95 % of the real number, which is the number that we will use to calculate costs and benefits.

Crimes referred to as narcotics crimes are consumption, production and distribution of narcotics. When we mean narcotics related crimes, we refer to them as such.

#### 4.2.1.1 Swedish Prosecution Authority

The average cost for a suspicion of a narcotics crime 2017 was 2,512 SEK. Over the years 2015 to 2017 there was on average 67,491 suspicions of narcotics crime per year. That averages a cost of 169 million SEK per year for the Swedish Prosecution Authority. The average cost of a violent crime was 7748 SEK, and there was on average 48,693 suspicions of this crime (Swedish Prosecution Authority, 2018). Assuming 20 % of these crimes are system-related, a legalization of narcotics should result in yearly benefits of 263 (277) million SEK. If system related crimes are responsible for between 10% and 30% benefits fall between 213 (224) and 314 (331) million SEK.

The average cost of a sexual crime is 9,350 SEK and there has been on average 12,492 suspicions. The average cost of an acquisitive crime is 3,947 SEK and there has on average been 56,999 suspicions (Swedish Prosecution Authority, 2018). Using our estimates of the shares of use- or economic-related crimes (see Table 1) the cost of use- and economic-related crimes can be estimated to be around 111 million SEK with a lower limit of 67 million and a higher of 155 million. This means a 10 percent increase in consumption of narcotics ceteris paribus should result in a cost of approximately 11 million SEK for the Swedish Prosecution Authority.

This should result in annual benefits in the form of reduced government expenditure of 251.9 million SEK.

#### 4.2.1.2 Swedish Police Authority

The total expenditure for investigation and prosecution for the Police authority in 2017 was 13,694 SEK, for crime prevention work it was 7,538. The average resource time of investigation and prosecution over the last three years was for the narcotics crime category 1,286,000, and for crime prevention work 567,000. As a fraction of all resource time multiplied with the total expenditures this equals a total cost of 446 million. The average

resource time for violent crimes was 6,901,000 for investigation and prosecution, and 3,694,000 for crime prevention. Sexual crime is not separately reported, but there was approximately 7,000 reported sexual crimes in 2017, and on average around 90,000 crimes against person, excluded violent crimes, resulting in a share of 8 %. This estimates the resource time to sexual crimes to 63,000 for investigation and prosecution and 47,000 for crime prevention. The total resource time to acquisitive crimes for investigation and prosecution was 3,758,000 and for crime prevention 1,785,000 (Swedish Police Authority, 2018). Using our estimated shares (see table 1) a legalization should therefore result in yearly benefits of 2061 (2169) million SEK. If system related crimes are responsible for between 10% and 30% of violent crimes benefits fall between 1,242 (1307) and 2,879 (3030) million SEK. The cost of use- and economic-related crimes can be estimated to be 1,329 million SEK with a lower limit of 735 million and a higher of 1924 million. Ceteris paribus a 10 percent increase of consumption should result in a cost to Swedish Police Authority of 130 million SEK.

This should result in annual benefits in the form of reduced government expenditure of 1,931 million SEK.

#### 4.2.1.3 Swedish Prison and Probation Service

The last three years there was on average 2,391 new intakes to correctional institution and 2,969 sentenced to probation service with background in narcotics crime. The average time in correctional institution for a narcotics offender is 311 days. The average time in probation service is 60 days. The daily cost of an inmate is 3,609 SEK and for a person in probation service 323 SEK. The total cost for custody is 2,320 million SEK. Narcotics crime is approximately 28 % of all inmates, assuming the ratio is similar in custody this equates 672 million SEK for the custody. There was on average 1,435 new intakes to correctional institution and 2,738 sentenced to probation service with background in violent crime (Swedish Prison and Probation Service, 2018). Assuming the 20 % share this equals a total cost to the Prison and probation service of 3,866 (4,069) million SEK (lower limit 3,544 (3,730) million and higher limit 4,188 (4,408) million). A legalization of narcotics should therefore result in yearly benefits of 3,866 (4,069) million SEK.

The intakes to correctional institution was 283 for sexual crime, 1,448 for acquisitive crimes excluding robbery (which is reported separately here) and 419 for robbery. To probation service there was 155 sentenced for sexual crime, 1,015 for acquisitive crimes and 168 for

robbery. The average time in correctional institution was 860, 182 and 606 respectively. Sexual offenders accounted for 3 % of inmates, acquisitive crime offenders 17 % and robbers 2 % (Swedish Prison and Probation Service, 2018). Using our estimates of the shares of use- and economic-related crimes (see Table 1) this equals a cost to the Swedish prison and probation service of 1089 million SEK with a lower limit of 662 and a higher limit of 1,517. Ceteris paribus a 10 percent increase in consumption should result in additional costs of 109 million SEK.

This should result in annual benefits in the form of reduced government expenditure of 3,756 million SEK.

#### 4.2.1.4 Swedish Courts

In 2017 23% of crimes going to prosecution was narcotics crimes and 10 % violent crimes (Swedish Prosecution Authority, 2018). The average cost for a criminal case 2017 was for the Supreme Court 21,830 SEK, for the court of appeals 56,979 SEK and for the district courts 17,134 SEK. The number of criminal cases was on average over the last three years 1808 for the supreme court, 8,792 for the court of appeals and 28,757 for the district courts (Swedish Courts, 2018). Using the 23 % share plus 20 % of the violent crimes this equals a total cost of 245 (258) million SEK. A legalization of narcotics should therefore result in yearly benefits of 245 (258) million SEK. If 10 to 30 % of violent crimes are system-related to narcotics the benefits will be between 236 (248) and 256 (269) million SEK. Using our estimates of use- and economic-related crimes (see table 1) these crimes share of criminal cases is 5% equaling a cost of 52 million (Swedish Courts, 2018). Using our low and high estimates the share is 3.2 % and 6.7% (Swedish Prosecution Authority, 2018), equaling a cost between 33 and 69 million SEK.

Other than the criminal cases narcotics are related to “the law on the care of young people”, “the law on the care of addicts”, social insurance cases, cases concerning the social services act and cases concerning psychiatry. According to the National Board of Health and Welfare (2010), alcohol and narcotics are responsible for 100 % of cases concerning “the law on the care of addicts”, 59 % of cases concerning “the law on the care of young people”, 20 % of social insurance cases, 15 % of cases concerning the social services act and 59 % of cases concerning psychiatry. Using the fraction of 10 % for the ratio of narcotics addicts and abusers to alcohol ones, we assume 10 % of these cases are narcotics related (Ramstedt et al. 2014). The average cost for a case in an administrative court is 8,548 SEK,

for an administrative court of appeal 13,227 SEK, and for the Supreme Administrative Court 18,024 (Swedish Courts, 2018). Using this assumption narcotics costs approximately 70 million SEK for the Swedish courts system excluding the costs related to crimes. This should imply that a 10 percent increase of narcotics consumption in Sweden would cost the Swedish court system around 7 million SEK for non-criminal cases and 6 million SEK for criminal ones, summing to a total of 12 million SEK.

This should result in annual benefits in the form of reduced government expenditure of 233 million SEK.

#### 4.2.1.5 National Board of Forensic Medicine

The number of matters for the national board of forensic medicine of police cases involving modest narcotics crime for own use was 35,370 in 2017. This is for example when the police departments asks the national board of forensic medicine to perform urine tests. The average cost for this matter is 967 SEK. This equals a total cost of 34 million SEK (National Board of Forensic Medicine, 2018). Other than this expenditure, they have other expenditures related to narcotics, but these costs are insignificant and the change to them should be even smaller. Therefore we disregard these costs. A legalization should therefore result in yearly benefits of 34 million SEK.

This should result in yearly benefits in the form of reduced government expenditure of 34 million SEK.

#### 4.2.1.6 Swedish Customs

During the last three years 65 % of seizures by Swedish customs was narcotics. The cost for handling crime for the Swedish customs was 526 million SEK in 2017, for carrying out physical control it was 504 million SEK. Assuming that 65% of these resources goes to narcotics, the total cost of narcotics criminalization would be 639 (673) million SEK (Swedish Customs, 2018).

This should result in annual benefits in the form of reduced government expenditure of 639 million SEK.

#### 4.2.1.7 Summary of Criminal Justice System

As can be seen in table 2, a legalization should result in benefits to the criminal justice system in the form of reduced government expenditure of around 6,872 million SEK with a lower limit of 5,561 million SEK and a higher limit of 8,181 million SEK.

Table 2. Annual benefits to the criminal justice system of a legalization

<b>Authority</b>	<b>Main estimate of benefits (million SEK)</b>	<b>Low estimate of benefits (million SEK)</b>	<b>High estimate of benefits (million SEK)</b>
Swedish Prosecution Authority	251.9	197.5	307.3
Swedish Police Authority	1931	1049.6	2805.5
Swedish Prison and Probation Service	3756	3392.3	4121.8
Swedish Courts	233	222	246
National board of forensic medicine	34	34	34
Swedish customs	639	639	639
Total	6871.9	5561.4	8180.6

#### 4.2.2 Public Services

Some of the authorities do not report the exact cost that is related to narcotics. The national board of health and welfare (2010) estimates how big share of the authorities total cost that's related to both alcohol and narcotics. They also make a low and a high estimate of these shares, which we will use for our sensitivity analysis for the municipalities and the county councils. The government agencies costs are relatively small so we make no sensitivity analysis. Multiplying that share with the share of the total abusive population that abuses narcotics gives an approximation of how much of an authorities total cost that's related to narcotics. The share of abuser that abuses narcotics is approximately 10%, in order with a report from STAD, an organization that performs research on drug and alcohol-related issues based in Stockholm (Ramstedt et al. 2014).

The public services in the following section only have costs that's related to a legalization of narcotics, and no benefits. These costs affects the government revenue in the cost benefit-analysis. For all of these services in the following section, cost will either be



increased or left unchanged. In other words, a legalization will result in costs in the form of increased government expenditures within the public services.

#### 4.2.2.1 County Councils

Table 3. Shares of narcotics related costs to county councils

<b>County Councils</b>	<b>Main</b>	<b>Low</b>	<b>High</b>
County Councils (Total)	0.33%	0.10%	1.50%

(National Board of Health and Welfare, 2010).

The county councils main task is to provide health care. Health care is divided up in smaller sectors such as dental care, open primary care and specialized closed care. Approximately 0.33% of the health sector's total cost is related to narcotics (see table 3). That sums up to a cost of 829.22 million SEK (Statistics Sweden, 2017). This cost would be affected by a legalization of narcotics. How much the cost would change depends on how consumption would change after the legalization. A 10% increase in consumption should therefore increase the total cost by 83 million SEK. If costs are 0.1 % to 1.5 % (see table 3) a 10% increase in consumption would increase the costs by somewhere between 25 and 368 million SEK.

This results in annual costs in the form of increased government expenditure for the county councils of 83 million SEK.

#### 4.2.2.2 Municipalities

The Swedish municipalities have three different types of costs relating to narcotics. The first one is social care, the second one is for the education system, the third one is connected to the emergency services.

Table 4. Shares of narcotics related costs to municipalities

<b>Municipalities</b>	<b>Main</b>	<b>Low</b>	<b>High</b>
Social Care, Abusive Care	10%	10%	10%
Social Care, Care for children	3%	0%	5%
Social Care, Economic Assistance	1.50%	1%	3.50%
Education System, Education	0.01%	0.01%	0.01%
Education System, Students Health	3%	3%	3%
Emergency Service	2%	0.50%	4%

(The National Board of Health and Welfare 2010)

The Social care has three categories that is affected by narcotics consumption. The first category is abusive care. The total annual expenditure on abusive care was 6452 million SEK in 2015-17. The share of this cost that is related to narcotics is assumed to be 10% (see table 4). That results in a yearly cost related to narcotics of 645 million SEK (516-774 million SEK using sensitivity analysis). The second category affected by narcotics is care for children and young people. The total annual expenditure on care for children and young people in 2015-17 was 12832 million SEK. Using the 3% share (see table 4) of this total cost we arrive at an estimate of 506 million SEK (0-844 million SEK). The last category of social care that is related to narcotics is economic assistance, where approximately 1.5% (see table 4) of the total cost of this category is assumed to be related to narcotics. Their total expenditure on economic assistance in 2015-17 was 11254 million SEK, resulting in a cost related to narcotics of 192 million SEK (128-449 million SEK). The cost related to narcotics for the social care was summed up to 1344 million SEK (Statistics Sweden, 2017).

The municipalities also spend money on education for information purposes to inform students about the consequences of using narcotics, as well as student care and help for students with addictive parents. The share of the education system's cost that's related to narcotics for information purposes of the total cost was 0.006% out of a total cost of 140,196 million SEK. The share of the total cost to student health was 3% (See table 4) out of a total cost of 3,332 million SEK. This sums up to a cost related to narcotics for the Swedish school system of 184.1 million SEK (Statistics Sweden, 2017).

The last part is the cost for the emergency service who had an annual cost of 6974 million SEK in 2015-2017. Approximately 2% (See table 4) of the fire departments total cost is related to narcotics. That makes the cost for narcotics related issues approximately 139 million SEK (34-278 million SEK) (Statistics Sweden, 2017).

This makes the total costs related to narcotics for municipalities in Sweden sum up to 1667 million SEK (863-2531 million SEK). Therefore, a 10% increase of consumption would lead to a cost increase of 166.7 million SEK.

This results in annual costs in the form of increased government expenditure for the municipalities of 166.7 million SEK.

#### 4.2.2.3 Government Agencies

Here follows the agencies excluding the criminal justice system that has costs related to narcotics. For the agencies that do not report their cost that is related to narcotics, the estimation of the share of the agency's total cost was used, gathered from The National Board of Health and Welfare (2010), as previously mentioned, and can be seen in table 5.

Table 5. Shares of narcotics related costs to government agencies

<b>Agency</b>	<b>Estimate</b>
The National Board of Health and Welfare (The Abusive Share)	10%
The Public Health Agency (The Abusive share)	10%
The National Board of Institutional care (Children's care)	4.50%
The National Board of Institutional care (Addictive care)	10.00%
Swedish Social Insurance Agency (Total)	1.70%
The Swedish National Council for Crime Prevention	5%
The Swedish Public Employment Service	2%
The County Administrative Boards (Total)	0.10%
The Swedish Transport Agency (Total)	0.04%
Swedish Civil Contingencies Agency (Total)	1.60%
Swedish Crime Victim Compensation and Support Authority (Total)	6.80%

(The National Board of Health and Welfare 2010)

The National Board of Health and Welfare is a regulator and expert authority for health related issues and social services in Sweden, providing other agencies with expert opinions and statistics for these areas. The board themselves estimates their costs for issues related to alcohol, narcotics, tobacco, doping and gaming to 5.7 million SEK during 2017 (The National Board of Health and Welfare, 2018). The share of that cost that's related to narcotics is estimated to be approximately 10% (see table 5), which results in a yearly cost of approximately 0.57 million SEK. We estimate this cost would not directly be affected by a legalization of narcotics. Therefore the cost of a legalization is assumed to be 0.

The Public Health Agency has a responsibility to evaluate the health related politics on a national level, and to spread knowledge about health related political issues. The agency accounted for a cost related to alcohol, narcotics, tobacco, doping and gaming of approximately 78 million SEK (Public Health Agency of Sweden, 2018). The share of that cost that's related to narcotics is estimated to be approximately 10% (see table 5). That

results in a cost related to narcotics of 7.8 million SEK. We assume a legalization would not directly affect this cost. We therefore assume the cost of a legalization to be 0.

The National Board of Institutional Care has a task of providing care for children with social problems, as well as providing care for adults with substance abuse and addictive care. The annual average cost for this part was 751 million SEK. For the part of addictive care, we assume 10% of the cost is related to narcotics (see table 5). The share of the part for children's care total cost that's related to narcotics is estimated to be approximately 4.5% (See table 5), and the total cost for this part was 2000 million SEK (The National Board of Institutional Care, 2018). This results in a cost that's related to narcotics of 165 million SEK. How a legalization of narcotics would affect this cost depends on how much consumption of narcotics would be affected after the legalization. If consumption were to increase with 10%, the cost for the national board of institutional care would increase by 16.5 million SEK, *ceteris paribus*.

The Swedish Social Insurance Agency has a cost that is related to narcotics of approximately 1.7% (See table 5). Their total annual expenditure was 8917 million SEK in 2015-17. 1.7% of their total expenditures sums up to a cost of 151 million SEK. The cost for the Swedish social insurance agency related to narcotics was compensation for people being out of work, rehabilitation and preventive actions, and compensation for health care (Swedish Social Insurance Agency, 2018). Therefore the effect of a legalization on the expenditures for this agency would depend on how consumption of narcotics is affected after the legalization. A 10% increase in consumption would increase the cost for the Swedish social insurance agency by 15 million SEK, *ceteris paribus*.

The Swedish National Council for Crime Preventions main task is to do research about crime and crime prevention, and to provide this information to the legal authorities. Their total annual expenditure was 125 million SEK in 2015-17. Approximately 5% of the Swedish national council for crime preventions total expenditures was related to narcotics (See table 5). That equals a cost of 6.26 million SEK (Swedish National Council for Crime Prevention, 2018c). If consumption of narcotics would increase by 10%, the cost for the Swedish national council for crime prevention would increase by 0.626 million SEK, *ceteris paribus*.

The Swedish Public Employment Service has a cost that is related to narcotics of approximately 2% (See table 5). Their total annual expenditure in 2015-17 was 9429 million

SEK. That is equal to an average cost of 188 million SEK over the last three years (Arbetsförmedlingen, 2018). Since the cost for the Swedish public employment service almost entirely is economic sanctions to help people who have problems with narcotics to get a job, this cost would remain after a legalization. A 10% increase in consumption of narcotics would lead to a cost increase of 19 million SEK, *ceteris paribus*.

The Swedish County Administrative Boards main task is supervision over municipalities social care. There are 21 county administrative boards. The average cost of two of them, chosen randomly was used to estimate the total cost related to narcotics for all of the county administrative boards. The reason why we accept this simplification is because the cost is so small and changes to it would not affect the conclusion. The County Councils total annual expenditure in 2015-17 was 198 million SEK. Approximately 0.1% of the county councils total cost is related to narcotics (See table 5). An estimation of their total cost related to narcotics gives a result of 4.75 MSEK (The County Administrative Board of Västernorrland, 2017), (The Administrative Board of Jönköpings County, 2017). A legalization of narcotics would not remove this cost. A 10% increase in consumption would lead to a cost increase related to narcotics of approximately 0.5 Million SEK, *ceteris paribus*.

The Swedish Transport Agency has costs that is related to narcotics. The costs that is related to narcotics are mainly costs for projects and for information purposes to prevent people from driving under the influence of alcohol or narcotics. Their total annual expenditure in 2015-17 was 35559 million SEK. Approximately 0.04% of the Swedish Transport Agency's total cost is related to narcotics (See table 5). That sums up to a cost of 16.16 million SEK (The Swedish Transport Agency, 2018). A 10% increase in consumption would increase cost by 1.6 million SEK.

The Swedish Civil Contingencies spent approximately 1.6% of their total spendings on narcotics related issues (See table 5). Their total annual expenditure over the last three years was 2995 million SEK. The cost related to narcotics was therefore 47 million SEK (Swedish Civil Contingencies Agency, 2018). The effect a legalization would have on this cost depends on how consumption would be affected of a legalization. A 10% increase in consumption would increase the cost for the civil contingencies agency by 4.7 million SEK.

The Swedish Crime Victim Compensation and Support Authority had a cost that was related to narcotics of approximately 6.8% of their total cost (See table 5). Their total annual

expenditure in 2015-17 was 45 million SEK. That makes their cost related to narcotics sum up to 3.04 million SEK. This cost is mainly decisions about crime damage compensation for violent crimes committed under the influence of narcotics (Swedish Crime Victim Compensation and Support Authority, 2018). A 10% increase in consumption would ceteris paribus increase the cost for this authority by 0.3 million SEK.

This results in total annual costs in the form of increased government expenditure for the concerned government agencies of 58 million SEK.

#### 4.2.2.4 Summary of Public Services

As can be seen in table 6, a legalization should result in a cost to public services of 308 million SEK, in the form of increased government expenditure. Using a low estimate, the government expenditure would increase by 148 million SEK, and 708 million SEK when using a high estimate.

*Table 6. Annual costs to the public services of a legalization*

<b>Authority</b>	<b>Main estimate of costs (million SEK)</b>	<b>Low estimate of costs (million SEK)</b>	<b>High estimate of costs (million SEK)</b>
County Councils	83	24.6	368.3
Municipalities	166.67	86.35	253.06
Government agencies	58.226	58.226	58.226
<b>Total</b>	<b>307.896</b>	<b>169.176</b>	<b>679.586</b>

#### 4.2.3 Systembolaget

A legalization of narcotics in the way of a government monopoly would increase government revenue. This is because any producer surplus would be transformed into government revenue. The policy we investigate is one where the post-legalization sales price of narcotics is equal to the current black market price  $c$ . This means that the government revenues should be this current black market price negative the wholesale price of acquiring the narcotics. The wholesale price may be lower than it is today though, if for example a significant part of the cost of production is the evasion of the criminal justice system. This cost reduction is practically impossible to estimate, but even so we assume that most of the risk is incorporated in the big difference between the wholesale price and the retail price, making it irrelevant.

Statistics Sweden (2005) estimated the amount of narcotics of different varieties consumed in Sweden in 2005. If we assume that consumption has increased approximately as much as the growth in population we can multiply the consumption patterns with the increase in population between 2005 and 2017, and the following results are acquired. The yearly consumption of amphetamine is estimated to be 2050 kg, cannabis 1736 kg, ecstasy 98250 pills and heroin 1743 kg. Other narcotics are assumed to be consumed in an insignificant amount. Today cocaine seizures are one fifth as large as amphetamine, implying that consumption of this drug has also become popular (European Monitoring Centre for Drugs and Drug Addiction 2017). We assume that consumed cocaine is one fifth the amount of consumed amphetamine, which is 410 kg. According to CAN (2018) the median street price of amphetamine 2017 was 250 SEK per gram, for cannabis 100 SEK per gram, cocaine 900 SEK per gram, (brown) heroin 822 SEK per gram and ecstasy 110 SEK per pill. The wholesale price is for amphetamine 60 SEK, cannabis (hashish) 45 SEK, cocaine 400 SEK, (brown) heroine 450 SEK and for ecstasy 40 SEK. Other kinds of narcotics are also consumed in Sweden, but the cost for these other narcotics are relatively small. These big ones are so dominant that the effects of a legalization of these drugs will be used as an approximation for the effects of a full legalization.

Table 7. Current narcotics market

<b>Drug</b>	<b>Quantity</b>	<b>Market price (SEK) (c)</b>	<b>Wholesale price (SEK)</b>
Amphetamine (g)	2050000	250	60
Cannabis (g)	1736000	100	45
Ecstasy (pills)	98250	110	40
Heroin (g)	1736000	822	450
Cocaine (g)	410000	900	400

Taking the price of each variety of narcotics subtracted the wholesale price multiplied by the quantity assumed to be consumed (see table 7.), we arrive at an estimate of 1,505 million SEK per year. A legalization should therefore result in yearly benefits of 1,505 million SEK. A 10 % increase in consumption should therefore also result in government revenues of and extra 151 million SEK *ceteris paribus*.

This should result in net benefits in the form of increased government revenue of 1656 million SEK.

## 4.3 Consumer Surplus

### 4.3.1 Consumers

To estimate the effects on the change in consumer surplus consumption demand curves of these drugs are needed. Chalmers et al (2009) estimates the price elasticity of amphetamine to be around -1.8. To get the price elasticities for marijuana, cocaine and heroin, a meta-analysis written by Gallet (2013) was used. The author have gathered information from 462 previous measures of the price elasticity of drugs to estimate a precise measure of these elasticities. The countries included in the meta-analysis is the United States, Australia, Norway, Indonesia, India and Taiwan. The result of the writer's estimation is an elasticity of approximately -0.5 for heroin - 0.55 for cocaine, and -0.23 for marijuana. No studies have been found that estimates the price elasticity of ecstasy, we therefore assume that it is close to heroin and cocaine and assume it is -0.5.

Using the consumption and price (see table 7.) together with the price elasticity, as well as assuming that the illegal narcotics demand curves are linear we approximate the demand curves, see table 8 (for calculations see appendix 7.1).

Table 8. Demand functions

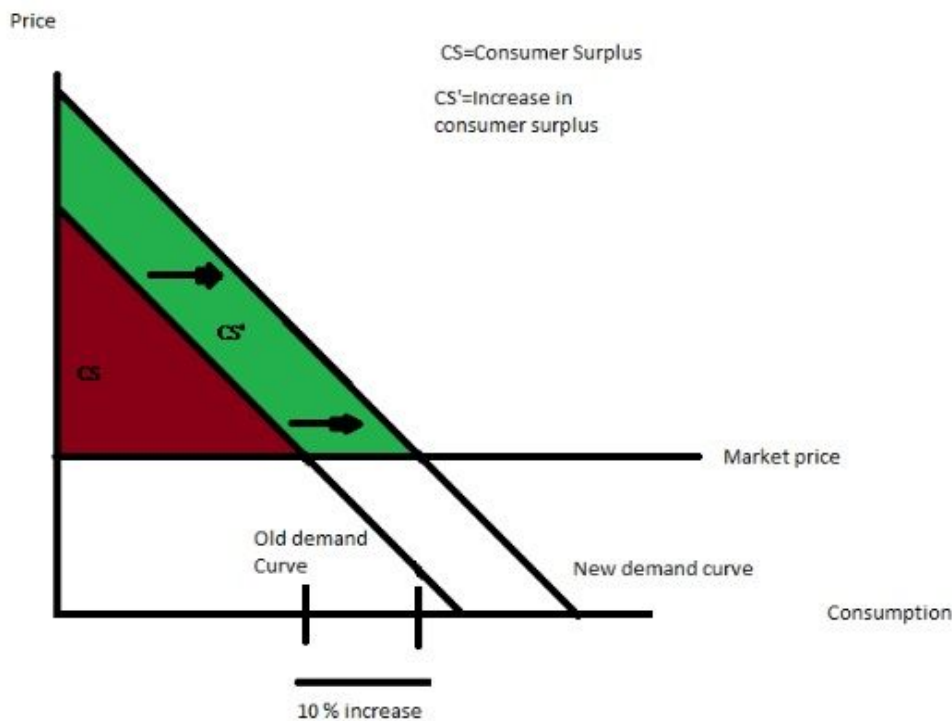
Drug	Demand function
Amphetamine	$389-0.0000678*x$
Cannabis	$535-0.00025*x$
Ecstasy	$330-0.00224*x$
Heroin	$2466-0.000943*x$
Cocaine	$2536-0.00399*x$

Using the demand functions in table 8, together with the current price and quantity consumed (see table 7.) we estimate the current consumer surplus in million SEK for the different markets to be, 142 for amphetamine, 378 for cannabis, 11 for ecstasy, 1433 for heroin and 335 for cocaine (For calculations see Appendix 7.2). Assuming a legalization results in an outwards shift in the demand curve resulting in an increase in consumption of



each drug of 10 % (see figure 1.), the increase in consumer surplus will in million SEK be, 29.9 million for amphetamine, 78.2 million for cannabis, 2.3 million for ecstasy, 300.5 million for heroin and 70.4 million for cocaine. This results in a benefit of 481 million SEK. It may be argued that consumer surplus in a market such as drugs should not be included in benefits. This approach is according to Clark (2003) overly paternalistic, and any increase in the risk of health concerns or addiction is assumed to be taken in to account when the consumer decides how much he or she consumes, just as one does when consuming a beer, a hamburger or a session of mountain-climbing. For this reason the value of a statistical life for example will not be taken into account explicitly, but any risk of dying is assumed to be taken into account when the consumer decides how much to consume. Health care costs on the other hand is as previously seen included since this is a cost borne by the government in Sweden and not the individual, and therefore assumed not to be taken in to account by the consumer, when deciding how much to consume.

Figure 2. Increase in consumer surplus



#### 4.3.2 Victim Cost of Crime

Attempts have been made to estimate the cost to a victim of a crime depending on what category of crime, however none for Swedish society. Miller et al. (1996) estimates the costs in the US. These costs may be assumed to be similar the Swedish one because of similar

standards of living. However differences may exist because of different approaches to paying for health care for example. This should be kept in mind. Since no better estimation have been found however these costs converted to 2017 (PPP) SEK will be used. The results are the following: burglary 23,085, armed robbery 312,551, serious assault 395,292, rape and sexual assaults 1,432,940, Murder 47,984,953, drunk driving (no death) 263,943, child abuse (nonfatal) 871,511, larceny (or attempt) 4,980 and motor vehicle theft 54,781.

The Swedish National Council for Crime Prevention (2016b) (2017b) (2018b) estimates with The Swedish Crime Survey the number of crimes yearly. For some crimes like murder they instead use their criminal statistics (Swedish National Council for Crime Prevention, 2016a, 2017a, 2018a) Using the average of these results over the last three years we get the following results: burglary 43,667, armed robbery 35,520, serious assaults 97,000, rape and sexual assaults 142,000, murder 110, drunk driving (under the influence of narcotics) 13,167, child abuse 22724, larceny (or attempt) 97,387 and motor vehicle theft 13,000. Using our estimates of the shares of use-, economic- and system-related crimes to narcotics (see table 1) we arrive at the following results. The victim cost of use-related crime is 20,665 million SEK, the victim cost of economic-related crime 2,661 million SEK and the victim cost of system related crime 8,728. If we use our low estimates the cost of use-related crime is 12,016, the cost of economic-related crime 1,996 and system-related crime 4,364. Using our high estimates the cost of use-related crime is 28,599, economic-related crime 3,327 and system-related crime 13,019. A legalization of narcotics should therefore result in reduced costs of 8728 (4,364 - 13,019) million SEK. Also *Ceteris paribus* a 10 % increase in consumption of narcotics should result in increased costs of 2,333 (1,401 - 3,193) million SEK.

This should result in benefits in the form of increased consumer surplus of 6,395 million SEK.

## 4.4 Loss of Production

Some of the heavy users of narcotics are out of the labor force due to their substance abuse. This could be because of different reasons. The main reasons are either crime- or health-related. The crime related reasons are mainly people who are imprisoned due to their usage of narcotics. The health-related reasons are that people die from overdose or other reasons, people are on sick leave and people who are going into an early retirement. The result of people being out of work is a production loss for the state of Sweden, which results

in a lower GDP and a lower tax income. This has to be accounted for as a cost in the cost-benefit analysis.

The Official Reports of the Swedish Government (2011) calculated how big the production loss is for an individual in Sweden in the year of 2003. Using that number and accounting for inflation gives an estimate of how much the production loss for an individual is in 2017. In 2003, the production loss for one individual was 446,000 kr (Official Reports of the Swedish Government, 2011). That is the same as approximately 516,580 SEK in 2017. As an approximation for the number of people being out of work, the number of people with heavy substance abuse is used. According to STAD, 10,000 people in Sweden are in this category (Ramstedt et al. 2014). Multiplying the number of people with heavy substance abuse with the estimated production loss of an individual results in a total cost of 5,165 million SEK per year at present.

Assuming consumption of narcotics would increase by 10%, the cost would increase by a number of 517 million SEK because of a legalization *ceteris paribus*.

This should result in a cost in the form of decreased production of 516,5 million SEK.

## 4.5 Net Benefits

Using our estimate of an increase in consumption of 10 % we get the following results (for calculations see appendix 7.3).

Table 9. Main estimate of net benefits

<b>Benefits</b>	<b>Annual (million SEK)</b>	<b>Discounted (million SEK)</b>
Consumer surplus	481	
Criminal justice system	6,845	
Revenues from Systembolaget	1,656	
Victim cost of crime	6,398	
		512,674
<b>Costs</b>		
Public services	308	
Loss of production	517	
		27,480
<b>Net benefits</b>	14,556	485,195

Table 10. Low estimate of net benefits

<b>Benefits</b>	<b>Annual (million SEK)</b>	<b>Discounted (million SEK)</b>
Consumer surplus	481	
Criminal justice system	5,534	
Revenues from Systembolaget	1,656	
Victim cost of crime	1,174	
		294,858
<b>Costs</b>		
Public services	680	
Loss of production	517	
		39,870
<b>Net benefits</b>	7,650	254,988

Table 11. High estimate of net benefits

<b>Benefits</b>	<b>Annual (million SEK)</b>	<b>Discounted (million SEK)</b>
Consumer surplus	481	
Criminal justice system	8,154	
Revenues from Systembolaget	1,656	
Victim cost of crime	11,619	
		730,331
<b>Costs</b>		
Public services	169	
Loss of production	517	
		22,856
<b>Net benefits</b>	21,224	707,475

As can be seen in table 9, annual net benefits is 14,556 million SEK. The discounted net benefits are positive and at a level of 485 million SEK. Using our low benefit estimates together with our high cost estimates for each category, our discounted net benefits are still positive at a level of 254 million SEK (see table 10). Using our high benefits estimates together with our low cost estimates for each category yields 708 million SEK (see table 11). Removing the benefits of consumer surplus still results in positive net benefits, even for our low estimate of net benefits, as can be seen in table 10. Using our best estimates an increase of consumption of more than 65 % is needed to make the net benefits negative. Using our low net benefit estimate consumption needs to increase by more than 28 % to make the net benefits negative. Using our high net benefit estimates, the net benefits of a legalization is positive up to an increase in consumption of 191 %.

## 5. Conclusion

In view of the results of the cost-benefit analysis made, the policy advice is to legalize narcotics in Sweden. A legalization would according to the results, increase economic efficiency in Sweden. Of course this policy change is not merely a financial one and moral and other aspects are not taken into account in this report. It should also be mentioned that since no country has implemented a full legalization of narcotics, the full range of economic consequences following a legalization is difficult to predict.

To reach a more general economic conclusion on whether a legalization of narcotics increases efficiency in society, it would be interesting to perform similar cost-benefit analysis on more countries than Sweden as further research. Even though the net benefits of a legalization in Sweden is positive, this might not be the case in other countries around the world, since every country has a different consumption pattern of narcotics as well as different methods in dealing with the negative externalities following consumption of narcotics. A post cost-benefit analysis would also improve knowledge in this area, of course that would have to be done after a legalization, which for now is impossible. Better reported statistics from some of the Swedish authorities together with improved statistics in the fields of crime and health-related issues related to narcotics are also examples of things that would improve the validity of the results of a legalization, and help any future research in this field.

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## 7. Appendix

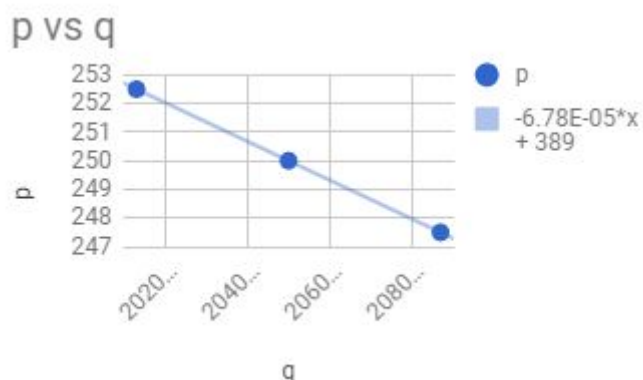
### 7.1 Estimating demand curve

We calculated the demand functions by taking the current price and quantity 250 and 2050000 in one cell, and in the other cell an increase respective decrease in price of one percent. In the other q cells we take the original consumption multiplied or divided by the price elasticity. We let excel estimate the best linear curve to fit the points.

Table 12. Estimating demand curve

Amphetamine	
q	p
2013100	252.5
2050000	250
2086900	247.5

Figure 3. Estimating demand curve



### 7.2 Estimating consumer surplus

We estimate the consumer surplus by multiplying the current consumption with 110 % resulting in 2255000 for amphetamine (see table 13 for the rest of this section). 250 is the price and 389 the old intercept. 402.889 is the new intercept for a demand function with the same slope as the old demand function but with the same price resulting in an increase in

consumption of 10 %. 139 respective 153 is the difference between the intercept and the price. 2050000 respective 2255000 is the new and old consumption. The CS is calculated by multiplying these two numbers and dividing by two. The increase in consumer surplus is calculated by subtracting the new consumer surplus with the old consumer surplus.

Table 13. Estimating consumer surplus

1.1	
2050000	250
2255000	250
205000	250
-0.0000678	389
-0.0000678	402.889
139	2050000
152.889	2255000
Old CS	142475000
New CS	172382347.5
Difference in CS	29907347.5

### 7.3 Calculating net benefits

The discounted net benefits calculated for infinity are calculated by summing the different benefit categories yearly benefits and then dividing them by the social discount rate 0.03, and then summing the yearly costs and dividing them by the social discount rate 0.03, and then taking the discounted benefits subtracted the discounted costs. The spreadsheet formula is  $=\text{SUM}(\text{B19}:\text{B22})/0.03-\text{SUM}(\text{B25}:\text{B26})/0.03$ .

To calculate how much consumption would have to increase, each category benefits cell is made up by two parts. The costs cells only have the latter part. The criminal justice systems

cell is for example ( $=7108-26.31*A17$ ) where 7108 is the benefits that will be the results of a legalization if consumption does not increase, and 26.31 is how much this benefit is reduced by for every percentage of increase in consumption. A17 is a cell that all these category cells is connected to in the same way, where we put a number, that is the percentage increase in consumption. By raising this number until the net benefits are zero, we estimate how much consumption would have to increase. Our low and high estimates are calculated in the same way, but with different numbers, instead of the 7108 and 26.31 for example. For the consumer surplus we connects this cell to the cell "Difference in CS" (see table 13) and the cell in table 13 where there is 1.1 to A17. This means when we change A17 a new change in consumer surplus in calculated automatically and the result of this calculation is transferred into the benefit category consumer surplus.