The contribution of illegal activities to national income in the Netherlands

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Explanation of symbols

.	data not available
*	provisional figure
**	revised provisional figure (but not definite)
x	publication prohibited (confidential figure)
–	nil
–	(between two figures) inclusive
0 (0.0)	less than half of unit concerned
empty cell	not applicable
2011–2012	2011 to 2012 inclusive
2011/2012	average for 2011 up to and including 2012
2011/'12	crop year, financial year, school year etc. beginning in 2011 and ending in 2012
2009/'10– 2011/'12	crop year, financial year, etc. 2009/'10 to 2011/'12 inclusive

Due to rounding, some totals may not correspond with the sum of the separate figures.

The contribution of illegal activities to national income in the Netherlands[1]

Brugt Kazemier, Arjan Bruil, Annemieke van de Steeg and

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Abstract

Illegal activities such as smuggling, prostitution and the production and sales of illicit drugs contribute to the national income of a country. In practice, however, they are not included in the statistics, because there are hardly any reliable estimates of the size of these activities. Recently Statistics Netherlands has started research into the share of illegal activities in the national income. This paper presents the estimates for 1995-2008.

The total contribution of illegal activities to the national income of the Netherlands increased from 1800 million euro in 1995 to almost 3500 million euro in 2008, equalling 0.6 percent of gross national income.

The main illegal sector is drugs, which accounted for over 50 percent of the total income from illegal activities in 2001. In 2008 that share was down to less than 40 percent, whereas finding illegal employment rose from about 10 percent in 1995 to 33 percent in 2008.

Keywords: illegal economy, national accounts

1. Introduction

Two of the most well known economic key indicators are national income and economic growth. Both are derived from the national accounts, a set of statistics that describes the economic process of a country and its economic relations with the rest of the world. The national accounts are produced along the lines of a comprehensive set of definitions, laid down in the System of National Accounts (European Commission et al., 2008) and the European System of Accounts (Eurostat, 2010). These systems define a production boundary to distinguish between activities that contribute to national income and those that do not. Whether an activity is legal or illegal is not important in this respect since illegal activities contribute to national income as long as they fall within the production boundary.

Crucial, especially for illegal activities, is that activities are carried out with mutual consent of both parties. For example, there is no mutual consent with blackmail and theft so they fall outside the production boundary. Another characteristic of transactions that contribute to national income is that there are two flows. Goods or services go in one direction, money flows in the opposite. One exception to the rule is agricultural production for own use. Although this is not a transaction with two parties and a money flow, this production contributes to national income. The same applies for the production of cannabis for one's own consumption. So raising cannabis for one's own consumption is an illegal activity that contributes to the national income.

Although income from illegal activities contributes to the national income according to the definitions in the SNA, for most countries they do not do so in practice. The main reason is that these activities are difficult to measure and that estimates are far from precise. Also, within the European Union there is a great deal of discussion on whether or not illegal activities should be included in the figures. This is especially relevant as about three quarters of the resources of the European Union are based on gross national income.

For Statistics Netherlands, this has been an incentive to do research in this field. The first estimates are of Van der Werf (1997, 1998). They estimated the value added of the illegal economy in 1995 at less than one percent of (gross) national income (at market prices). Smekens and Verbruggen (2005) repeated and extended this research, with similar results. In 2010 Statistics Netherlands started a third study, sponsored by Eurostat. Again the conclusion is that the illegal economy is less than one percent of the national income.

This article presents a time series of the illegal economy in the Netherlands since 1995. As there is a lack of data, the estimates heavily rely on assumptions so they are surrounded by wide margins. Various figures include an indication of these margins. The primary goal of the research was to estimate the contribution of illegal activities to the national income and its components: consumption, imports and exports. Estimates for these components can be found in the appendix.

Chapter 2 provides a description of how illegal activities contribute to national income. Chapters 3 to 9 have estimates for the various illegal activities. Chapter 10 has the final conclusions. The data necessary to reproduce the estimates are presented in the appendix.

2. Illegal activities in the System of National Accounts

The System of national Accounts (SNA) distinguishes illegal from hidden (tax evasion) activities. Illegal activities are the production of goods or services whose sale, distribution or possession is forbidden by law[3] such as drugs and prostitution. Hidden activities are in themselves legal but do not comply with the tax legislation. Both, illegal and hidden activities contribute to the national income as long as they are performed with mutual consent of both transaction parties.

Illegal activities have long been excluded from national income, mainly because they are unwanted and difficult to estimate reliably.

However, there are also two important reasons to include illegal activities in the estimates of national income (OECD, 2002). First there is the need for overall consistency of the national accounts of a country. Excluding illegal activities causes discrepancies between production and consumption, between income, spending and savings. If spending on, for example, prostitution is not recorded as part of household consumption then there is an unexplained gap between household income and household savings. Second, the national accounts should be comparable over time and between countries. National incomes are only comparable if all activities, also prostitution and the drugs trade are treated the same way. This is especially important for the European Union where (gross) national income determines about half of the total financial contribution of the member states.

In the Dutch national accounts illegal activities are not explicitly taken into account. This does not mean that illegal activities are fully absent as they are already implicitly taken into account. An example is the production of cannabis. The use of electricity and other costs related to the production of cannabis is currently implicitly recorded as household consumption. As such they contribute to the national income. Actually these are intermediate costs. This 'incorrectly' recorded household consumption serves as a proxy for the consumption of cannabis.

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[3] The SNA identifies two kinds of illegal production. The most common one is the production of goods and services whose sale, distribution or possession is forbidden by law. This is the subject of this article. The other consists of productive activities that are usually legal but become illegal when they are carried out by unauthorized producers, for example unlicensed medical practitioners, or people processing hazardous waste without permit.

For an adequate estimate of the size of illegal activities that should contribute to the national income we have to identify the relevant illegal activities. These are for the Netherlands[4]:

1. The production and trade of illicit drugs. The sale of cannabis in so-called coffee shops is tolerated in the Netherlands. Nevertheless, it is illegal.
2. Prostitution. Since 2000 some forms of prostitution are legal in the Netherlands. But as they are not explicitly included in the Dutch national accounts yet, they are included in the estimates.
3. Fencing, the handling of stolen goods.
4. Illegal temporary employment through employment agencies
5. Illegal gambling
6. Illegally copying software, games, movies and music
7. Smuggling cigarettes

The value added of illegal activities in the Netherlands is estimated to have increased from 1800 million euro in 1995 to 3500 million euro in 2008. This is about 0.6 percent of the gross national income.

3. The consumption, production and trade of illicit drugs

3.1 Introduction

The most widely used illicit drugs in the Netherlands are heroin, cocaine, cannabis and the party drugs ecstasy (XTC) and amphetamines. Estimates are made for production, imports, exports and domestic consumption of these illicit drugs. The consumption of these drugs increased from about 565 million euro in 1995 to 735 million euro in 2008. This increase is almost fully due to the increased consumption of cannabis: from 230 million euro in 1995 to 425 million euro in 2008. The consumption of heroin, cocaine and ecstasy, measured in euros, remained fairly constant during this period (see figure 1).

The consumption of illicit drugs is computed as the product of the number of drug users, the average consumption per user and the street price of drugs. The number of drug users is taken from Trimbos (1999-2008) and StatLine, the database of Statistics Netherlands. For heroin and cocaine a distinction is made between heavy addicts and other users. Missing data is completed by interpolation or extrapolation. The average use per drug user is taken from Korf (2003), Van der Werf (1997) and Van der Heijden (in Decorte, 2008). The street prices of illicit drugs can be found in Van der Werf (1997), UNODC (2000-2010), Smekens en Verbruggen (2005), Niesink et al. (2006-2008), Neve et al. (2007), Trimbos (2007) and EMCDDA (2009). The average price has steadily decreased over time. Figure 1 shows the consumption of illicit drugs (in current prices) in the Netherlands.

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[4] Other illegal activities such as the smuggling and illicit sales of weapons are of minor importance and assumed to be zero.
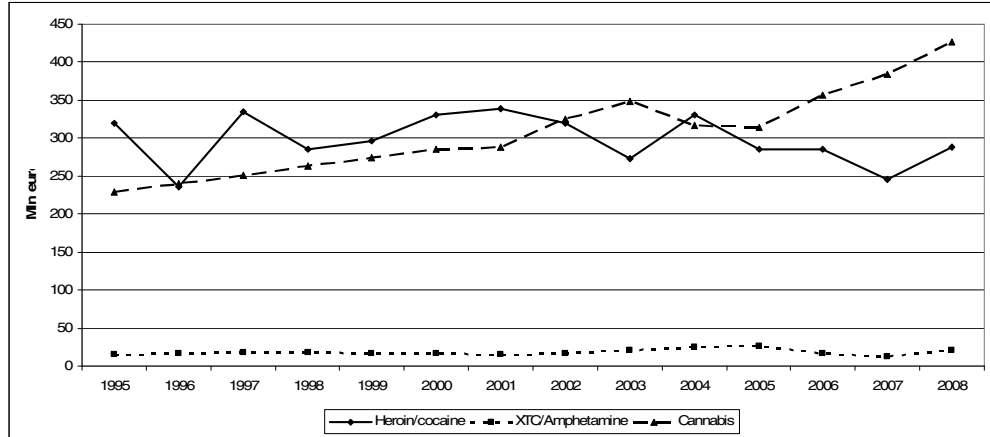
Figure 1. The consumption of illicit drugs in the Netherlands, 1995-2008

Illicit drugs are not only used in the Netherlands, they are also produced (cannabis, ecstasy) and exported. Moreover, many drugs find their way via Rotterdam Harbour, Amsterdam Harbour and Amsterdam Airport to Germany, Belgium, France and the rest of Europe.

To calculate the value added of the drugs sector (also called income from illicit drugs) it is necessary to make an estimate of domestic production, imports and exports and the costs of production and trade. The following identity applies:

$$VA = (P - S_P) - K_P + T_M - K_M \qquad\qquad [1]$$

The income from illicit drugs (*VA*) can be split into income from domestic production and income from imports. The first equals the net value of the domestically produced drugs (*P*) minus seizures (S_P) minus the costs of production (K_P). The second equals to the trade margins on imported drugs (T_M) minus the costs of transport and storage (K_M).

3.2 Heroin and cocaine

Heroin and cocaine are not produced in the Netherlands. So the value added of heroin and cocaine equals the trade margins on imports minus the costs of transport and storage. As data on these costs are not available, it is assumed that they are 10 percent of the trade margins

$$VA = T_M - K_M = 0.9 \times T_M \qquad\qquad [2]$$

The trade margins in this case are the value of the domestic consumption (C_M) of imported heroin and cocaine plus the trade surplus, i.e. the difference between the values of the exports (E_M), imports (*M*) and confiscated imports (S_M)

$$T_M = C_M + (E_M - M - S_M) \qquad\qquad [3]$$

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The export value is the difference between the volume of the imports (m) minus the volumes of the seizures (s_M) and domestic consumption (c_M)[5], multiplied by the average export price of heroin and cocaine (p_E)

$$E_M = p_E \times (m - s_M - c_M)$$ [4]

The export prices are taken form the World Drug Report (UNODC, 2000-2010). As the destination of the exports is unknown, we used the average street price in the European Union.

The imports are deduced from the seizures (s_M), the risk of being caught or seizure rate (R_M) and the import price (p_M)

$$M = p_M \times m = p_M \times \frac{s_M}{R_M}$$ [5]

So imports minus seizures (M_{-S}) are

$$M_{-S} = p_M \times (m - s_M) = p_M \times \frac{(1 - R_M)}{R_M} s_M$$ [6]

The import prices are taken from the World Drug Report. The seizures come from the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA, 2009). As the seizures strongly fluctuate over time, we used a five year moving average.

Part of the heroin and cocaine that enters the Netherlands is not destined for the Netherlands. If the re-exported heroin and cocaine are not owned by a Dutch resident and no change of ownership has taken place involving a Dutch resident, these re-exports are considered transit trade. By definition, profits from transit do not contribute to national income. Therefore, transit (m_E) should be deducted. Transit is calculated as a fraction (q) of total exports. In our calculations it is assumed that q equals 0.5 for all years.

$$m_E = q \times \left(\frac{(1 - R_M)}{R_M} \times s_M - c_M \right)$$ [7]

No information is available on the seizure rate. Van der Werf (1997) used a 25 percent rate in 1995. Smekens and Verbruggen (2005) assumed 15 percent in 2001. Neither is based on facts. Also, there is no indication that the intensity or effectiveness of the investigations has changed very much between 1995 and 2001. So there is no justification for this decrease in seizure rate. We assume a constant seizure rate of 15 percent for 1995 to 2001. In 2002, however, things changed (Trimbos, 2009) when the pre-flight checks were introduced. In 2003 Schiphol Amsterdam Airport started 100 percent checks for flights from high risk countries. In 2004 body scanners were installed. This increased investigation intensity is visible in the time series of seized cocaine and heroin with a 15 percent increase

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[5] There are different grades of heroin and cocaine. The figures used are corrected for these quality differences.

between 2002 en 2003. Therefore, we set the seizure rate at 17.5 percent in 2002 and at 20 percent in 2003.

The import prices are taken from the World Drug Report. These are rather constant with a peak in 2001 and 2002. Formula [2] now reduces to

$$VA = 0.9 \times \left\{ \left(p_E - p_M\right) \times \left[\frac{\left(1 - R_M\right)}{R_M} \times s_M - m_E \right] + \left(p_C - p_E\right) \times c_M \right\} \qquad [8]$$

with p_C being the average street price of heroin and cocaine in the Netherlands and c_M the consumption of these drugs in (kilo)grams. The value added is generated by the difference between the import and export prices and the difference between the domestic and the export price.

Figure 2 shows the value added of the heroin and cocaine trade that contributes to the national income of the Netherlands. The assumed seizure rate is crucial. The lower the seizure rate, the higher the value added estimates. To show the influence of this assumption, the figure also shows the outcomes for alternative assumptions: a high with a seizure rate of 10 percent until 2002 and 15 percent thereafter, and a low with a seizure rate of 25 percent for the whole period.
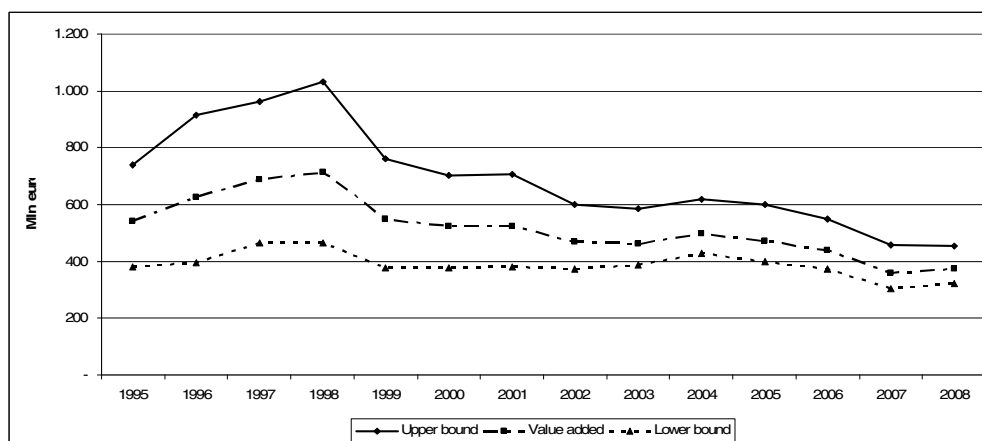
Figure 2. The value added of the heroin and cocaine trade in the Netherlands, 1995-2008

According to the calculations above, the heroin and cocaine trade in the Netherlands is less than 0.05 percent (low variant in 2007 and 2008) to almost 0.3 percent (high variant in 1998) of the gross national income. The sudden decrease since 1998 is caused by a sudden change of the terms of exchange in that year. Until 1998 the export price was about twice the import price. The ratio was 1.6 in 1998 and steadily declining to 1.4 in 2008.

3.3 Ecstasy and amphetamines

Almost all ecstasy and amphetamine tablets sold in the Netherlands are produced in the Netherlands. Therefore it is assumed that the imports of these illicit drugs are nil. The value added (*VA*) of the production and sales of these drugs then equal domestic

production (P) minus seizures (S_P) minus production costs (K_P). The latter include the costs of storage and transport.

$$VA = (P - S_P) - K_P \qquad [9]$$

The estimates of the production volume (p) of ecstasy and amphetamines are based on the seizures (s_P) and the risk of detection (R_P)

$$p = \frac{s_P}{R_P} \qquad [10]$$

Data on seizures can be found in the annual report of the Kernteam Zuid Holland / Unit Synthetische Drugs (2003) and Neve et al (2007). As with heroin and cocaine, we use five year moving averages to compensate for large fluctuations in the seizures. For 2006 and 2007 it is assumed that the seizures were as large as those in 2001.

Again, little is known about the rate of detection. Like Van der Werf (1998) we assume 10 percent in 1995 gradually increasing to 15 percent in 2001 (Smekens and Verbruggen, 2005) and 20 percent in 2006 because of the steadily increasing investigation efforts (Ministry of Justice, 2001).

There is much evidence that the production of ecstasy has fallen, as confiscations were halved from 2002 to 2007 / 2008, while the detection efforts were not reduced. Also the production of these drugs has spread to other countries (e.g. Canada and Australia) so the Netherlands plays a smaller role in this market (Neve at al, 2007, Trimbos / WODC, 2009). The Kernteam Zuid-Nederland / Unit Synthetische Drugs (2003) and the EMCDDA (2009) also identify this development.

The cost of production and sales per tablet (p_P) of ecstasy and amphetamines consists of laboratory costs, transport costs and storage. In 1995 these costs were 11 cents per tablet (Van der Werf, 1997). Smekens and Verbruggen (2005) assumed that these costs were doubled in 2001. In 2002 the production costs would have been 25 cents per tablet (Ministry of Justice, 2001). For the years in between we interpolated, for later years we assumed that the costs remained 25 cents per tablet.

The value added of the production and trade in ecstasy and amphetamines is

$$VA = (p_E - p_P) \times \frac{(1 - R_P)}{R_P} \times s_P + (p_C - p_E) \times c_P - p_P \times s_p \qquad [11]$$

The value added is generated by the difference between the export price and the production costs and the difference between the domestic price and the export price. The production value of the confiscated tablets is then deducted.

Figure 3 shows the value added of the production and trade of ecstasy and amphetamines. Again, the estimates strongly depend on assumptions of the seizure rate. Therefore the figure also shows the outcomes for a seizure rate rising from 10 percent in 1995 to 15 percent in 2008 (high variant) and for a seizure rate of 25 percent during the whole period (low variant).
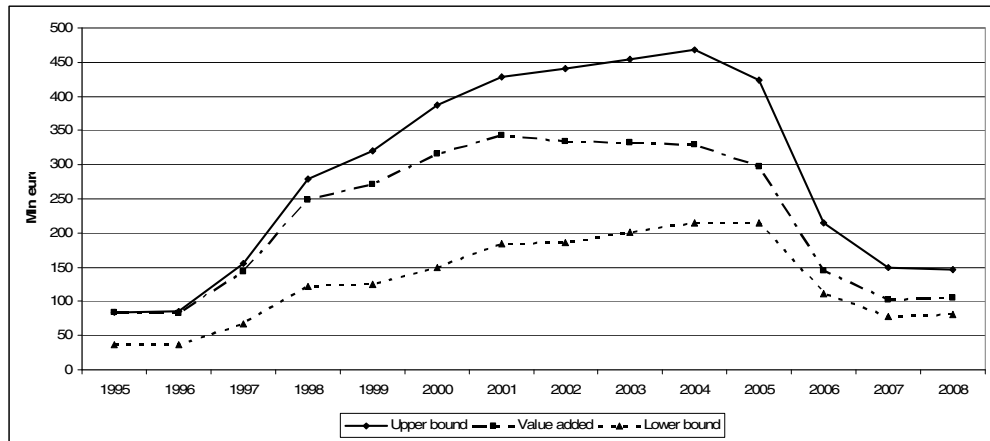
Figure 3. The value added of the production and trade of ecstasy and amphetamines in the Netherlands, 1995-2008

According to the calculations above, the value added of the production and trade of ecstasy and amphetamines fluctuates between less then 0.05 percent (low variant, all years) to 0.1 percent (high variant in 2001) of gross national income. The period 1998 to 2005 was the most prosperous period of the ecstasy industry in the Netherlands.

3.4 Cannabis

In most countries, the production and use of cannabis is illegal. In the Netherlands, however, the possession and sales in 'coffeeshops' of small quantities are tolerated. An advantage of this policy is that crime related to the use and sales of cannabis is partly reduced. The negative effects include drugs tourism, which has led to the tightening of the policy of tolerance in recent years (Decorte, 2008; KLPD, 2008).

Much of the cannabis consumed in the Netherlands is produced domestically, the so-called "nederwiet". The total production of nederwiet is not known, but the confiscations are. This, plus the known average yield per plant and an assumption on the number of harvests per year allows us to estimate of the seized production capacity. The latter can be transformed into an estimate of the total domestic production capacity (q_P):

$$q_P = \frac{3 \times s_P}{R_P} \hspace{4cm} [12]$$

with s_P being the five year moving average of the number of seized cannabis plants times the potential yield per harvest per plant. Following Korf (2003) it is assumed that there are three harvests a year. R_P is the share of the cannabis stands dismantled. Van der Heijden (2006) estimates a detection rate of 30 to 50 percent. We assume 40 percent.

The actual production (*p*) of nederwiet equals the production capacity minus the cannabis that couldn't be produced because of plantations were dismantled. The latter is half of the potential yearly yield of the confiscated cannabis plants (0.5×3 harvests $\times s_P$), as one may expect that the detection efforts and seizures are equally

distributed over a year. The actual production also equals the domestically consumed nederwiet (c_P) plus the exports of nederwiet (e_P) and the confiscated ready to harvest yields, on average $0.5 \times s_P$:

$$p = q_P - 1.5 \times s_P = c_P + e_P + 0.5 \times s_P \qquad [13]$$

A large part (f_P) of the consumption of cannabis (c) in the Netherlands is nederwiet. Spapens (in Decorte, 2008) mentions 50 percent for the mid 1990's. Jansen (in Decorte, 2008) states that this percentage had increased to 80 percent by the end of the century and has remained high since then. We use the same percentages. The domestic consumption of cannabis is calculated autonomously. Nederwiet consumed by non-residents (drugs tourists) or is not consumed in the Netherlands is exported to Belgium, France, Germany and elsewhere.

To estimate the value added of the production and sales of nederwiet (*VA*), we need the domestic consumption price (p_C), the export price (p_E), the costs of production and the cost of sales via coffee shops. The cost of production is estimated at 20 percent of the consumption price of nederwiet. The sales costs via coffee shops are estimated at half the difference between purchasing and selling. Furthermore it is assumed that the purchase price for coffee shops is equal to the export price of nederwiet. The market share of coffee shops (f_C) in the sales of nederwiet is known for 2001, 2003 and 2007 (Trimbos, 1999-2008) and is 40 percent on average. This percentage is assumed to be valid for the whole period.

$$VA = (p_E - 0.2 \times p_C) \times p + (p_C - p_E) \times f_P \times c$$
$$- 0.2 \times p_C \times 0.5 \times s_P - 0.5 \times f_C \times (p_C - p_E) \times f_P \times c \qquad [14]$$

The value added of nederwiet equals the net profit in case all production less seizures was exported (first part of equation 14) plus what domestic sales yield more than sales abroad (second part of equation 14) minus the costs of the confiscated stands (third part) minus the costs of sales via coffee shops (fourth part).

Figure 4 shows value added of the production and trade of nederwiet. Like the estimates above, these estimates depend on the assumptions about the seizure rate, in this case the share of the production capacity dismantled by the police. To show the sensitivity of the estimates for this assumption, a high variant with a seizure rate of 30 percent and a minimum variant with a seizure rate of 50 percent are included.
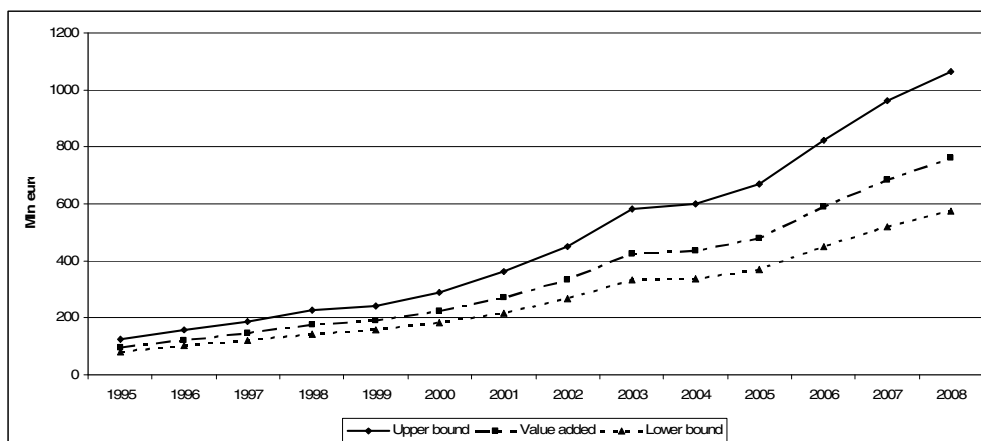
Figure 4. The value added of the production and trade of nederwiet in the Netherlands, 1995-2008

According to the calculations above, the value added of the production and sales of nederwiet equals 0.05 (all variants, first years) to less than 0.2 percent (maximum variant in 2008) of gross national income.

For the imports of cannabis the same method applies as for the imports of heroin and cocaine. For the whole period a seizure rate of 30 percent is assumed. The sales costs of cannabis sold via coffee shops, is calculated in a similar way as for nederwiet. As with heroin and cocaine, the export costs of cannabis are fixed at 10 percent of the difference between the export and import price. Transit is assumed to be half of all cannabis that leaves the country.

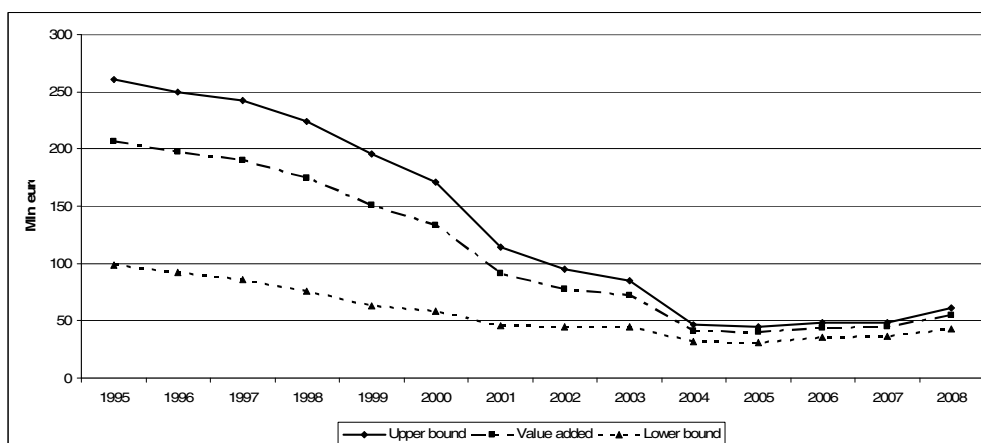*Figure 5. The value added of the trade of cannabis in the Netherlands, 1995-2008*

Figure 5 shows the value added of the trade of cannabis, again with a high variant (with a 20 percent seizure rate) and a low variant (with a 40 percent seizure rate). A comparison of figures 4 and 5 shows that there has been a substitution between cannabis produced abroad and nederwiet.

3.5 Conclusions

The value added of the production and sales of illicit drugs has increased from about 925 million euro in 1995 to almost 1325 million euro in 1998 and has been fluctuating between 1150 and 1300 million euro ever since. This constitutes a decrease from about 0.35 percent of gross national income in the late 1990's to little over 0.20 percent in 2008 (see figure 6).
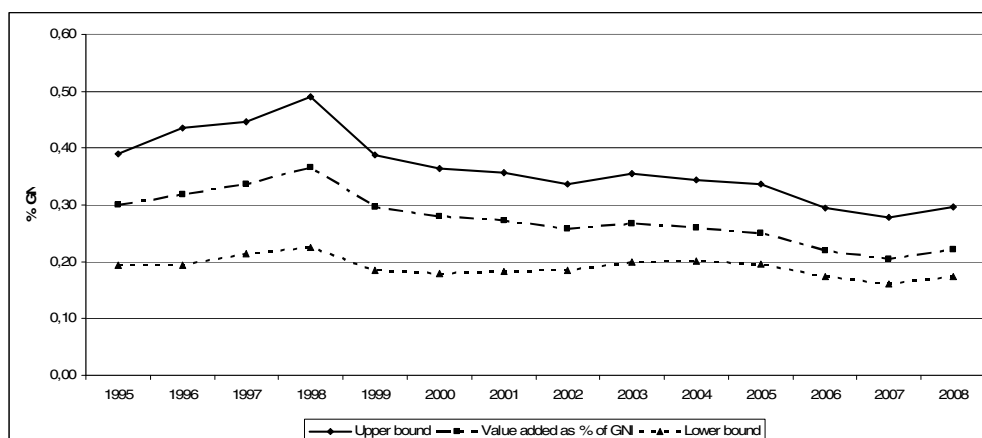
Figure 6. The value added of the production and trade of illicit drugs in the Netherlands as percentage of gross national income, 1995-2008

The main reasons are the steadily decreasing prices of illicit drugs since 1999 and the deteriorating terms of trade for heroin and cocaine. Also the production of ecstasy decreased due to increasing competition from abroad. Finally, the increased detection activity made the Netherlands less attractive as transit country for illicit drugs.

4. Prostitution

On 1 October 2000 brothels and sex clubs became legal in the Netherlands, provided that they have a licence. These licences are granted by the municipalities. The police are responsible for monitoring compliance with conditions. An important goal of lifting the ban on brothels was to combat trafficking, involuntary prostitution and prostitution involving minors (Ministry of Foreign Affairs, 2005; Utrecht city, 2009).

As many prostitutes were afraid of losing their anonymity, they fled to the less visible parts of the sex industry. They became escorts, for which no permit was required until 2008, started working on the streets or from home. So the law created a division into a visible and an underground sex industry.

Reliable information on the number of prostitutes, prices, earnings and the number of clients is virtually unavailable, even for legal prostitution. Mens and Van der Helm (1999) and Lethi (2003) estimated that there were 20 to 30 thousand

prostitutes at by the end of the century. Prices didn't change very much until the legislation in 2000 (Kruize and Slot, 1999), and increased sharply with the introduction of the euro in 2002 (www.volkskrant.nl, Prostituee prijst zichzelf uit de markt) and reached about 50 euro per client by 2008 (Flight and Hulshof, 2009).

Although separate estimates for legal brothels, illegal brothels, clubs, escorts, street prostitution and prostitution from home should be made, the available data does not allow this. Therefore we estimate prostitution as a whole.

The turnover of the prostitution industry (P) is the product of the number of prostitutes (n_{pros}), the number of clients per prostitute ($n_{clients}$) and the price per client (p).

$$P = p \times n_{pros} \times n_{clients} \qquad [15]$$

The prices are assumed to be 50 euro per client in 2008 and rise in tandem with the consumer price index, except for 2002. With the introduction of the euro prices probably have risen by at least 10 percent to a multiple of 5 euro. The number of prostitutes was fixed at 25 thousand in 1999, for other years following the trend of the male population of 15-65 years. The number of clients is set at 20 a week, and working weeks at 40 a year (Flight and Hulshof, 2006).

Part of the turnover is generated by providing prostitution services to people from abroad. In the national accounts, these are booked as exports (E).The remainder is consumed by Dutch residents, called domestic consumption (C).

$$P = C + E \qquad [16]$$

Since 2002, about half of the clients of window prostitutes in Amsterdam have been non-residents (Flight and Hulshof, 2009). The same applies for escorts (Eysink Smeets et al., 2007). Although, or because, one third of the prostitution industry is concentrated in Amsterdam, it is not representative for the prostitution industry elsewhere in the Netherlands. We therefore assume that prostitutes outside Amsterdam only receive 10 percent customers from abroad. The average share of customers from abroad (f_e) has been 23 percent since 2002. Eysink and Smeets et al. (2007) argue that before 9/11 and the economic recession, this share was higher. Therefore we assume an average share of 25 percent in the period 1995-2001.

The value added (VA) of the prostitution industry is the sum of the domestic consumption (C) and exports minus imports (M) minus costs (U). Imports are the prostitution services provided by foreign prostitutes who remain less than a year in the Netherlands plus the consumption of prostitution services by Dutch residents abroad. The latter is negligible, the first is not.

$$VA = C + E - M - U \qquad [17]$$

Many prostitutes in the Netherlands are non-residents. Increased international mobility has led to an increase in non-resident prostitutes, especially after the recent accessions of new countries to the European Union. Eysink Smeets et al. (2007) find that many women from the Balkan countries, Romania and Bulgaria are working as escorts. Lethi (2003) estimates that about two-third of the prostitutes are foreign.

Visser et al. (2000) state that most foreign prostitutes have no work permit and that half work in the Netherlands for less than a year and either go back home or start working in another country.

Based on the information above we assume that one-third (f_M) of total turnover in 1999 can be considered as imports. Because of the expansions of the EU in 2004 and 2007, this share is assumed to be 35 percent since 2004 and 37 percent since 2007.

The costs or intermediate consumption of the prostitution industry are the costs of the prostitutes themselves and the costs of their managers or pimps. The first relates to clothing, condoms and travel expenses by escorts. Like De Heij (2007) we assume that in 2001 prostitutes spent 125 euro a month on clothes and 0.5 euro on condoms per visitor. For escorts, we assume 7 euro per visit. Following Eysink Smeets et al. (2007) the escort sector is assumed to be 15 percent of the prostitution sector and that escorts have 10 clients a week. The consumer price index is used to calculate these figures for the other years. The costs of the managers or pimps mainly relate to the rent and costs of rooms and brothels. It is assumed that half of the turnover of the prostitutes is paid to the managers and that half of that is intermediate consumption (Smekens en Verbruggen, 2005).
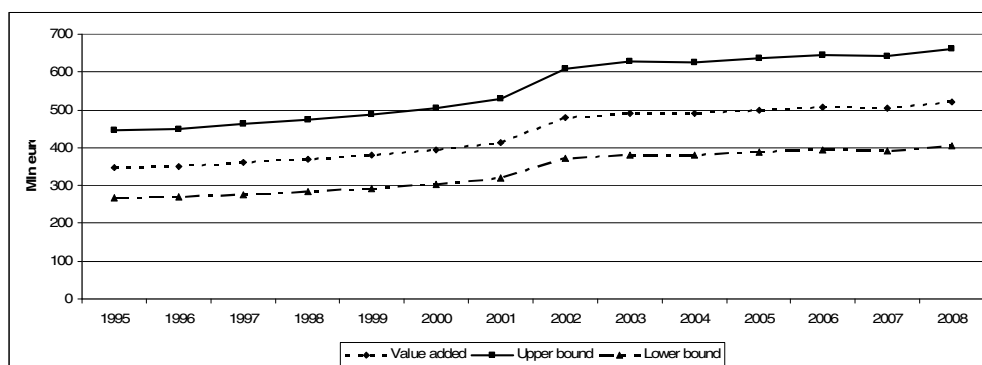
Figure 7. The value added of the prostitution industry in the Netherlands, 1995-2008

Figure 7 presents the estimates of the value added of the prostitution sector in the Netherlands. The value added of the prostitution industry rose from 350 million euro in 1995 to a little over 500 million euro in 2008. As these estimates are influenced by a large number of assumptions, we also show some alternative calculations.[6]

One of the most influential assumptions is the 20 visitors a week per prostitute. This number may well be higher. Therefore an alternative calculation is made assuming 25 visitors per week. Another is the price per visit. Dekker, Tap and Homburg (2006) found that one third of all prostitutes they interviewed earned less then 500

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[6] According to the definitions of the national accounts, prostitution services provided by non-residents staying for less than one year in the Netherlands to non-residents should be considered as transit. However, this does not affect the effect of prostitution on national income. Therefore, this correction is not made.

euro a week, and quotes a prostitute who is willing to provide her services for 15 euro. If this is representative for the whole sector, the average price used in our calculations may be too high. Therefore figure 7 also presents an alternative with average prices that are 20 percent lower. According to these alternatives, the value added of the Dutch prostitution industry in 2008 ranged between 400 and 660 million euro.

5. Fencing

In paragraph 2 we stated that theft does not contribute to national income. But fencing does. The sale of stolen goods is a transaction with mutual agreement which may generate income. We distinguish three types of transactions. The first is the sale of stolen goods by the thief to a consumer. This is comparable with the sale of second-hand goods within the sector households and does not generate value added. The second is the sale of stolen goods by the thief to a company. For that company it is intermediate consumption and as a consequence its profits may diminish. We assume that the extent of this phenomenon is limited and therefore negligible. The third possibility is that stolen goods are sold via a receiver. The value added, consisting of the profit generated by the receiver, is estimated below.

The value added (VA) of fencing equals the trade margins (T) minus costs (U). The costs are fixed at 10 percent of the trade margins. To estimate the trade margins we distinguish four categories of stolen goods: motor vehicles excluding cargo, shop lifting, goods stolen from private individuals excluding motor vehicles, and goods stolen from companies excluding motor vehicles and shop lifting. The trade margins generated by fencing these goods are respectively T_v, T_s, T_p and T_c. Shop lifting is usually for personal use and will therefore be disregarded.

$$VA = T - U = 0.9 \times \left(T_v + T_p + T_c \right)$$ [18]

The trade margins on motor vehicles are estimated by multiplying the value of the non-retrieved motor vehicles (V_m) with the profit margin (m_v) of the receiver.

$$T_v = V_v \times m_v$$ [19]

The value of non-retrieved motor vehicles equals the number of non-retrieved vehicles multiplied by the average market price of used cars. This is done for both motor vehicles stolen from individuals and from companies. The latter are split into light and heavy vehicles (Blaauw, 2006, 2009). The average value is estimated based on data for 2003 (RDW, 2004). The other years are estimated using the consumer price index for new cars and occasions. The profit margin for the receiver is fixed at 50 percent (Smekens en Verbruggen, 2005).

The margin on goods stolen from private individuals is the product of the market value of these goods, the percentage of the stolen goods sold via a receiver, and the profit rate

$$T_p = V_p \times f_p \times m_p$$ [20]

The market value of these stolen goods (V_p) is considered to be 40 percent of the financial loss because of theft. Data on the latter can be found in Statistics Netherlands (2007, 2008). Again, the profit margin of the receiver (m_p) is fixed at 50 percent. This leaves the other 50 percent, being 20 percent of original value of the stolen goods, to the thief. This is in line with the findings of Gruter and Van de Mheen (2007) that a thief gets about 20 to 40 percent of the original value. The percentage of stolen goods sold via a receiver (f_p) is assumed to be 67 percent (Van der Werf, 1997).

The estimate of the trade margins on goods stolen from companies follows the same reasoning. The market value of the stolen goods (V_c) is 40 percent of the financial losses because of burglary. Data on burglary in five industries can be found in Visser, Frederikse and Hermans (2002) and WODC (2009). These figures are raised to the whole economy. The years before 2001 are extrapolated by means of the number of burglaries in companies (Statistics Netherlands, 2008). As before, the percentage of goods sold via a receiver (f_c) and the profit margin (m_c) are fixed at 67 and 50 percent respectively.

$$T_c = V_c \times f_c \times m_c \qquad [21]$$

Figure 8 presents the estimates of the consumption and exports of stolen goods (trade margin only) and the value added of fencing in the Netherlands. The profit margins and the percentage of stolen goods sold via a receiver may well be significantly higher or lower. If we assume a margin of 10 percent point, the value added might be about 40 percent higher or lower.
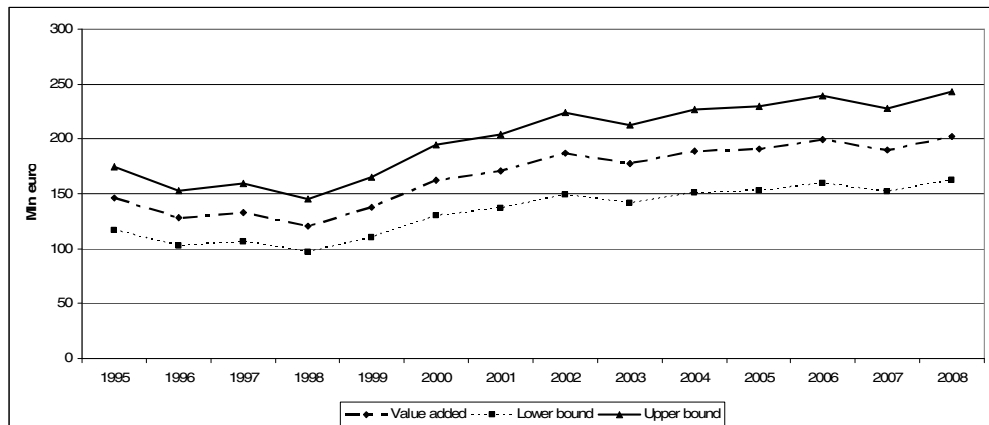
Figure 8. The value added of fencing in the Netherlands, 1995-2008

The value added of fencing decreases between 1995 and 1998 and has increased ever since as more cars were stolen from individuals.

The consumption of stolen goods is calculated as the value added of stolen goods minus exports plus imports. Motor vehicles are a very popular export product (Gruter and Van de Mheen, 2007). Because of lack of data, these exports are assumed to be 75 percent of the trade margin (Smekens and Verbruggen, 2005).

Information on the imports of stolen goods is even more limited. These are assumed to be zero.

6. Illegal temporary employment provided by employment agencies

The 'Flexwet' of 1999 made it possible for employers to attract a flexible workforce and provide legal certainty to flex workers. The resulting increase in the administrative burden and workers rights were incentives for employers to circumvent this law (Grijpstra and Zuidam, 2004) through illegal employment mediation. In 1998, the compulsory licensing for temporary employment agencies was lifted, resulting in an increasing number of agencies. A significant number became involved in illegal mediation.

In order to separate the legal from illegal employment agencies, registers for bona fide temporary employment agencies were set up. However these were not binding (Bolhuis et al., 2006). In 2009 the legislation for temporary employment agencies was extended so that both the employer and the agency are held responsible for the working conditions of the temporary worker.

Grijpstra en Zuidam (2004) distinguish three types of illegal mediation: (1) people staying in the Netherlands legally but without a work permit or who work more hours than allowed, or work for less than the minimum wage, (2) temporary labour migrants (mostly from Eastern Europe) and (3) people staying in the Netherlands illegally. Research voor Beleid (Grijpstra and Zuidam, 2004; Bolhuis et al., 2006; De Bondt and Grijpstra, 2008) estimated an increase in illegally mediated working years (FTE) in the period 1999-2008. These estimates are used to construct time series for 1995-2010.

The value added (*VA*) of the illegal mediation of temporary workers is the difference of the gross value or turnover (*P*) of this mediation minus the costs (*U*), for example the costs of transporting the workers to the work place. The latter are assumed to be 5 percent of the gross value. There are no exports and imports. People working for temporary employment agencies are on the payroll of the agency. This is a difference with prostitution. Prostitutes are considered to be self-employed, whereas illegally mediated people are employees.

The gross value of illegal mediation of temporary workers is the product of the number of mediated working years (*Y*), the number of hours per working year (*H*) and the hourly wage (*W*) plus mark up or profit margin (*T*). The hours per working year are fixed at 1872 hours for the whole period.

$$VA = P - U = 0.95 \times (W + T) \times Y \times H \qquad [22]$$

The wages and profit margin are based upon Grijpstra and Zuidam (2004) and Smekens and Verbruggen (2005). They are set at 5 euro/hour in 2001 and 100 percent in all years. The wages in other years are assumed to follow the collectively agreed wage changes (www.statline.nl). The illegally mediated working years are taken from Grijpstra and Zuidam (2004), Bolhuis et al. (2006) and De Bondt and

Grijpstra (2008). They provide estimates for four years: 1999, 2004, 2006 and 2008. For the other years the illegal mediated working years were interpolated or assumed to follow the development of the volume of (legal) labour, as published by Statistics Netherlands.

The results are shown in figure 9. Like all estimates presented in this paper, there is much uncertainty about the validity of the figures. The figure also shows the estimates if the number of illegally mediated working years were 20 percent higher or lower.
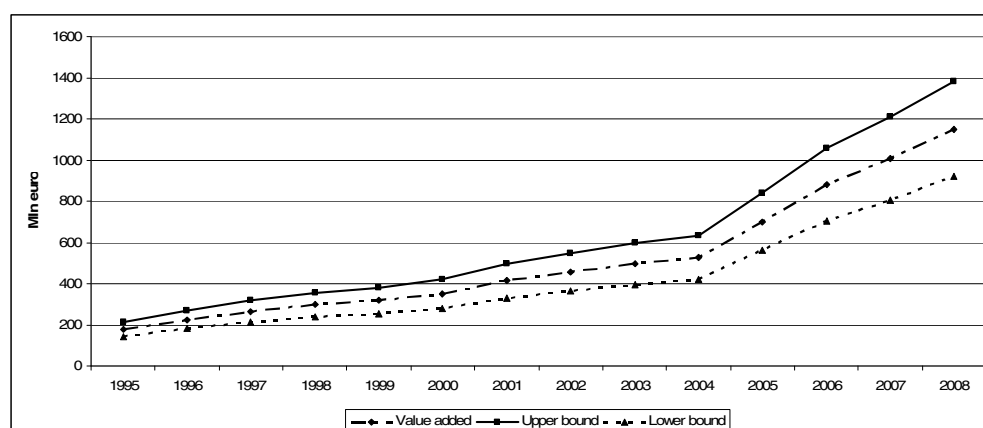
Figure 9. The value added of illegal employment mediation in the Netherlands, 1995-2008

Although the Flexwet was already introduced in 1999, the figures show a break after 2004. This coincides with Poland, the Baltic countries, Czech Republic, Slovakia, Hungary, Malta and the Greek part of Cyprus joining the EU. People from those countries were not allowed to work in the Netherlands, but many did.

7. Illegal gambling

Illegal gambling is estimated for four types of games: illegal casinos and live poker, illegal lotto and pools, commercial bingo and e-games. Illegal casinos hardly exist anymore. The illegal lotto and pools are lotteries, for which unlicensed operators sell tickets. Commercial bingo can be illegal if the prices exceed the allowed maximum, or if bingo is the main activity of the company. E-gaming is playing interactive games of chance on the internet. This can be digital casinos, slot machines or poker.

For each activity, the value added (*VA*) is calculated as domestic production (*P*) minus costs (*U*). Production equals consumption (*C*) plus exports (*E*) minus imports (*M*). Imports and exports are only relevant for E-games. The amounts Dutch residents spent on illegal bingo, lotto etc abroad are assumed to be negligible. The same applies for non-residents playing these games in the Netherlands.

$$VA = P - U = C - M + E - U \qquad\qquad [23]$$

Most people who play gambling games lose all or part of their bets. Consistent with the definitions of the National Accounts, these net losses (bets minus payouts) are considered as the consumption of gambling games. In 2000 the net gaming receipts of illegal casinos in the Netherlands were 136 million euro and the number of illegal casinos was rather constant until that year (Donker et al., 2001). The Ministry of Justice and the tax authorities set up a special project, called "Joker" and have closed down many illegal casinos since 2000. In 2001 the net gaming receipts fell to 50 million euro (Pemberton et al., 2002). Currently almost all illegal casinos are closed down (Homburg and Oranje, 2009).

Live poker still exists, although it is no longer played in illegal casinos. Tournaments have moved to other places. The net gaming receipts were 4.7 million euro in 2008 (Homburg and Oranje, 2009). For the years before this figure is extrapolated using time series of the highly educated male population aged 15-35.

Donker et al. (2001) also made an estimate for illegal lotto, pools and bingo in 2000. According to Wilkinson et al. (2008) the demand for these games is rather stable. Homburg and Oranje (2009) present some characteristics of the people playing these games. Lotto and pools are favourites with men and women of 35-65 years old with secondary education or less. Bingo is played mainly by 35-65 years old women with secondary education or less. Time series of these populations are used to estimate the trend for these games.

The net receipts of e-gaming for 2001-2005, 2007 and 2008 are estimated by using data from the Nationaal Kenniscentrum Kansspelen (downloaded from www.nationaalkenniscentrumkansspelen.nl, now defunct). These include the stakes paid by the players. Half of the stakes is paid out, so net receipts are also 50 percent (Homburg and Oranje, 2009). About 45 percent of the e-games played in the Netherlands are Dutch (KLPD, 2003). The remaining are imports of illegal gambling services. This 45/55 distribution is used for all years. No information is available on non-residents playing e-games provided by Dutch companies. Therefore, these are kept at zero till information becomes available.

According to Donker et al. (2001) the intermediate use for illegal casinos and live poker is 50 percent of the net receipts. For lotto, bingo and e-games we assume 10, 10 and 5 percent. The estimates of the value added of illegal gambling are shown in figure 10.
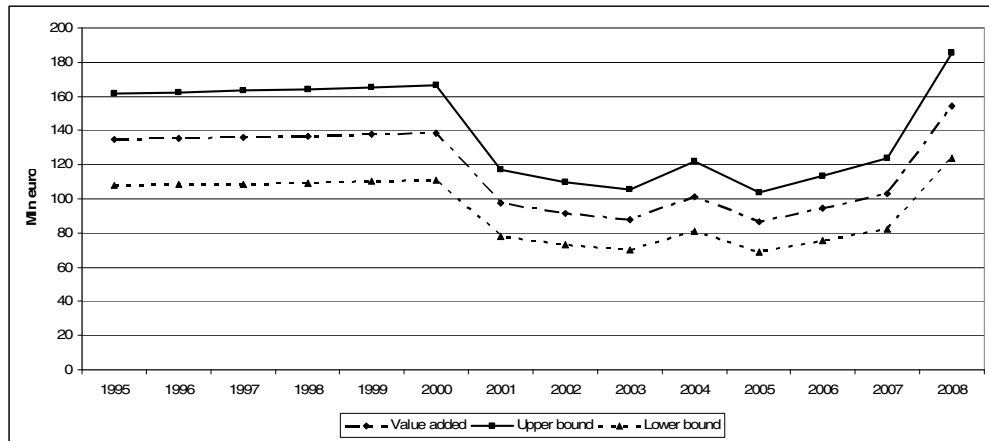
Figure 10. The value added of illegal gambling in the Netherlands, 1995-2008

The decrease of the value added after 2000 is caused by the closure of illegal casinos. The increase after 2005, and especially after 2007, is due to the rise in e-gaming.

As exports are neglected, the estimates for e-games must be considered as a lower bound. Just as about half of the money spent on e-gaming by residents is spent on illegal e-gaming abroad, it is quit possible that half of the revenues of Dutch e-game companies comes from abroad. For the other estimates a margin of 20 percent is not unlikely.

8. Illegal copying of software, games, movies and music

Not all illegal copies of software, movies and music contribute to the national income. Only those that are sold for money do. The 'value' of copies for people's own use, for friends, or for exchanges through the internet that are not paid for, do not count. The latter are similar to theft, the former is similar to fencing.

The number of illegal copies of music, movies and games sold (c_m) is calculated as a percentage (f_m) of the total (legal plus illegal) volume sold. The legal sales ($c_{m,legal}$) are taken from www.npvi.nl. According to Breininfo (2003) the number of illegal copies in 2002 was one-fifth of the legal ones, of which 40 percent was sold professionally. So the number of illegal copies sold was 8 percent of the legal ones. Based on data from www.anti-piracy.nl this was 11.6 percent for 2004 and 2006. The turnover (P_m) is the number of illegal copies sold times the price of an illegal copy (p_m). According to anti-piracy.nl (2004, 2006) the price of an illegal copy was 5.75 euro in 2004 and 6.00 euro 2006. For 2005 the price is interpolated, for the other years the price is extrapolated using the consumer price index of blank media.

$$P_m = c_m \times p_m = \frac{f_m}{(1 - f_m)} \times c_{m,legal} \times p_m \qquad [24]$$

The production of illegal copies of computer software (P_s) is estimated at 10 percent of the value of this software, if it were legal ($C_{s,legal}$). The original value, which they

consider as the financial loss because of illegal copying, is estimated by BSA (2002, 2007) and BSA and IDC (2010).

$$P_s = 0.1 \times C_{s,legal} \qquad [25]$$

Imports and exports are assumed to be of equal size and are therefore neglected. The cost of production (*U*) is fixed at 10 percent of the production value. The value added (*VA*) of illegal copying is

$$VA = P_m + P_s - U = 0.9 \times (P_m + P_s) \qquad [26]$$

Figure 11 shows the estimates of the value added of illegal copying. The sharp increase after 2001 is caused by the hike in illegally copied software as shown in the figures of BSA (2002, 2007). The drop after 2004 is due to the sliding value of the dollar, resulting in lower prices for software in Europe.
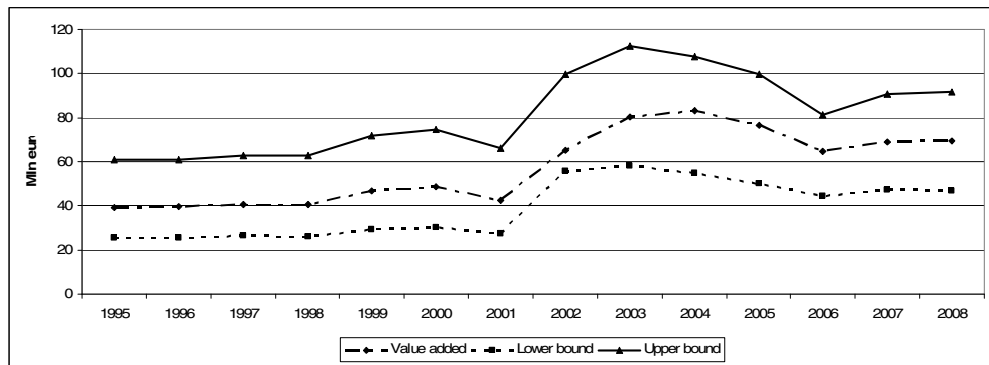
Figure 11. The value added of illegal copying of software, games, movies and music in the Netherlands, 1995-2008

Breininfo, anti-piracy.nl and BSA have no reasons to underestimate the illegal copying of games, movies and music. So, their estimates for 2002, 2004 and 2006 must be quit reliable or even an over-estimate. The margin will be larger for earlier and later years. Alternative calculations were made assuming that the number of illegal copies sold was between 6 and 12 percent of the number of legal copies in 1995, reaching 10 to 12 percent in 2002-2006, and expanding to 10 to 13 percent by 2008. A margin of 5 percent-point was considered for the production of illegal copies of computer software. The results of these calculations are shown in the figure.

9. Smuggling of cigarettes

The differences in excise duties between countries are a major cause of smuggling of tobacco products. Duties in the Netherlands are comparatively low so cigarette smuggling is not all that prevalent.

The domestic consumption of illicit cigarettes (*C*) is the product of the number of illicit cigarettes consumed (*c*) and their price (p_C). The latter is fixed at half of the

price of legally sold cigarettes, based on an article on smuggling in newspaper BN De Stem (2009). The price of a packet of 25 Marlboro cigarettes is used as reference.

The number of illicit cigarettes consumed is unknown. Although experts (e.g. van Dijck, 2007; Integis, 2008; Broekhuis and Rotteveel, 2009) have different opinions no one thinks that it is over eight percent of the consumption of legal cigarettes. According to Broekhuis and Rotteveel (2009) the consumption of illicit cigarettes had been rather constant for many years. This changed because of a sharp rise of duties on cigarettes in 2004. Data of the Dutch customs (www.minfin.nl) show that the share of illicit cigarettes intended for the Dutch market strongly increased from 10 percent in 2005 to 38 percent in 2008, then fell to 23 percent in 2009. Given this, it is assumed that until 2005 the domestic consumption of illicit cigarettes is 2.5 percent of total consumption of cigarettes (c_{total}) and that this percentage (f) has increased by half a percent-point a year since then. This results in an increase of the domestic consumption of illicit cigarettes from less than 25 million euro in 1995 to almost 80 million euro in 2008. The total consumption of cigarettes is the product of the consumption of cigarettes per capita and the size of the Dutch population.

$$C = p_C \times c = p_C \times f \times c_{total} \qquad [27]$$

As with illicit drugs, the imports of illicit cigarettes minus seizures (M_{-S}) are calculated from the seizures by the customs (s), an estimate of the detection or seizure rate (R) and the import price (p_M).

$$M_{-S} = p_M \times \frac{(1-R)}{R} \times s \qquad [28]$$

Seizures are taken from de website of the Ministry of Finance. To smooth incidental fluctuations we used 3-years moving averages. The seizure rate is fixed at 10 percent.

As with illicit drugs, part of all illicit copies that enter the Netherlands is transit (m_E) which by definition is excluded from the calculation of national income. Again transit is calculated as a fraction (q) of total exports. In our calculations it is assumed that q equals 0.5 for all years.

$$m_E = q \times \left(\frac{(1-R)}{R} \times s - c \right) \qquad [29]$$

Until 2000 the import price is assumed to be 30 percent of the street price of illicit cigarettes. Most of the illegal imports originated from China and the former Warsaw Pact countries where cigarettes cost about 70 percent less than in the Netherlands. After 2000 the smuggling from China fell sharply due to increased investigations by the Chinese authorities. These illegal imports were replaced by imports from a wide variety of other countries and the import of imitation cigarettes.

In 2006 genuine cigarettes in the exporting (smuggling) countries cost about 30 percent of the price in the Netherlands. Broekhuis and Rotteveel (2009) reported that around 2006 genuine cigarettes were sold at 17 to 25 percent of the 'official' price.

As the margins on imitation cigarettes are much higher than on genuine cigarettes, their import price will be far lower. Therefore, it is assumed that the import prices had gradually declined from 25 percent of the street price in 2001 to 10 percent by 2008.

As the domestic production of illicit cigarettes is negligible, exports (*e*) equal imports (*m*) minus domestic consumption (*c*). Until 2005 the United Kingdom was the main destination of the exports, as the street price of illicit cigarettes there was 60 percent of the legal price (Integis, 2008). To calculate the value of the exports (*E*) this price (p_E) is used for all exports until 2005. After that Ireland became the most popular destination as its excise duties on tobacco sharply increased. The Irish street price of illicit cigarettes was about 50 percent of the legal ones (Broekhuis and Rotteveel, 2009). That price is used from 2006 on.

$$E = p_E \times e = p_E \times (m - c) \tag{30}$$

No information is available on the costs of transport and storage. As with illicit drugs, these costs are assumed to be 10 percent of the trade margin. The value added (*VA*) generated on Dutch territory is now

$$VA = 0.9 \times \left\{ (p_E - p_M) \times \left[\frac{(1-R)}{R} \times s - m_E \right] + (p_C - p_E) \times c \right\} \tag{31}$$

The value added generated by the smuggling and sales of illicit cigarettes is shown in figure 12. Most of value added is generated by re-exports. The estimates largely depend on the assumptions on the detection rate. Therefore, alternative calculations are made assuming detection rates of 5 and 15 percent.
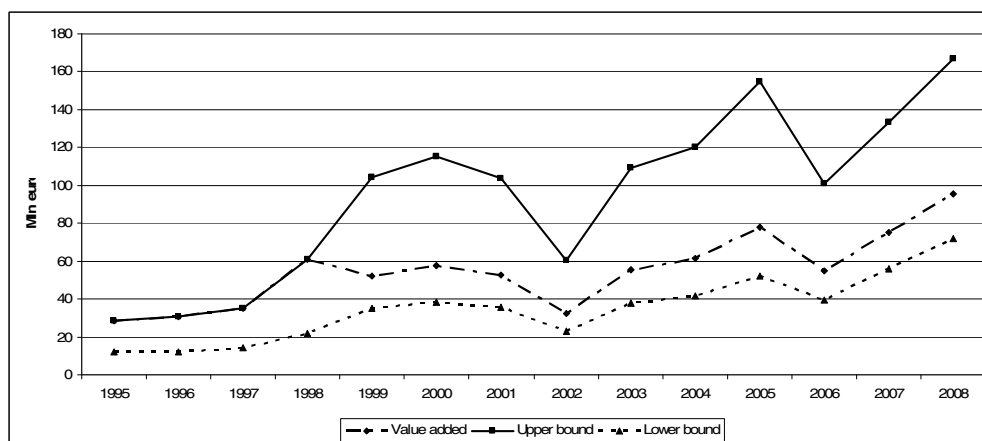
Figure 12. The value added of illicit cigarettes in the Netherlands, 1995-2008

10. Conclusions

The contribution of illegal activities in the Netherlands to the national income increased from 1800 million euro in 1995 to almost 3500 million euro in 2008. This is the equivalent 0.6 percent of gross national income.
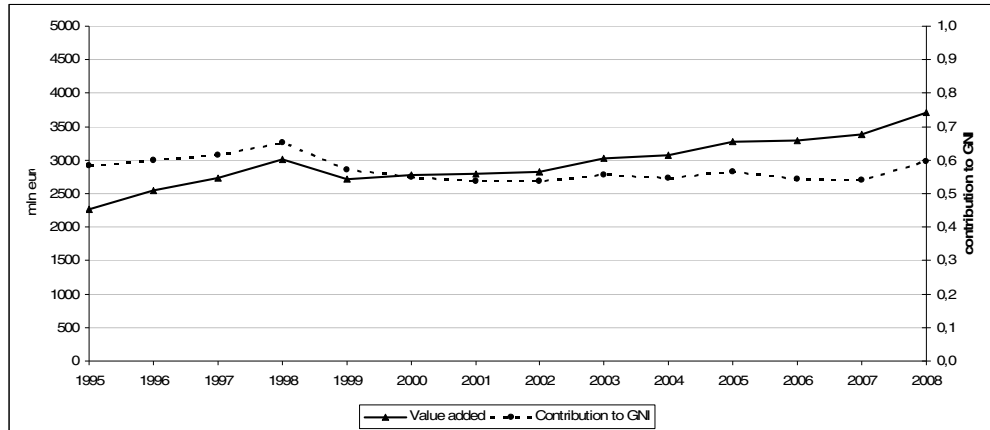
Figure 13. The value added of illegal activities in the Netherlands, 1995-2008

The main illegal sector is the production and trade of drugs, which accounted for over 50 percent of total income from illegal activities until 2001. By 2008 its share was down to less than 40 percent. Illegal employment-finding saw its share increase from 10 percent in 1995 to 33 percent in 2008.

As reliable data on illegal activities are lacking, the estimates presented heavily depend on assumptions. Therefore, the margins around these estimates are quite large and may very well be 0.3 percent of gross national income larger or smaller.

Epilogue

The figures presented in this article cannot be added to the national income without further corrections. Parts of the illegal activities may already contribute implicitly or explicitly (European Commission et al., 2008). Units providing illegal goods may be included in the business register and report to the statistical agency. In the Netherlands this can be the case for coffee shops, registered prostitution and employment agencies. Companies may report illegal activities under different headings, hiding these activities. Consumption of illegal services like prostitution may be reported in the annual household budget surveys labelled as 'other expenditures'. Finally intermediate costs of production may already be booked as household expenditures and contribute to the national income, for example clothes and lingerie bought by prostitutes and the use of electricity to grow cannabis.

The main corrections for intermediate use of illegal activities already booked as household consumption are the sales of cannabis via coffee shops, prostitution and illegal employment mediation.

It is assumed that half of the sales of cannabis via coffee shops are already included in the current estimates of national income, spread over domestic consumption and exports. About one third of the turnover of coffee shops is sales to non-residents (Korf, 2003).

Some forms of prostitution have been legal since October 2000. This legal part is estimated at 50 percent of total prostitution (Goderie en Bouttelier, 2006). It is assumed that half of the legal prostitution is already included in the current estimates of national income.

Illegal mediation of temporary employment is already included in the current estimates of national income.

If the value added of all illegal activities were included in the estimates of national account and all relevant corrections were made, (gross) national income in 2008 would be 0.4 percent higher than currently estimated. The margins, however, are quite large.

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Symbols

3. The consumption, production and trade of illicit drugs

Values:

C_M	Domestic consumption of imports
E_M	Exports from imports
K_M	Costs of imports (transport and storage)
K_P	Costs of domestic production (including transport and storage)
M	Imports
M_{-S}	Imports minus seizures
P	Domestic production
S_M	Seized imports
S_P	Seized domestic production
T_M	Trade margins on imports
VA	Value added

Rates:

f_C	The market share of coffee shops in the total domestic consumption of nederwiet
f_P	Fraction of nederwiet in the domestic consumption of cannabis.
q	Fraction of exports that is transit
R_M	Seizure rate for imports
R_P	Seizure rate for domestic production

Volumes:

c_M	Domestic consumption of imports
c_P	Domestic consumption of domestic production
e_P	Exports from domestic production
m	Imports
m_E	Transit
p	Domestic production
q_P	Domestic production capacity
s_M	Seized imports
s_P	Seized domestic production

Prices:

p_C	Consumption price
p_E	Export price
p_M	Import price
p_P	Production price

4. Prostitution

Values:

C	Domestic consumption
E	Exports
M	Imports
VA	Value added
P	Turnover

Rates:

f_e	Share of customers from abroad
f_M	Share of total turnover realised by non-resident prostitutes leaving the Netherlands within one year

Volumes:

n_{pros} Number of prostitutes

$n_{clients}$ Number of clients per prostitute

Prices:

p Consumption price

5. Fencing

Values:

T Trade margin on fencing of stolen goods

T_c Trade margin on fencing of goods stolen from companies (excluding motor vehicles and shop lifting)

T_p Trade margins on fencing of goods stolen from private individuals (excluding motor vehicles)

T_s Trade margins on fencing of goods in shops (shop lifting)

T_v Trade margins on fencing of stolen motor vehicles

U Intermediate use (costs)

V_c Market value of goods stolen from companies (excluding motor vehicles and shop lifting)

V_p Market value of goods stolen from private individuals (excluding motor vehicles)

V_v Market value of stolen and non-retrieved motor vehicles

VA Value added

Rates:

f_c Share of stolen goods from companies sold through a receiver

f_p Share of stolen goods from private individuals sold through a receiver

m_c Profit margin on fencing goods stolen from companies (excluding motor vehicles and shop lifting)

m_p Profit margin on fencing goods stolen from private individuals (excluding motor vehicles)

m_v Profit margin on fencing stolen motor vehicles

6. Illegal temporary employment provided by employment agencies

Values:

H Hours per working year (FTE)

T Profit margin (mark up)

P Turnover

U Intermediate use (costs)

VA Value added

W Hourly wage

Y working years (FTE)

7. Illegal gambling

Values:

C Domestic consumption

E Exports

M_{-S} imports minus seizures

P Domestic production

U Intermediate use (costs)

VA Value added

8. Illegal copying of software, games, movies and music

Values:

$C_{s,legal}$ Domestic consumption of illegal copies of computer software if it were legal

P_m Domestic production of illegal copies of music, movies and games

P_s Domestic production of illegal copies of computer software

U Intermediate use (costs)

VA value added

Rates:

f_m Consumption (sales) of illegal copies of music, movies and games as share of the total (legal plus illegal) legal sales

Volumes:

c_m Consumption (sales) of illegal copies of music, movies and games

$c_{m\,legal}$ Consumption (sales) of legal copies of music, movies and games

Prices:

p_m Price of an illegal copy of music, movie or game

9. Smuggling of cigarettes

Values:

C Domestic consumption

E Exports

M Imports

VA Value added

Rates:

f Consumption of illicit cigarettes as fraction of the total consumption of cigarettes

q Fraction of exports that is transit

R Seizure rate

Volumes:

c Domestic consumption

c_{total} Total domestic consumption of cigarettes (legal plus illegal)

e Exports

m Imports

m_E Transit

s Seizures

Prices:

p_C Consumption price

p_E Export price

p_M Import price

Appendix. Data (and assumptions) underlying the estimates.

Table A1a. Illicit drugs, heroin and cocaine

			1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Value added	VA	Million euro	541	625	686	715	547	522	524	469	462	499	473	439	360	372
Seizures (5-years moving average)	s_M	1000 kg	8.4	9.7	10.4	10.8	10.8	10.0	11.5	11.9	13.8	14.3	15.1	14.1	14.2	13.5
Seizure rate	R_M		0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.175	0.20	0.20	0.20	0.20	0.20	0.20
Domestic consumption	c_M	1000 kg	6.3	6.2	6.4	6.3	6.3	6.4	6.5	6.6	6.9	7.1	7.3	7.3	7.3	7.3
Export price	p_E	Euro/gr	36.74	36.84	36.91	35.84	33.96	35.00	34.61	34.02	31.98	31.94	32.11	30.99	30.66	30.73
Import price	p_M	Euro/gr	21.00	17.01	19.27	16.38	20.87	22.85	24.15	23.39	19.95	20.70	20.90	20.56	21.66	22.47
Consumption (= street) price	p_C	Euro/gr	51.02	38.24	52.71	44.98	46.91	51.43	51.92	48.38	39.78	46.63	38.98	39.03	33.56	39.30

Table A1b. Illicit drugs, ecstasy and amphetamines

			1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Value added	VA	Million euro	84	83	143	248	272	316	342	333	332	329	297	145	102	105
Seizures (5-years moving average)	s_P	Million tablets	2.4	2.8	5.8	11.7	16.9	23.7	29.9	32.8	31.0	29.5	26.0	22.9	20.2	20.0
Seizure rate	R_P		0.10	0.11	0.12	0.13	0.13	0.14	0.15	0.16	0.17	0.18	0.19	0.20	0.20	0.20
Domestic consumption	c_P	Million tablets	2.3	2.6	2.9	3.1	3.2	3.3	3.4	3.7	4.1	4.4	4.8	4.8	4.0	6.9
Export price	p_E	Euro/tablet	3.40	3.22	3.04	2.85	2.67	2.48	2.20	2.25	2.50	2.75	2.75	1.75	1.50	1.50
Production price	P_P	Euro/tablet	0.11	0.13	0.15	0.17	0.18	0.20	0.22	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Consumption (= street) price	p_C	Euro/tablet	6.81	6.44	6.07	5.70	5.34	4.97	4.60	4.50	5.00	5.50	5.50	3.50	3.00	3.00

Table A1c. Illicit drugs, nederwiet

			1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Value added	VA	Million euro	97	122	146	175	189	222	271	334	426	436	481	589	684	759
Seizures (5-years moving average)	s_P	1000 kg	3.9	4.8	5.5	6.4	6.3	7.8	10.4	11.6	14.6	16.9	19.2	21.0	22.7	22.5
Seizure rate	R_P		0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Domestic consumption	c	1000 kg	25.2	28.9	32.5	36.1	39.6	39.5	39.5	39.4	39.3	39.0	38.7	38.3	37.9	37.6
Market share of coffee shops	f_C		0.40	0.40	0.42	0.42	0.42	0.42	0.42	0.385	0.35	0.363	0.375	0.388	0.40	0.40
Share of nederwiet in domestic consumption of cannabis	f_P		0.50	0.575	0.65	0.725	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Export price	p_E	Euro/gr	2.27	2.39	2.52	2.64	2.77	2.89	2.92	3.30	3.55	3.26	3.26	3.72	4.06	4.54
Consumption (= street) price	p_C	Euro/gr	4.54	4.79	5.03	5.28	5.53	5.78	5.83	6.59	7.10	6.51	6.51	7.44	8.11	9.07

Table A1a. Illicit drugs, cannabis (excl. nederwiet)

			1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Value added	VA	Million euro	207	197	190	175	151	133	91	78	72	42	40	44	45	55
Seizures (5-years moving average)	s_M	1000 kg	125.0	110.0	100.0	89.0	75.1	70.5	52.0	35.0	29.0	24.5	19.1	15.4	13.5	14.6
Seizure rate	R_M		0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Import price	p_M	Euro/gr	1.12	1.12	1.12	1.16	1.19	1.47	1.75	2.02	2.30	2.73	2.63	2.96	3.29	3.44

Table A2. Prostitution

			1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Value added	VA	Million euro	348	351	361	370	381	393	414	478	492	490	499	506	505	520
Number of prostitutes	n_{pros}	× 1000	24.7	24.7	24.8	24.9	25.0	25.1	25.3	25.4	25.5	25.6	25.6	25.6	25.6	25.6
Share of customers from abroad	f_e		0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.23	0.23	0.23	0.23	0.23	0.23	0.23
Share of total turnover by non-residents who leave within a year	f_M		0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.35	0.35	0.35	0.37	0.37
Consumption price	p	Euro	35.15	35.25	36.00	36.75	37.50	38.40	40.00	45.15	46.10	46.70	47.50	48.00	48.80	50.00

Table A3. Fencing

			1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Value added	VA	Million euro	146	128	133	121	138	162	170	187	177	189	191	200	190	202
Market value of goods stolen from companies (excl. motor vehicles and shop lifting)	V_c	Million euro	137	147	139	141	149	168	158	157	156	155	136	127	125	132
Market value of goods stolen from private persons (excl. motor vehicles)	V_p	Million euro	275	209	231	187	229	272	319	366	355	400	432	466	442	480
Market value of goods stolen and non-retrieved motor vehicles	V_v	Million euro	49	47	49	50	54	67	61	66	53	50	46	48	43	41

Table A4. Illegal temporary employment through employment agencies

			1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Value added	VA	Million euro	179	225	264	296	317	351	413	455	496	528	700	881	1.008	1.151
Hourly wage	W	Euro	3.78	3.93	4.08	4.23	4.38	4.53	5.00	5.19	5.35	5.40	5.43	5.50	5.63	5.80
Mediated working years	Y	× 1000	13.3	16.1	18.2	19.7	20.4	21.8	23.2	24.6	26.1	27.5	36.3	45.0	50.4	55.8

Table A5. Illegal gambling

			1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Value added	VA	Million euro	135	135	136	137	138	139	98	91	88	101	86	95	103	154
Turnover illegal casinos and live poker	P	Million euro	136	136	136	136	136	136	50	6	5	5	3	3	3	5
Turnover illegal lotto, pools, bingo	P	Million euro	72	72	73	73	75	75	77	77	77	76	76	77	77	77
Turnover e-gaming	P	Million euro	5	6	6	7	8	9	10	54	46	87	46	69	93	238

Table A6. Illegal copying of software, movies and music

			1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Value added	VA	Million euro	39	40	41	41	47	48	43	65	80	83	77	65	69	69
Consumption of illegal software if it were legal	$C_{s,legal}$	Million euro	169	174	173	175	248	247	180	390	510	505	479	334	366	383
Sales of legal copies of music, movies and games	$c_{m,legal}$	×Million	47.6	46.6	49.1	47.3	46.5	49.5	50.1	57.8	55.9	56.1	55.0	59.2	62.0	61.8
Sales of illegal copies of music, movies and games as share of the legal sales	f_m		0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.098	0.116	0.116	0.116	0.116	0.116
Price of an illegal copy of music, movie or game	P_m	Euro	6.50	6.57	6.56	6.74	6.71	6.78	6.77	6.62	6.32	5.75	5.19	5.00	4.94	4.80

Table A7. Smuggling of cigarettes

			1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Value added	VA	Million euro	29	31	35	61	52	58	53	33	56	61	78	55	75	96
Seizures (3-years moving average)	s	×Million	60.0	65.0	70.0	123.3	210.8	225.8	173.8	92.6	176.7	149.3	186.0	113.7	136.0	166.8
Seizure rate	R		0.05	0.05	0.05	0.05	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Total domestic consumption of cigarettes	c_{total}	×1000 Million	17.1	15.4	16.5	16.6	16.5	16.6	16.2	16.8	17.0	14.8	13.5	14.1	15.2	14.9
Consumption of illicit cigarettes as share of the total consumption of cigarettes	f	Million	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.030	0.045	0.050
Export price	p_E	Euro-cents	6.1	6.3	6.7	7.0	7.3	7.6	8.2	8.5	8.5	11.0	11.0	11.0	11.0	10.5
Import price	p_M	Euro-cents	1.5	1.6	1.7	1.8	1.8	1.9	1.7	1.8	1.8	2.3	1.8	2.0	1.5	1.1
Consumption (= street) price	p_C	Euro-cents	5.1	5.2	5.6	5.9	6.1	6.3	6.9	7.1	7.1	9.2	9.2	10.0	10.0	10.5