Opium Production in Afghanistan

Which are the Key Determinants of Opium Production?

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Executive Summary

This thesis analyses the phenomenon of widespread illicit industries in developing countries; specifically focusing on the situation of the Afghan opium economy. The thesis aims to determine the key factors affecting the level of Afghan opium production. The potential determinants have been divided into two perspectives: either the opium cultivation has grown large due to rational decisions by farmers driven by positive economic incentives, or farmers have been pressured, or even forced, into opium cultivation due to the lack of alternatives and the widespread poverty and corruption. In parallel, six variables have been defined and will be tested in an econometric regression; opium price, opium yield, security level in Afghanistan, poverty, Gross Domestic Product per capita and the alternative livelihood of wheat production. The finding of the thesis is that both perspectives are correct to some extent; however, the impoverished Afghan population is mainly driven by positive economic incentives and that is why the opium production has flourished.

Keywords*: Illicit Products, Opium, Heroin, Afghanistan, Cocaine, Blood Diamonds*

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"Either Afghanistan destroys opium or opium will destroy Afghanistan."
– President Hamid Karzai
(Glaze, 2007, p. 1)

Source: Peterkin (2008)

List of Abbreviations

FAO: Food and Agriculture Organization of the United Nations

OECD: Organisation for Economic Cooperation and Development

UNDP: United Nations Development Programme

UNICEF: United Nations Children's Fund (Originally United Nations International Children's Emergency Fund)

UNODC: United Nations Office on Drugs and Crime

UNODCCP: United Nations Office for Drug Control and Crime Prevention

UN-OHRLLS: The United Nations Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and the Small Island Developing States

UNSD: United Nations Statistical Division

WB: World Bank

WHO: World Health Organization

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1. Introduction

In the human development rankings from the United Nations, Afghanistan is found at the bottom (UNDP, 2009). According to UN statistics, the country belongs to those least developed in the world. Afghanistan is defined as a landlocked developing country, whose growth is impeded by lack of access to coast, long distance to world markets and high transportation costs (UN-OHRLLS, 2010). One UN report describes Afghanistan as "a country struggling with some of the most daunting statistics in the world for literacy, maternal mortality, food security and life expectancy. In this context, simply to survive from one day to the next is a terrible challenge for many people" (UNODC, 2010b).

However, one index where Afghanistan does come in the lead is that of opium production. According to Dilanian (2009), Afghan opium production alone constitutes as much as 90 percent of the world market. Each year, 900 tons of opium and 375 tons of heroin (processed opium) are trafficked from Afghanistan to other countries. Drugs from Afghanistan cater to approximately 15 million drug users and cause 100 000 deaths each year, as well as contribute to the spread of HIV at a rapid pace. The opium economy is also a source of funds for criminal groups and terrorists (UNODC, 2009).

Furthermore, opium production constitutes 30 percent of Afghanistan's GDP and causes great damage to the Afghan economy (Dilanian, 2009). It employs two million Afghan workers, approximately eight percent of the population (Rotberg, 2007). The opium production poses a great threat to the country's potential for development as the opium economy entails corruption, criminality and insecurity (Byrd, 2008).

In light of the necessity to decrease opium production, one needs to understand the determinants of its magnitude. This thesis divides prior research and potential determinants of opium production into two main theories regarding farmers' production choice. The first theory states that farmers are forced into opium cultivation by factors such as pressure from warlords, the widespread poverty and the lack of alternatives. The second theory states that farmers engage in opium production voluntarily, due to positive incentives such as high income potential. Even though these two standpoints are not mutually exclusive, and both are likely to have an effect on the Afghan opium economy, it is important to know which one is more dominant in order to formulate future policies to combat opium production.

Prior literature has not been able to determine which of the above theories is dominant and thereby decides the key variables affecting opium production. This can, however, be tested through econometric standard methodology, which is what this thesis aims to do. The purpose of this work is to identify the determinants behind the cultivation of opium poppy.

The central research question for this thesis is as follows: *Which are the key determinants of opium production in Afghanistan?*

The rest of this dissertation is structured as follows. The initial question formulation is broad to allow for an explorative approach in identifying the relevant key determinants. Theories from prior research on the Afghan opium economy will furthermore be examined for their external validity by comparing to some other countries. The thesis will thereafter be narrowed into examining those variables that are claimed to have the most crucial influence on the size of the Afghan opium production. Following is an econometric regression in order to test the relevance of the variables. Thereby, the determinants of opium poppy cultivation in Afghanistan will be concluded through the use of prior literature as well as the econometric model conducted within this thesis.

2. Theoretical Framework

In this chapter, a theoretical framework is presented to examine the reasons why impoverished populations choose to engage in illicit activities; more specifically why Afghan farmers cultivate opium. The different factors can be divided into two perspectives; one perspective implies that peasants choose opium cultivation due to the positive incentives and the other perspective implies that they are forced into this line of work.

2.1 General Theories on Illicit Industries

In many countries worldwide, impoverished rural populations are dependent on the involvement in illicit production of different kinds of goods. These countries are generally characterised by widespread poverty, corruption and a lack of alternative livelihoods. The combination of peasants desperate to make a living and a strong presence of rebel forces is what often facilitates pervasive illicit industries in developing countries (Boschini, Pettersson & Roine, 2007). These kinds of industries are often dominated by warlords and insurgents who are attracted to these fields due to the high profits and potential for gaining societal and political power (Byrd, 2008). It has been suggested that it is easier for rebel forces to gain control over an illegal industry when the resource involved is bound to a specific and reasonably small geographic location (Boschini, Pettersson & Roine, 2007). The more control insurgents have gained over an industry, the more likely the rural population is to be pressured into it. Hence, peasants will have fewer opportunities to affect their own destiny and they are likely to end up at the mercy of the rebel forces (Byrd, 2008).

The object in focus of the present work is Afghanistan with the world's largest production of opium and heroin (Dilanian, 2009). Afghanistan has been plagued by poverty, corruption and violence for decades and these are all intricate characteristics of the opium economy (Byrd, 2008). The Afghan situation will be compared to Colombia and a selection of African countries. Colombia has the world's largest cocaine production and is employed as an example due to the many similarities to Afghanistan (Telegraph, 2010). The chosen African countries produce 'conflict diamonds' (blood diamonds); these diamonds are illegally produced and smuggled, and are used to fund rebel activities against legitimate governments (UN, 2001). This example is chosen as it provides a broader perspective of illegal activity, beyond a discussion merely on narcotics.

The main similarity between these countries is that they are all plagued by illegal activity, poverty, corruption and violence. The key difference between the drug producing countries and the blood diamond producers is the nature of the resource; the geographical spread of

the area involved, mobility of production and the size of the product. It is more difficult to control illicit production that spreads over large areas, such as fields with coca and poppy. Furthermore, controlling an illegal industry is less complicated when the object of desire is small and easy to smuggle, like diamonds. Hence, African blood diamonds are a suitable object for rebel forces (Olsson, 2006). The situations of Colombian coca fields and Afghan poppy fields are on the other hand quite difficult to supervise. Cultivation of crops is a flexible livelihood in terms of location and cannot be easily hidden as it requires large amounts of space. Despite this, it seems that both Colombian and Afghan rebel forces have succeeded in gaining control of these highly profitable industries (Peterkin, 2008 & Rosenberg, 2000).

2.2 Empirical Background: The Afghan Opium Economy

The Afghan rural population is, to a large extent, involved in the cultivation of opium poppy as well as the refinement of this poppy into opiates, mainly raw opium and heroin. Heroin is nowadays a dominant opiate in Afghanistan and highly lucrative. The impoverished Afghans need to provide for their families and opium cultivation is an accessible means for most of the rural population to make a living (UNODC, 2009).

Afghanistan has been the dominant opium producer since the early 1990's. Drugs from Afghanistan are estimated to be abused by approximately 15 million drug users worldwide and are believed to cause 100 000 deaths each year (UNODC, 2009). The graph below illustrates Afghanistan's share of total global opium production (UNODC, 2009). The present magnitude and dependence on opium as a livelihood in Afghanistan is virtually unprecedented in global experience (Byrd, 2008).

Global Opium Production 1980-2009

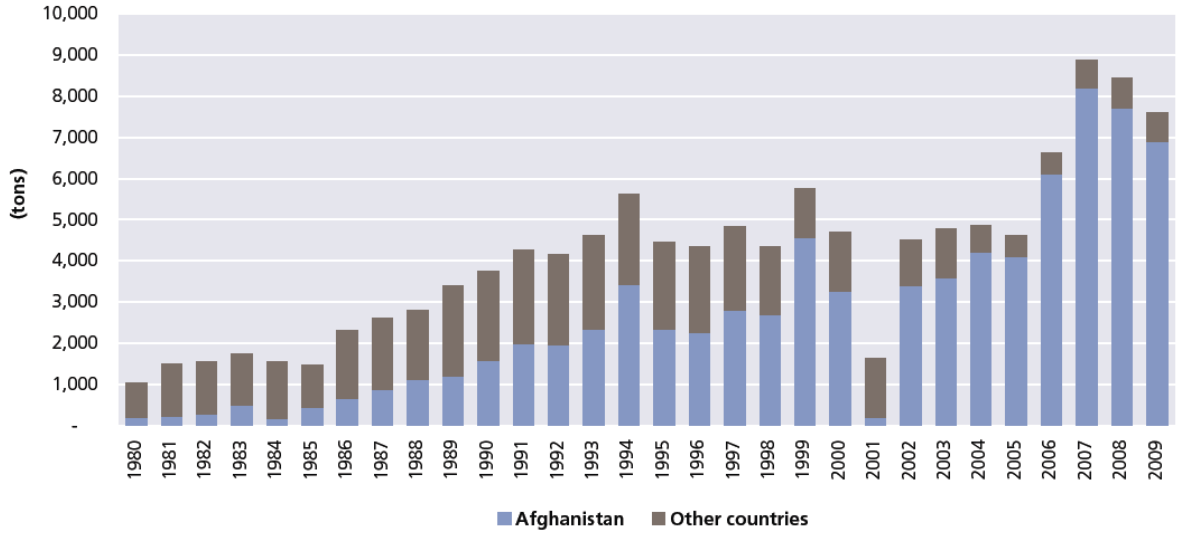

Figure 1 - Source: UNODC (2009), p. 10

As is shown in Figure 1, the Afghan opium cultivation has followed an increasing trend for the past three decades. The only significant exception was in 2001 when the Taliban imposed a temporary ban on opium cultivation and nearly extinguished production that year. Experts agree that the primary purpose of this ban was not to extinguish cultivation, but to drive up opium prices for the benefit of the Taliban rulers themselves (Törnblom, 2010). Opium trade was in fact legal in Afghanistan before and during the Taliban period until the new president Karzai and his administration criminalized production of the crop in 2002 (UNODC, 2003).

Apart from the farmers, there are several other actors in the Afghan opium economy; the Taliban as well as warlords constitute an integral part of this industry. The opium production finances warlord activity and in return warlords offer protection to the opium farmers (Byrd, 2008). Hence, warlords assume a dominant position in the complex web of poppy cultivation and refinement, thereby maintaining control over this industry and the peasants that are involved.

2.3 Farmers Forced Into Cultivation

2.3.1 Insecurity and Corruption in Afghanistan

The vicious circle of rebel forces, corruption, violence and illegal products is evident in the Afghan opium industry. Corruption and insecurity are argued to be leading indicators of the extent of opium production, suggesting that Afghans may in fact be pressured to participate in this industry. Mansfield (2001) states that the level of security in an area heavily influences the level of opium cultivation; the more secure the area, the less likely for opium to be cultivated. Mansfield provides an example; the dramatically increased cultivation of opium poppy in the province of Helmand as security deteriorated during the Taliban insurgency. Moreover, Törnblom (2010) believes that opium production is an expression of the widespread insecurity and the lack of a functioning judicial system. Oldham, Mansfield and Ward (2008) argue that the government does not provide sufficient security or governance; and in order to decrease the dependence on opium the Afghan state must become stronger legally, politically and economically.

Opium is produced in many of the Afghan provinces, but it is increasingly being concentrated to the five southern provinces of Helmand, Kandahar, Uruzgan, Dai Kundi and Zabul. In 2007, these provinces alone accounted for 70 percent of the country's total opium production. These areas are also among the most insecure ones in the country (Oldham, Mansfield & Ward, 2008). Additionally, UNODC surveys have shown a correlation between insecurity and opium cultivation where 79 percent of villages with very poor security conditions are involved in opium cultivation, whereas only 20 percent of villages with good

security cultivate opium poppy and a mere 7 percent of villages with very good security cultivate opium (UNODC, 2010a). MacDonald (2007) also argues in favour of this relationship between insecurity and opium cultivation; however with limited evidence.

The problem of corruption, a common reason for insecurity, is further illustrated through the opinions of the Afghans themselves, with 59 percent stating that public dishonesty is their biggest concern. "Encounters with corruption are so pervasive in the lives of Afghan people that corruption may literally determine whether parents can afford food and clothing, whether a child is admitted to school, and whether a family can enjoy the protection of law enforcement actors" (UNODC, 2010b, p. 15). Bribes are a part of everyday life in Afghanistan and the average amount for a bribe paid is $160; almost 38 percent of the annual GDP per capita. Bribes are paid to all kinds of public officials; 25 percent of Afghans had to pay a bribe to police officers during the past year, 18 percent paid bribes to judges and 13 percent paid bribes to prosecutors. Furthermore, Afghans paid bribes 40 percent of the times they were in contact with senior politicians (UNODC, 2010b).

The reason as to why bribes are paid differs; the most common ones are speeding up an administrative process, making a finalization possible, avoiding fines and receiving better treatment by officials. A mere nine percent of the Afghan population have ever reported a case of corruption; they think that reporting these instances would be of no use as they believe that officials will not suffer any consequences (UNODC, 2010b). Furthermore, Gynnå Oguz (2010) argues that the presence and severity of insecurity and corruption in Afghanistan has worsened during the last few decades. Hence, both corruption and opium cultivation have followed an increasing trend for many years.

"Corruption is at the heart of all the difficulties that Afghan people are encountering today, it is at the heart of Afghanistan's current challenges and instability, and it must be at the heart of all peace building efforts in Afghanistan" (UNODC, 2010b, p. 16). The widespread corruption in Afghanistan is what facilitates the opium production (Byrd, 2008). The corruption is also what makes counter narcotics campaigns so difficult to execute successfully (Glaze, 2007). Corruption and criminality thereby hinder future economic growth as well as humanitarian progress. Figure 2 below illustrates how the government, the warlords, the opium economy, corruption and a lack of security are interlinked (Byrd, 2008).

The Vicious Circle of the Drug Industry

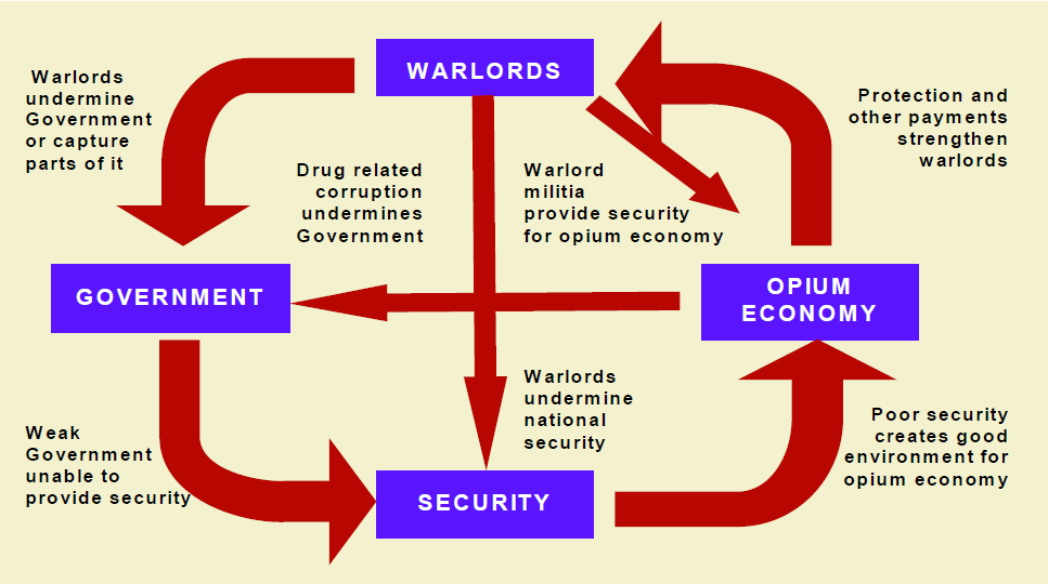

Figure 2 - Source: Byrd (2008), p. 14

Local warlords undermine government actions by exercising informal power or taking political positions themselves. The power of the warlords and the drug-related corruption weaken the government, which can no longer provide security for its citizens. Poor security leads to an environment where opium cultivation can flourish. The opium economy finances and strengthens warlord activity (Byrd, 2008). The weak position of the Afghan government and the financial strength of the warlords generate an environment where opium cultivation and drug trafficking has become socially acceptable (Törnblom, 2010).

The vicious circle can be extended to explain the intricate web of corruption, violence and insecurity present both in Colombia and the African countries producing blood diamonds. As in the case of Afghanistan, rebel forces and warlords control the illegal activities and use the illicit income to strengthen their influence and power in the country. Goreux (2001) as well as Clune and Harper establish that there is no functioning law enforcement in either of these countries, as the rebel forces undermine the formal judicial system and take the law into their own hands. The resulting lack of security creates an environment where the production of illegal commodities is plentiful, both in Colombia and the African countries. The insecurity further strengths the position of the warlords. The vicious circle seems to manifest itself in countries with large illicit industries.

2.3.2 Poverty

Another factor that has been highlighted in prior research as a determinant of opium production is that of poverty. Poverty has largely been argued to drive the rural population into the hands of the powerful warlords; thereby forcing these farmers into the opium

economy. The UNODC has performed annual Afghanistan Opium Surveys since 1994 based on interviews with a large number of village headmen, asking them why farmers in their village make the choice to produce or not to produce opium. This is by far the most rigorous scientific study that has been performed on the decision factors most influential to farmers themselves (UNODC, 2010a).

The most recent survey from 2010, see Figure 3, shows that farmers cultivating opium poppy value the following factors as the most important when choosing to cultivate opium:

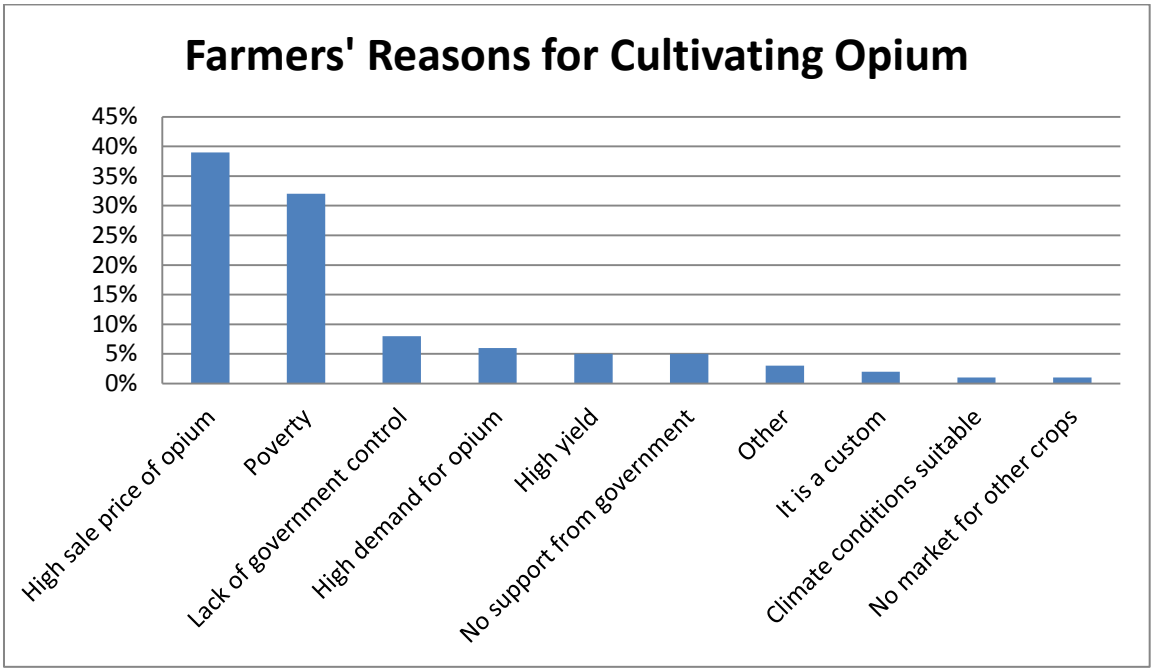

Figure 3 - Source: UNODC (2010a), p. 9

In the study, 32 percent state that poverty is a dominant reason in favour of cultivation, making it the second most important factor in this survey (UNODC, 2010a). Mansfield (2001) further argues for the influence of poverty as a driving force behind cultivation by emphasizing the importance of opium as a provider of credit to Afghan families. Afghanistan is a country where many people, especially the poorest, are left without access to a formal financial system. In rural Afghanistan, most farmers are left with the system of 'saalam', where farmers receive advance payments on a predetermined amount of agricultural products (Mansfield, 2001). This is often the only way for impoverished Afghans to gain access to credit. Gynnå Oguz (2010) explains that this is a frequently occurring phenomenon; farmers are lent money by local drug traffickers and in return farmers promise manual labour or future opium harvest. Although the system is used for different agricultural products, opium is the crop most favoured by lenders. Opium cultivation has become the most common means to gain access to credit in Afghanistan. The system of salaam enables credit to the poor peasants, but it also locks them into a vicious circle of a perennial

dependence on drug traffickers. Furthermore, if a harvest is not as large as expected, for example due to a drought, farmers default on their debts and have to spend future earnings to pay back loans (Mansfield, 2001). Macdonald (2007) further develops this concept, stating that many rural families are completely dependent on opium cultivation in order to gain access to credit that they can use for food or housing.

Mansfield (2001) argues that another vital determining factor related to that of poverty, in the choice of cultivation, is the extent to which the household in question owns any assets. Examples of relevant assets are physical assets, proximity to labour markets, proximity to commodity markets and number of males in the household. These assets will determine if and how many alternative incomes the family has; the fewer options a farmer has, the more dependent he becomes on opium cultivation.

Further indicative of poverty as a driving force behind production of illegal substances and objects is the fact that the leading producers of conflict diamonds are among the poorest nations in the world. Mining of conflict diamonds is most commonly regarded as a poverty-driven activity that can be found in the most remote and impoverished areas of a country. The miners often have low or no education and as their alternatives are few, they are heavily dependent on the income from mining for survival. Just as poor opium farmers have become victims in a vicious circle of indebtedness through the system of salaam, many African miners have become dependent on loans from local 'godfathers'. The lack of an accessible financial system has forced poor miners to turn to godfathers for the provision of equipment and food. The indebtedness often turns into a life-long agony for miners as they are underpaid for their diamond findings (Goreux, 2001).

Although Colombia is categorised as a middle-income country, it too is plagued by poverty and half of the population lives below the poverty line as a result of the highly unequal distribution of income (Agencias Británicas Colombia, 2008). Poor Colombian peasants who choose to produce cocaine are faced by a lack of alternative livelihoods and cocaine is often their only means for escaping poverty. The relatively high earnings generated from cocaine production cannot be achieved in any other way by the uneducated and isolated rural population (Wren, 1997).

There is, however, some evidence against this theory of poverty being such a dominant force behind the choice to become involved in illegal industries. Mansfield (2001) has for example found many Afghan households that are better off, but still choose to cultivate opium in order to increase the household income. Goeldner (2004) has found evidence of a group of opium farmers that are not dependent on opium production for income, yet choose to cultivate the crop. Goeldner categorizes opium farmers into three different groups: those not dependent,

those dependent and those highly dependent on opium cultivation. The group that is not dependent on opium is generally located fairly close to markets and centres, farmers cultivate other crops as well, where opium poppy makes out somewhere between 30 and 50 percent of their crops. They often own cattle and they have access to various sources of credit and sometimes even provide loans to others. The group that is dependent on opium poppy is located further into the rural areas with less access to infrastructure. These farmers grow other crops but opium poppy makes up at least 50 percent of their cultivation, they often sell some dairy products and they have some access to credit. The final group; those heavily dependent on opium, is located in remote areas where government presence is limited. Their opium cultivation makes up at least 70 percent of their total cultivation, with the rest often being cultivation of wheat. These farmers tend to be indebted and their only source for credit is through the cultivation of opium (Goeldner, 2004). Hence, some of the farmers have other options for making a living and gaining access to credit, yet they still choose to cultivate opium (Oldham, Mansfield & Ward, 2008).

2.3.3 Alternative Livelihoods

A potential determinant of opium cultivation is the availability of alternative livelihoods. If few feasible alternative livelihoods exist, more farmers will be forced into opium production. Alternative livelihoods can entail the cultivation of other crops, or it can imply working in a completely different industry. Alternative livelihoods efforts are most often aimed at shifting production from opium to other crops. Attempts are made to increase the potential earnings of these crops, using subsidies and improving means of transportation for better access to markets (Oldham, Mansfield & Ward, 2008). The more accessible alternative livelihoods are to the peasants, the less likely they are to continue cultivation of opium poppy. An issue with alternative livelihood efforts in Afghanistan is that infrastructure is lacking; one fourth of Afghan districts do not even have road access to the capital city in their province (WB, 2008).

These alternative livelihood programmes are often funded by Western donors and are complicated to execute. In order for these to succeed, Reuter (2008) argues that it is vital that farmers trust the government's future ability to maintain its promise of financial support for alternative crops or livelihoods. A striking 98 percent of opium farmers state that they would abandon opium cultivation if a viable alternative was introduced (Glaze, 2007). However, in Columbia where attempts for alternative livelihoods have been executed, no improvements have been seen and the cocaine production has continued to grow (Posso).

Figure 4 below illustrates the share of the economy that is made up of the opium industry:

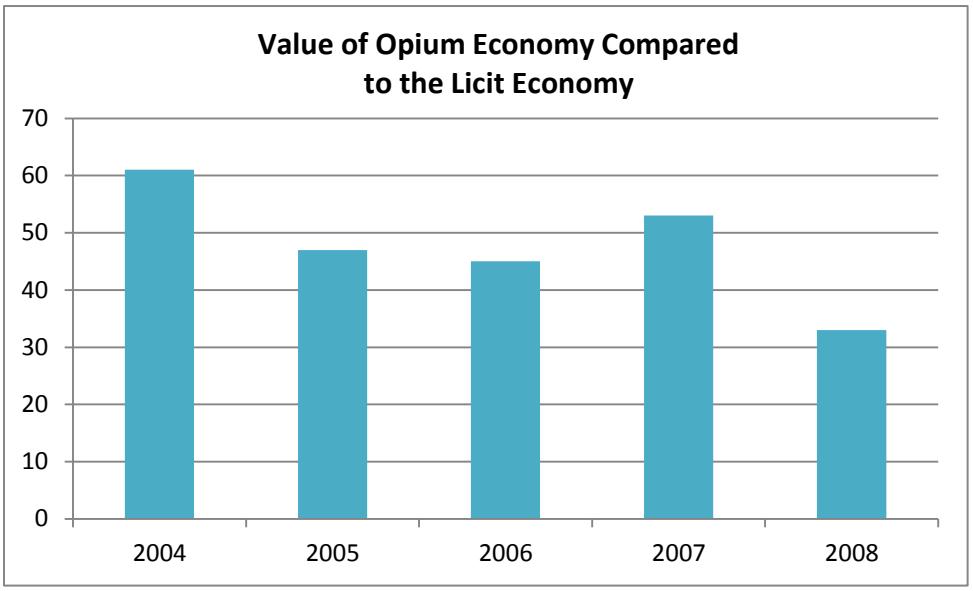

Figure 4 – Source: UNODC (2009), p. 95

Opium production in tons has been increasing steadily during the years covered in the graph, 2004-2008, although its share of the licit economy has slowly been decreasing since the year of 2004 and it was almost cut in half between the years of 2004 and 2008 (UNODC, 2009). This is the result of a rapid and sustained growth of the licit economy (Byrd & Buddenberg, 2006).[3] This may imply a larger future potential for alternative livelihoods due to a development of the licit economy with new markets and opportunities emerging.

Two alternative crops that have been discussed and are thought to have the most potential in Afghanistan are wheat and saffron (Gynnå Oguz, 2010). Saffron is, just like opium, a high-profit crop, but the Afghan climate is not believed to be beneficial for cultivation of saffron (Törnblom, 2010). According to Törnblom, Afghanistan's most promising alternative crop is wheat. Gynnå Oguz (2010) notes that Afghanistan as a country is not self-sufficient with its relatively low production of food products. Wheat is a dominant crop in the country and makes up 70 percent of the total cultivated land in Afghanistan. Furthermore, wheat constitutes over half of the average calorie intake of the Afghan population. Previous attempts to change farmers' production decisions from opium to wheat have been filled with difficulties due to droughts, lack of functioning irrigation and on-going conflicts in the country. Instead of increasing domestic production of wheat, imports have risen substantially during the past decade, which can be seen in Figure 5 below. Persaud (2010) says that if irrigation and security issues were to be solved in Afghanistan, the potential for extended domestic production is large. Glaze (2007) provides evidence showing the potential extent of

[3] Noteworthy is that it is exceptionally difficult to measure licit GDP and exclude income from the opium economy. Despite this, the norm is to exclude illicit income to the best of one's ability when calculating GDP in Afghanistan (Halewood, 2010).

wheat production; Afghanistan has previously produced enough food to both feed its population and leave a surplus for export.

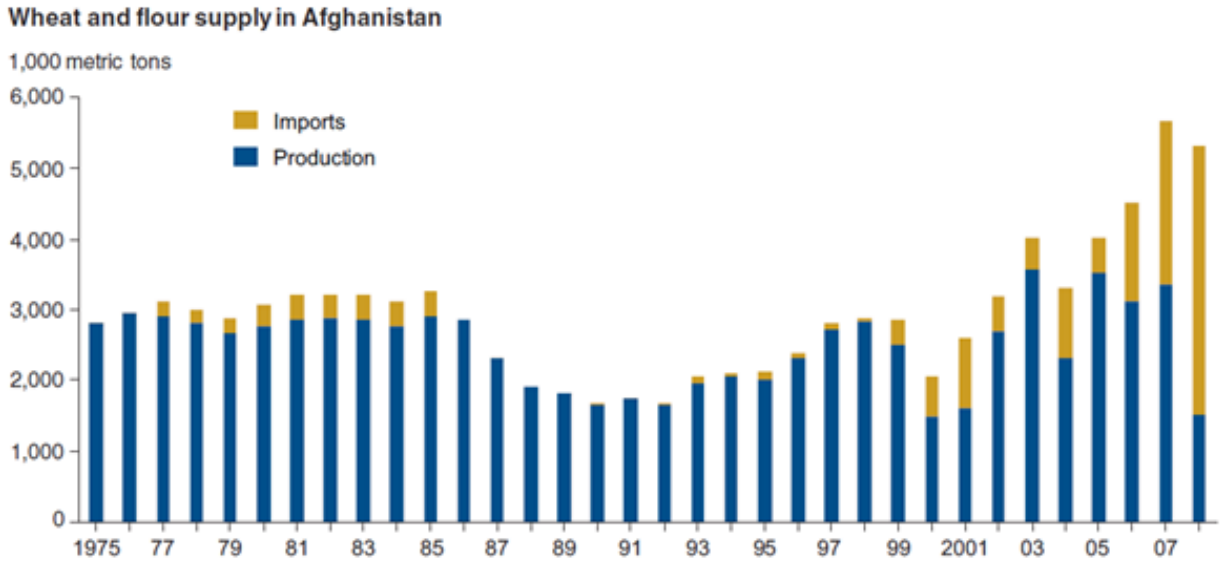

Figure 5–Source: United States Department of Agriculture (2010), p. 4

However, the importance of wheat as an alternative livelihood is not evident. When asking the farmers themselves, only one percent state that they cultivate opium poppy because there is no market for other crops; such as wheat. Hence the correlation between the choice to produce opium or wheat might not be as strong as some researchers seem to think (UNODC, 2010a). Even if these alternative development efforts were to be successful, they would be financially draining to the government. Rural farmers are dependent on their agricultural income and cultivation of opium has yields that are 12 to 30 times higher than that of wheat. To match these high yields, government subsidies to wheat producers would have to be substantial (WB, 2010). Furthermore, Gynnå Oguz (2010) states that from a societal point of view, cultivating wheat could be harmful since it may increase levels of unemployment as wheat production is nowhere near as labour-intensive as opium cultivation. Wheat cultivation is estimated to require 135 people per day for each hectare cultivated, compared to the 350 people per hectare that opium poppy requires (Rotberg, 2007). Just as with eradication, the methods of alternative livelihoods so far lack empirical evidence to support their effectiveness (Reuter, 2008).

2.4 Rational Farmers Driven by Economic Incentives

2.4.1 Profitability of Opium

Apart from the intricate relationship between rebel forces, impoverished rural inhabitants and illegal activities, there are several other factors that are likely to affect the level of opium production. There is an emphasis on economic factors in previous research; many argue that opium poppy is a high profit crop and that peasants voluntarily choose this livelihood in order to maximise the household income. Opium poppy requires little land and water and has a low production cost compared to its selling price. It is furthermore a durable good that can be stored for several years without lowering the quality (Byrd, 2008). Afghanistan's climatic conditions are well suited for cultivating opium, especially in the southern regions, and the country has an opium yield that is higher than the international average (Oldham, Mansfield & Ward, 2008).

Byrd and Jonglez (2006) discuss the importance of opium price in farmers' decision making. They emphasize this as the dominant factor influencing farmers' choices; both because it affects profits but also because opium is often held as an asset by the cultivating households. "Since opium is a durable good and is widely held as an asset, opium prices directly affect asset values, capital gains, and decisions on building, holding, and selling inventories" (Byrd & Jonglez, 2006, p. 117). Fluctuations in opium price will hence affect much more than merely the income of the farmers.

Byrd (2008) further analyses the high selling price of opiates and sees this as the main reason for opium cultivators in favour of cultivating the crop. One example of the strong correlation between the selling price and the level of cultivation is from the period of the Taliban ban in 2001 when prices skyrocketed. This of course created further incentives for farmers to cultivate the crop as prices, and hence profits, were significantly higher than usual and production increased heavily. MacDonald (2007) is another author who has drawn the same conclusion regarding the correlation between the price of opium and the amount of opium that is cultivated; once again based on the abnormal increases in the price during the eradication attempts.

Further indicative of the opium price as a dominant determinant of cultivation is the fact that this was the reason most frequently stated by farmers themselves as to why they produce opium. As can be seen in Figure 3 on page 13, 39 percent of the farmers mentioned this as the main reason for choosing to produce opium. Another 5 percent stated that the high opium yield is a key determinant. However, in the same study, some farmers not producing opium seem to regard the price and yield as reasons *not* to produce opium. Regarding the sale price

of opium, 12 percent of the farmers in the Southern and Western regions, where 99 percent of all opium in Afghanistan is produced, stated that the low sale-price was one reason behind their choice to refrain from opium cultivation. Furthermore, 13 percent stated that the yield was not sufficient. The view on prices and yields as driving forces behind opium production thereby differs somewhat (UNODC, 2010a). Moreover, Byrd has noted that prices of opium are currently being pushed down as a result of the large increases in output during the past few years. Hence, cultivation of this crop should become less attractive to farmers that have regarded high selling price as one of the main reasons for producing opium (Byrd, 2008).

To further shed light on the relevance of the economic incentives in attracting the rural population into illegal activities, parallels can be drawn to both Colombian cocaine production and African production of conflict diamonds. Large parts of the rural population in Colombia are involved in the highly lucrative cocaine production, generating much higher profits than any legitimate alternative. Just like in the Afghan opium production, the economic incentives for farmers in favour of cocaine production are strong and the main factor of production required is unskilled labour, something there is plenty of in both Afghanistan and Colombia (Wren, 1997). The production of conflict diamonds is also a highly profitable illegal activity but, in contrast to the two narcotics industries mentioned above, this industry merely generates high profits for the smugglers, not for the miners themselves. The miners are poorly paid and receive a minimal income in a high-risk context, yet they remain in this industry due to few other employment alternatives. Although the economic incentives may not be dominant, miners are to some extent driven by the dream of finding a large enough diamond to lift them out of poverty (Goreux, 2001). Consequently, the two narcotics industries show similar characteristics as they are both highly lucrative for the poor farmers, whereas conflict diamonds is mainly a means to survive for the rural itinerant population.

2.5 Combating Opium Production

Another potential factor influencing farmers' choice to cultivate, or to refrain from cultivation of opium, is previous attempts at combating production. This factor cannot be divided into either of the two main perspectives above; however, it may still be an important indicator to analyse. The most radical strategy for combating illicit production is eradication. In the case of opium cultivation, eradication has been attempted through aerial spraying of poppy fields. The aim is to destroy existing crops and discourage farmers from future cultivation (Oldham, Mansfield & Ward, 2008). The UNODC argues that some eradication efforts have been successful and to some extent farmers have chosen to no longer cultivate opium. According to a survey conducted by the UNODC in 2010, the main reason for farmers refraining from opium cultivation is the fact that it is banned by the Afghan government. Another, but less

dominant reason is farmers' fear for the possibility of successful eradication (UNODC, 2010a).

The strategy of eradication has proven successful in the case of conflict diamonds in Africa, where the instance of these diamonds has been reduced from four to one percent out of total global diamond production in a mere decade. The key ingredient to this accomplishment was the introduction of a certification system, facilitated by the cooperation between the global diamond industry, the UN, governments and non-governmental organisations (World Diamond Council). A similar attempt for the Afghan opium economy to increase the legal production of opiates, in the form of morphine, is however unlikely to be successful according to Törnblom (2010). A critical difference in the prerequisites between the two examples is that almost all activity in the diamond industry is in fact legal, whereas almost all activity in the opium industry is illegal. There is a strong and established licit diamond industry that has incentives to diminish the illegal share in favour of legal and certified diamond production (World Diamond Council).

However, there is large global scepticism towards eradication efforts. More specifically, aerial spraying of poppy and coca fields has been strongly criticised since it is potentially harmful to the environment and because it worsens the situation for the already poor and vulnerable farmers (Oldham, Mansfield & Ward, 2008). Byrd (2008) argues that eradication could exacerbate the prevailing poverty in Afghanistan and increase the rural population's heavy dependence on opium cultivation for income. Glaze (2007) argues that there has been too much emphasis on eradication attempts and that they have often lead to counterproductive results where farmers have been alienated. Furthermore, Reuter (2008) claims that there is little evidence that eradication even works. According to a study executed in Afghanistan by the UNODC, previous eradication does not seem to have a significant influence on current decisions to cultivate opium (WB, 2008). Similar failures can be found through the eradication attempts in Colombia; where no significant decrease in narcotics production has been achieved, rather these attempts have simply lead to a relocation of cultivation (Posso).

Another strategy for combating the production of narcotics is to target the refiners. Reuter (2008) explains that this is meant to decrease the number of refiners and smugglers and this should in turn decrease the demand for narcotics from farmers. Thereby farmers' incentives to cultivate these types of crops will be heavily decreased. Prior research states, for the case of Colombian cocaine, that "until we remove the profit out of trafficking, nothing will change" (Rosenberg, 2000). In Afghanistan, a limited number of traffickers dominate the field of smuggling and Törnblom (2010) thinks that targeting these could significantly reduce opium smuggling, as well as set an example for drug traffickers of smaller scale. Byrd (2008) provides empirical evidence suggesting that traffickers do respond to financial incentives and

the level of risk that smuggling opiates implies. Drug traffickers earn a high income as the price of opium is increased many fold as soon as it crosses Afghanistan's border; often into Tajikistan or Pakistan. It has been estimated that a mere 18 percent of all heroin that is produced worldwide is captured during the smuggling process, a small share compared to other drugs (Reuter, 2008). Nevertheless, the possibility of being caught by the authorities in Afghanistan has in fact increased during recent years (Byrd, 2008).

The targeting of refiners has, however, been difficult to implement in Afghanistan. Reuter (2008) states that the reason for these failed attempts is the widespread corruption across the country. Gynnå Oguz (2010) says that these attempts to target the refiners are more suitable for the insecure southern regions in Afghanistan. These regions have a prevailing lack of government control and attempts to invest in infrastructure or create alternative livelihoods here are likely to fail. Hence, the only method that is likely to have an effect in the southern parts of the country is to target the refiners directly.

2.6 Key Questions of the Thesis

This thesis aims to determine which of the above mentioned factors are the key determinants affecting the level of Afghan opium production. Are the economic incentives dominant in farmers' decision making? Are the high selling price of opiates and the high opium yield the most influential? Do people choose opium cultivation due to the high profitability of this profession or are they forced into this field due to the extensive poverty? Is the lack of economic growth and development causing farmers to continue the cultivation of opium poppy? Is opium production likely to follow the same pattern as the licit GDP? Perhaps the severity of the corruption as well as the security situation in Afghanistan drives people into the hands of the opium-advocating warlords. Previous attempts at combating opium production may also be an important determinant for the rural farmers. Are previous eradication projects discouraging farmers from further cultivation? Would a development of alternative livelihoods programmes cause Afghans to switch away from cultivating opium poppy or is targeting the refiners a more successful method for combating opium production?

The above variables will be evaluated through the two aforementioned perspectives. By determining which of these perspectives and variables are the most influential, the conclusions of this thesis will hopefully contribute to facilitating future attempts of reducing the farmers' heavy dependence on opium production. The literature does not provide sufficient answers to the above questions; hence an econometric model will be applied to provide clarity.

3. Hypotheses

In this section, six different hypotheses are presented for the independent variables.

Hypothesis 1: *Opium production increases with higher opium price.*
A higher opium price affects farmers' incomes and generates higher returns, which should give strong economic incentives for further production. One can thereby expect a positive sign for the coefficient.

Hypothesis 2: *Opium production increases with higher opium yield.*
A higher yield also affects the return to farmers and implies that the production is more lucrative and efficient. Thereby production should increase and the expected sign for the coefficient is positive.

Hypothesis 3: *Opium production decreases with higher rate of security.*
As insecurity prevails, the Taliban and warlords pressure farmers into producing opium. Furthermore, when the situation is insecure and government control is lacking, there are few official forces attempting to prevent farmers from further cultivation and few sanctions are imposed. Hence, higher security should decrease opium production and the expected sign for the coefficient is negative.

Hypothesis 4: *Opium production increases with a higher rate of poverty.*
The poorer the population, the stronger are incentives for farmers to turn to opium cultivation. Higher poverty will increase opium production and the expected sign for the coefficient is thereby positive.

Hypothesis 5: *Opium production decreases with higher GDP per capita.*
With increased economic growth in the country, new markets emerge and develop and new possibilities appear for making a living. The expected sign for the coefficient is negative as the opium production sector should become less dominant as more economic alternatives appear.

Hypothesis 6: *Opium production decreases with higher wheat production.*
Since wheat is the primary alternative crop, higher wheat production should imply decreased opium cultivation. The expected sign for the coefficient is therefore negative. The relationship is however likely to be weak due to the large difference in profitability between the crops.

4. Econometric Model

In this chapter, the econometric model is introduced and the chosen variables are presented and explained. The regression is specified as an estimation of the relationship between opium production in Afghanistan and its main determinants.

4.1 Choice of Variables

The independent variables chosen for this regression are those that are identified as most relevant in explaining and determining the size of the Afghan opium production, according to our interviewed field experts as well as prior research. Some of the earlier mentioned factors have been excluded due to a lack of data. For further reasoning on these variables and their exclusion, see section 4.3 Limitations to the Scope below.

Dependent variable – Opium Production

The dependent variable is aggregate annual opium production in Afghanistan. This variable is measured in metric tons. One alternative could have been to measure this in hectare; however, data for production in tons is available for a longer time period and thereby improves the ability to perform a strong analysis.

The independent variables to be tested in the regression are the following six:

1. Heroin Price – As a Proxy for Opium Price

The price of opium is considered one of the most essential determinants of opium production, since it determines farmers' incomes. This variable would be best measured by farm-gate prices; that is the price farmers receive when they sell their crop at the farm, before any transportation or delivery costs are incurred (OECD, 2010).

As opium farm-gate prices are only available for 16 years, a proxy for these will be used instead. The proxy will be heroin prices in the USA measured in USD per kilogram. These two data sets have a correlation of 88 percent during the years they overlap; hence, they can be assumed to have a strong correlation during the other years as well. Heroin and opium are closely related since heroin is the most common end-product of all opium that is produced. Further strengthening the use of American heroin prices as a proxy is that the market for opium can be assumed to be a global one; 90 percent of the world's opium originates from Afghanistan and the vast share is exported (UNODC, 2007). The use of heroin as a proxy provides us with data for 26 years to be tested in the econometric regression.

2. Opium Yield

Opium yield is the other variable that takes the economic aspect into account. In previous research, it is also one of the most frequently mentioned factors underlying farmers' choice to cultivate opium. This variable is measured in kilograms of opium poppy per hectare. The yield may differ from season to season, but this variable is based on an annual average and shows how lucrative opium cultivation has been each year.

3. Tetanus Vaccinations – As a Proxy for Security

In Afghanistan, there is a vicious circle involving insecurity, corruption and criminality. A lack of security has prevailed for decades and is a factor that may affect farmers in their choice of crop. There are several ways in which to measure insecurity, such as number of security incidents or corruption. However, due to lack of data, not many can be employed for the case of Afghanistan. One action which is indicative of security in a country is that of targeted aid projects, such as official vaccination schemes. Higher security implies that these projects can be executed more successfully and reach a larger share of the population.

One official vaccination scheme which has been carried out for a long time in Afghanistan is the vaccination of infants against neonatal tetanus. This factor will be used as a proxy for security where higher vaccination rate implies higher level of security. This variable is defined as protection of newly born babies in the form of vaccination against tetanus, measured as a percentage out of the total number of infants.

4. Child Mortality – As a Proxy for Poverty

Poverty reflects the overall economic development within a country and is considered a factor in driving farmers to take part in the lucrative but illegal Afghan opium production. Unskilled labour is the main factor of production and little capital is required. For the poor population, opium production therefore provides an easy means of making a living.

Child mortality ('under 5 mortality rate') is regarded as one of the strongest indicators of the level of poverty, welfare and development within a country. 'Under 5 mortality rate' signifies the probability of a child dying per 1000 children under the age of five. According to the World Health Organization, it is a leading indicator of the level of overall health and development (WHO, 2010). Therefore, the 'under 5 mortality rate' will be used as a proxy for poverty where higher mortality rate implies higher poverty.

5. Gross Domestic Product per Capita – As a Measure of Economic Growth

When performing a regression on an aggregated level, it is appropriate to control for the economic growth within a country. Gross Domestic Product (GDP) and poverty can be seen as two sides of the same coin. As markets grow and develop and more goods and services are produced, new production possibilities take form and growth is likely to influence most types of production, including opium production. This variable is measured as the annual per capita GDP.

6. Wheat Production - As an Alternative Crop

Experts agree that wheat is the largest and most promising alternative crop for Afghan farmers and, in most cases, the choice of crop can be assumed to stand between opium poppy and wheat. Wheat production is included as a variable to illustrate the attractiveness of cultivating wheat and the effect this has on the size of opium cultivation. As Afghan wheat prices are not available for a sufficient amount of years, and wheat yield cannot alone explain the attractiveness in producing wheat, the chosen variable is wheat production. [4] Wheat production is assumed to incorporate the effects from both yield and price. This variable is here measured annually in metric tons, in alignment with the measurement of opium production.

4.2 Regression Specification

The econometric model will be processed in the statistical programme Stata.[5] The model employed is a linear time-series based on annual data. The data has been tested for normality (see Appendix A) and since the assumption of normal distribution is not violated, the regression will be estimated with Ordinary Least Squares (OLS). The time series covers the years between 1984 and 2009.

From the above given variables, the following regression is generated:

$$log[Opium\_Production] = \beta_0 + \beta_1 log[Opium\_Price\_Proxy] + \beta_2 log[Opium\_Yield] + \beta_3[Security\_Proxy] + \beta_4 log[Poverty\_Proxy] + \beta_5 log[GDP\_Capita] + \beta_6 log[Wheat\_Production] + u_{j,i} + e_{j,i,t}$$ [6]

[4] Wheat prices from other countries have been tested as potential proxies for the Afghan prices, but they did not show sufficient correlation.
[5] Stata is an integrated statistical programme that enables the user to analyse and manage the data entered as well as illustrate characteristics of the data graphically. Stata 9.2 is the version that has been used during the course of this thesis. For more information see http://www.stata.com
[6] See section 5.2 on page 28 for an explanation to the use of logarithms.

4.3 Limitations to the Scope

The amount of years in the regression is limited to 26 years; 1984-2009. Preferably, a regression of this sort would have included a greater number of years, but due to a lack of historic data for Afghanistan this has not been a possibility.

One could have performed this kind of study on a regional level, perhaps even on a household level, to account for the differences in quality of the soil, proximity to markets, availability of alternative livelihoods, corruption and poverty. This approach could be a means to avoid the problem of little variation in the data which tends to occur when looking at statistics from an aggregated level. However, this kind of data is not available for the relevant variables.

Furthermore, there are some possible determinants on opium production which are not included in the regression due to a lack of data. Preferably, one would have wanted to include the level of corruption, official programmes for alternative livelihoods, eradication efforts and the targeting of refiners as independent variables. Unfortunately neither of these factors has been measured in Afghanistan for more than a few years and some are almost impossible to measure. However, some factors are partially covered by other variables. The security proxy should to some extent include corruption, as shown earlier in the vicious circle of insecurity. Official programmes for alternative livelihoods are to some extent included in the variable for wheat. The scope of this thesis is assumed to have included the most relevant and dominant factors.

5. Data

In this chapter, a table of the data used in the econometric regression will be presented as well as the sources underlying the data.

5.1 Sources

Reliable data is a scarce resource when performing research on Afghanistan in general and the opium economy in particular. Due to this fact, emphasis has been placed on finding reliable sources when collecting both statistics and qualitative information. The data is based on statistics and reports from sources with international recognition and high credibility; the United Nations (UN), the World Bank and the International Monetary Fund (IMF). This has been of utmost importance since information and statistics from Afghanistan are often either lacking or unreliable due to weak government control and little monitoring. As a complement to these sources, a number of interviews have been performed with field experts.[7]

5.2 Regression Statistics: Afghanistan

Year	Opium Production	Opium Price Proxy	Opium Yield	GDP/ capita	Poverty Proxy	Security Proxy	Wheat Production
1984	160	272 015	34.5	375.4	270	5	2 194 000
1985	450	218 365	34.5	386	268	13	2 081 000
1986	350	194 834	34.9	406	266	18	1 925 000
1987	875	183 227	35	369.2	265	13	2 300 000
1988	1 120	148 406	35	339.3	263	16	1 900 000
1989	1 200	130 166	35	309.7	262	26	1 800 000
1990	1 600	162 500	38	287.9	260	13	1 650 000
1991	2 000	155 000	39	248.8	260	13	1 726 000
1992	2 000	150 000	40	238.5	259	11	1 650 000
1993	2 300	146 000	40	168	258	13	1 940 000
1994	3 400	142 500	47.8	123.8	258	10	2 050 000
1995	2 300	146 000	43.4	179	257	13	2 000 000
1996	2 200	141 875	39.6	166.1	257	17	2 300 000
1997	2 800	129 375	48	156.2	257	19	2 711 000
1998	2 700	125 000	42.3	148	257	21	2 834 000
1999	4 600	107 000	50.4	140.2	257	28	2 499 000
2000	3 300	81 200	39.9	132.1	257	32	1 469 000
2001	185	59 500	24.3	123.6	257	47	1 597 000
2002	3 400	50 750	45.9	216.3	257	52	2 686 000
2003	3 600	65 500	45	238.2	257	62	3 480 000
2004	4 200	68 800	32.1	251.1	257	95	2 390 000
2005	4 100	65 000	39.4	277.2	257	96	4 266 000
2006	6 100	65 000	37	297.5	257	95	3 363 000
2007	8 200	71 200	42.5	333.8	257	84	4 484 000
2008	7 700	58 000	48.8	333.3	257	83	2 623 000
2009	6 900	51 371	56.1	330.5	257	89	2 875 000

** Some of the statistics have been rounded off in the above table due to a lack of space.*

Figure 6 – Source: WHO/UNICEF, UNODC (2004, 2008, 2009), Byrd, Demirbuken, Child Mortality, FAO Stat, National Accounts UN

[7] Four different interviews have been conducted with: Demirbuken (UNODC), Halewood (UNODC), Törnblom (Swedish Afghan Committee) and Gynnå Oguz (UNODC). For more information, see the bibliography.

All above data, except the proxy for security, will be used in logarithmic form in the regression in order to correct for the different units of measurement. This way all variables and results can be interpreted in a percentage manner. The security proxy, Tetanus vaccinations, is already expressed in a percentage form.

5.3 Multicollinearity

The problem of multicollinearity arises when two or more of the independent variables are highly (but not perfectly) correlated with each other. Multicollinearity increases standard errors and hence decreases the credibility of the coefficients. There is no universal rule for what level of multicollinearity that poses a problem (Wooldridge, 2009). Many experts, however, seem to agree on a rule of thumb of 0.8. Our test for multicollinearity, measuring the bivariate correlations between the independent variables, showed no such high correlations (see Appendix B). Thereby, multicollinearity poses no threat to this regression.

5.4 Heteroskedasticity

A basic assumption in an OLS regression is that of homoskedasticity, implying a constant variance of the error term. If this assumption is violated, the regression is heteroskedastic and the coefficients become biased (Wooldridge, 2009). Through the Breusch-Pagan test, we have examined whether the above assumption holds. The test showed proof of heteroskedasticity (see Appendix C). By using heteroskedasticity-robust standard errors, we correct for the heteroskedasticity and compute unbiased coefficients (Wooldridge, 2009).

5.5 Robustness Tests

Robustness tests have been performed to test the accuracy of the model. These tests have not shown any significant obstacles with the model, rather they have indicated a sufficient robustness. The tests are presented in greater detail in Appendix D.

6. Results

In this chapter, the results from the regression are presented for each variable and the hypotheses are either rejected or accepted.

Opium Production	Coef.	Robust Std. Err.	t	P > |t|	[95%Conf	Interval]
Opium Price Proxy	1.080197	.4829766	2.24	0.038	.0693154	2.091079
Opium Yield	2.861851	.8744728	3.27	0.004	1.031558	4.692144
Security Proxy	.0169831	.0082642	2.06	0.054	-.0003141	0342803
Poverty Proxy	-59.64253	13.87334	-4.30	0.000	-88.67976	-30.60531
GDP Capita	.6778588	.4128348	1.64	0.117	-.1862144	1.541932
Wheat Production	-0.2104517	0.4678024	-0.45	0.658	-1.189573	0.7686699
Constant	314.7796	72.38046	4.35	0.000	163.2856	466.2736

Figure 7: Results from the econometric regression in Stata.

Starting from the top, opium price is significant on a five percent significance level. The coefficient is strongly positive, showing that the stated hypothesis was correct: opium production does indeed increase with a higher opium price. There is a strong economic incentive for farmers when choosing to cultivate opium poppy.

The second variable, opium yield, is also significant on a five percent level. This variable also shows a positive coefficient as well, indicating that opium production increases with a higher opium yield. The second hypothesis is therefore also validated. This further proves that the economic incentives are of high importance for opium farmers as the yield will determine how lucrative opium cultivation is.

The proxy for the level of security in Afghanistan, Tetanus vaccinations, has a positive coefficient, although only on a ten percent significance level, implying that a higher level of security will result in higher opium production. This is the opposite of the expected outcome.

The proxy for poverty, in the form of child mortality, shows a negative coefficient, as opposed to our expected outcome of higher poverty implying higher opium production. The extremely large coefficient (-59.64253) and the p-value of zero indicate that something is not quite right and that these results may not be representative of reality.

The variable GDP per Capita has a positive coefficient, but is not statistically significant. Strong conclusions cannot be drawn, but since the p-value was fairly low (0.117), some indication may be given regarding the relationship between these two variables. The result was in contradiction to the hypothesis. Opium production increases with a higher economic growth (a higher GDP per capita).

Wheat production has a negative coefficient but is not statistically significant. This means that no conclusions can be drawn regarding the effects of wheat cultivation on the level of opium production. The expected negative sign for the coefficient was in accordance with the findings. Furthermore, as the hypothesis stated, the relationship between wheat and opium production appears weak.

The explanation power of the regression is given by an R-squared value of 0.9037 and an adjusted R-squared value of 0.8733. These numbers indicate that 87.33 or 90.37 percent of the variation in the dependent variable, opium production, is explained by the six independent variables.

7. Discussion

In this chapter, an analysis of the regression results will be performed and compared to the theories from previous literature and research. A brief section on limitations of the thesis and suggestions for future research will also be presented.

7.1 Analysis of Results

The question of whether farmers are forced into opium production or simply react rationally to positive incentives has through this thesis been further developed by categorising theories in literature and research, as well as tested in our econometric regression. The previous chapters have also illustrated that the question is much more complex than one might first expect, with many factors at work.

7.1.1. Farmers Reacting to Economic Incentives

One of the theories states that rural populations engage in illicit production as a rational reaction to positive incentives. The price and yield of these illicit products are what determine the profitability of engaging in these activities and people are driven by a desire to maximise the household income. Prior research strongly points to the profitability of illicit activities as the main driving force in favour of the rural population engaging in these kinds of industries. Especially important in the two narcotics-producing countries is the high relative price compared to all licit alternatives. The Afghan opium production and the Colombian cocaine production are both characterised by farmers mainly being driven by economic incentives. The high returns on these narcotics are crucial in the eyes of the peasants.

The strength of these economic incentives in Afghanistan is primarily illustrated through the effect on opium production by economic factors such as opium price and yield. When Afghan farmers were asked about the primary reasons behind their choice to cultivate opium, the high opium price was given as the dominant factor. Almost 40 percent of the farmers stated that opium price was a key determinant. In previous literature, there are several studies confirming a strong correlation between opium price and production. These have, however, mainly shown examples of where production has affected prices. The first example is when prices skyrocketed during the Taliban ban of opium, due to a production fall of 94 percent. The second example is the recent phenomenon of prices being lowered because of the large increases in opium production. This proves how production affects prices, but prior literature has not been able to identify specific time periods showing the opposite relation on an aggregated level; how prices affect production.

The performed regression is, according to our knowledge, the first statistical study performed showing that prices have a large impact on the size of opium production. The regression shows that opium price has a strong and significant coefficient. Opium price can thereby be stated to have a substantial effect on opium production. This further confirms the earlier studies showing that farmers themselves value the high opium price as the main incentive for cultivating opium.

Important to note is that opium prices are not only high, they are even higher in comparison to all other viable alternative crops. The relative price of opium has remained high during all the 26 years examined in this study. It is not surprising that opium prices are so central in farmers' decision making since opium production is by far the most lucrative alternative for the rural population.

Another important economic incentive for farmers is the high opium yield from the poppy. The opium poppy requires little land and water and hence it is not costly to produce. The main resource required is that of unskilled labour and Afghanistan is a labour-abundant country. Opium poppy is a high profit crop. Furthermore, opium yields in Afghanistan are higher than the international average due to the suitable climatic conditions. Achieving a high yield seems attainable for most Afghan farmers. The importance of a high opium yield is further confirmed by farmers themselves stating that it is the fifth largest reason in favour of cultivation. Our regression confirms this theory by providing a high, positive and significant coefficient for opium yield.

The driving economic factors for farmers to engage in opium production are price and yield; these are highly interlinked and determine the profitability. Afghan farmers consider these two as vital in the decision to produce opium and research indicates the same. The regression confirms this theory by providing statistical proof of their relevance and accuracy. Out of the six variables included in the model, opium price and opium yield are by far the most dominant, since they have large coefficients, are highly significant and show consistent results in all robustness tests. By analysing the economic incentives for producing opium through our regression, we can conclude that they were even more important than what was originally expected. Looking at the regression as well as prior research, the economic incentives are evident in driving the rural population to engage in opium production. Even though the economic incentives are dominant, they are complemented by other driving forces.

7.1.2. Farmers Forced into Production

The second theory, which states that poor rural populations are being forced into illicit industries, is mainly illustrated by the effect on production by factors such as insecurity, poverty and economic growth. These factors place restrictions on the impoverished peasants and itinerants as these are left with fewer options for survival. This creates a heavy dependence on warlords and rebels, placing them in a powerful position in these widespread illicit industries. This is especially evident in the African countries; blood diamond miners are both pressured and threatened by insurgents to engage in the mining for diamonds. Rather than a result of economic incentives, the engagement in the illegal mining industry seems to be a result of rebels taking advantage of the helpless population. Afghan warlords are also taking advantage of their powerful position in the country and the widespread poverty to pressure Afghans into the opium industry.

One of the main difficulties in Afghanistan is the extensive lack of security due to the constant presence of wars, corruption and violence. This factor seems to be an important determinant of the opium production. Several studies indicate that the higher the security, the less likely for opium to be cultivated. Villages with poor security conditions are more involved in opium cultivation than those with good security conditions. A large part of the insecurity consists of corruption, which facilitates opium production and hinders anti-narcotics efforts. People involved in opium production find themselves in a vicious circle where they are indebted to local warlords and have to continue producing opium to become free of these debts. Opium production further seems to be an expression for a lacking judicial system. Previous research concludes that higher security is an essential factor to combat future opium cultivation.

In the regression, Tetanus vaccinations as a proxy for security unexpectedly expressed a positive causality with opium production. This outcome can perhaps be explained by statistics on neonatal Tetanus vaccinations being a too narrow proxy for security in Afghanistan, rather than higher security actually leading to higher opium cultivation. Prior research strongly indicates that security is of utmost importance, the unexpected result in the regression should rather indicate Tetanus vaccinations as an insufficient proxy. Tetanus vaccinations may not show the dynamics or complexity of the security situation in Afghanistan, but it is important to note that it is nevertheless the best available proxy.

Poverty was mentioned by 32 percent of farmers as a dominant factor in their choice to produce opium. The question is if people are forced into this industry as a result of the extensive poverty? Due to the lack of a formal financial system in Afghanistan, opium production is the main means for the rural population to gain access to credit. Furthermore,

opium is a durable good that can be stored for long and is often held as an asset by households as opium is favoured by lenders. We support the theory that poverty is a determinant for farmers in their choice to produce opium and this was the hypothesis tested in the regression. Unfortunately, results for the poverty proxy do not provide a sufficient basis to draw any conclusions from in either direction. The source of these misleading results could be that the statistics for the level of child mortality have remained constant between the years of 1995 and 2009, which makes the effect difficult to calculate. This proxy for poverty has not provided results that can be used to draw any conclusions for how poverty affects the level of opium cultivation. It is possible; however, that child mortality merely covers one aspect of poverty and was not sufficient. As mentioned earlier, child mortality is nevertheless considered the leading indicator of poverty and development.

GDP per capita illustrates the overall economic progress in the country. The results from the regression show a positive correlation between GDP per capita and opium production, but with a p-value of 0.117. This quite low value does, however, imply that some indication could be given. The result was not in accordance with the hypothesis. How can one interpret this unexpected result? First of all, it is important to note that the calculations for Afghan GDP are uncertain. The question is whether income from the opium economy has been included in the official GDP figures or not. Government agencies attempt to exclude illicit income from official calculations to the best of their ability. Hence, the hypothesis was formulated with the assumption that GDP only incorporates licit income. This line of reasoning should be in favour of a negative correlation between GDP and opium production.

However, since income generated from opium cultivation circulates throughout the economy; it is extremely difficult to separate between the two. If illicit income has been included in GDP to a large extent, this could explain why a positive correlation was shown in the regression.

Another interpretation of the results for GDP would be that *licit* GDP is in fact positively correlated with opium production and that people do not cultivate opium merely due to low income or poverty. This reasoning is in accordance with the existence of a certain group of opium farmers that are not dependent on opium poppy for their livelihood, yet choose to produce opium anyway. The unexpected result for GDP per Capita could above all indicate that economic growth is not crucial in farmers' decisions to cultivate or not cultivate opium.

Further strengthening the idea that high insecurity and poverty create favourable conditions for these kinds of illegal productions, are comparisons to the case of cocaine and conflict diamonds. The case of conflict diamonds more strongly supports this theory of peasants being forced into illicit industries, rather than due to economic incentives. The rural African

population does not engage in mining of conflict diamonds due to the profitability. The miners receive a low income and profits go to the middlemen. Rather, miners are forced into the industry by pressure from rebel forces and due to the lack of any other means for survival. The vicious circle of corruption, criminality and insecurity for the Afghan opium economy can be applied to both the Colombian cocaine production and the African conflict diamonds. In all three examples, one can see a clear pattern of a vicious circle at work.

The lack of alternative livelihoods is another factor that is potentially forcing farmers into illicit production and it is a strong determining factor in all three of the illicit industries discussed. African peasants are those with the least viable alternatives and most miners are completely dependent on the illicit diamond industry for survival. Colombian and Afghan farmers do in fact have other options and few of them depend on the narcotics industries for earning their income; there are other alternatives available. Colombia is a middle-income country, yet large parts of the population choose cocaine production due to the high profitability. The same phenomenon is present in Afghanistan: farmers choose to produce opium as the alternatives that exist are not nearly as lucrative.

The literature refers to wheat as the main alternative crop in Afghanistan. One should, however, bear in mind that the difference in profitability between the two is still extremely large, with opium being 12 to 30 times more lucrative. According to several of the interviews, wheat production is not an attractive enough alternative for farmers. The hypothesis for alternative livelihoods was based on the idea of a negative but weak causality. The regression did show a negative coefficient, but unfortunately the results were too weak to be able to draw any conclusions from.

In accordance with the literature, we support the idea that there is potential for future wheat production in Afghanistan. The country has been self-sufficient in food production previously and half of their daily calorie intake is composed of wheat products. Saffron has also been mentioned by experts as the new alternative livelihood as the relative price of opium and saffron is not as high: saffron is much more lucrative than wheat. To take advantage of these great opportunities, the Afghan state should consider options such as developing infrastructure to improve farmers' access to markets, strengthening the judicial system to combat opium production and introducing a proper formal financial system. In previous studies, farmers confirm this potential by a striking 98 percent stating that they would abandon opium production if a feasible alternative was introduced.

The weak regression results for this perspective may indicate either that the proxies applied are insufficient or that the variables are not as important as one might suspect. Literature supports the theory of insecurity, poverty and a lack of alternatives as elements forcing

farmers into opium production. We believe that these factors do affect opium production, however not as the dominant determinants.

7.1.3 The Goodness-of-Fit

Both the R-squared and the Adjusted R-squared are measures of the goodness-of-fit of the regression. The primary focus should be on Adjusted R-squared, since this measurement imposes a penalty for including new variables that are not essential (Wooldridge, 2009). The Adjusted R-squared is a rather high number (0.8733) and may appear too good to be true. One must, however, take into consideration that the R-squared statistics have received widespread scepticism in their ability to fully evaluate the strength of a regression. The R-squared statistics are especially likely to show artificially high numbers when examining a time-series, like the one above. The literature suggests that not too much focus should be placed on the value of the R-squared statistics.

7.2 Suggestions for Further Research

As a basis for further research one should ask the following question: What do we want to achieve by studying the opium economy in Afghanistan? The ultimate goal should be to combat opium production and help the rural population to find alternative livelihoods. One should then ask a second question: Why do farmers choose to cultivate opium poppy? Opium production is by far the most profitable livelihood available to Afghan farmers and the economic incentives seem to be the most vital. Hence, opium cultivation needs to be made relatively less profitable and alternative livelihoods relatively more profitable. Further research is imperative to gain an insight in order to know how to best achieve the aforementioned.

More specifically, further research should focus on the collection of data on a regional and household level to be able to perform this kind of study taking individual prerequisites into consideration. This approach could circumvent the problem of little variation in aggregated data and thereby fully incorporate the changes taking place within the country. As an example, the Southern regions have more extensive opium production and a higher level of corruption in comparison to the rest of Afghanistan. When applying disaggregated data, one could better analyse how to combat opium production and develop feasible alternative livelihoods in each region.

8. Conclusion

The aim of this thesis has been to examine the underlying factors determining the size of opium cultivation in Afghanistan. Through the coupling of an analysis of previous research and an econometric model, we have identified two main perspectives and six key variables. One perspective states that the poor population voluntarily chooses to engage in illicit industries as they are attracted by the economic benefits, whereas the other perspective states that they are pressured into production due to a combination of lacking alternatives, poverty and threats from rebel forces. Neither of the two perspectives can alone explain the widespread opium production in Afghanistan, nor why the level of production varies over time and space, or what kind of people are involved in this industry. The reason for the widespread opium production is a combination of the two.

This thesis concludes that the dominant factors driving the impoverished rural populations, in Afghanistan as well as in Colombia, into narcotics industries are the economic incentives. This driving force is a result of the high selling price of the illicit products, making these highly lucrative livelihoods. Moreover, the high yields from the cultivation of narcotics add another economic benefit to this choice. These illicit industries appear especially profitable when comparing them to the available licit alternatives. This economic perspective is dominant for the case of Afghanistan, as supported both by the literature and the regression. Impoverished farmers in developing countries should be among the most rational people in the world, as many of their choices determine the difference between life and death. If illicit production is the livelihood that will generate the highest income for the household, we firmly believe that this will be the driving force for farmers in their choice of livelihood. The Western point of view on whether or not to engage in illicit activities is likely to differ from the Afghan one. Cultivation of opiates is a custom in Afghanistan and has a long history in the country. Our initial point of view was based on the belief that people in general, including Afghan farmers, attempt to stay away from illegal activities to the best of their ability. During the course of writing this thesis, we have discovered that this Western assumption is likely to be naive. Although illegal, opium cultivation is a socially accepted means for making a living in Afghanistan.

The second perspective of the rural population being forced or pressured into illicit production is also supported by previous research. The widespread poverty, the lack of alternatives and the mighty rebel forces together create an environment where illicit livelihoods are sometimes the only option for the impoverished peasants. This is the primary reason for Africans engaging in mining for blood diamonds; however, it is not as dominant for the case of Afghan or Colombian farmers. The regression has not provided strong

evidence in favour of this theory for Afghanistan. Noteworthy is however that this latter perspective is more difficult to examine in the form of a regression, as there are fewer measurable variables available. While these factors do constitute the reasons for why some Afghan farmers choose to engage in opium cultivation, this perspective does not provide the primary answer to why the Afghan opium production has flourished.

We conclude that the economic aspects in form of opium price and opium yield have an even more dominant effect on opium production than what was originally expected; the economic advantages are the main forces driving Afghan farmers into opium production.

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10. Appendices

Appendix A - Normal Distribution

The histogram below illustrates how the distribution of the regression residuals compares to a normally distributed curve. The residual distribution shows a tendency for normal distribution. To further test the normality assumption, two different tests are applied; the Shapiro-Wilk Test and the Kolmogorov-Smirnov Test.

Distribution of the Residuals

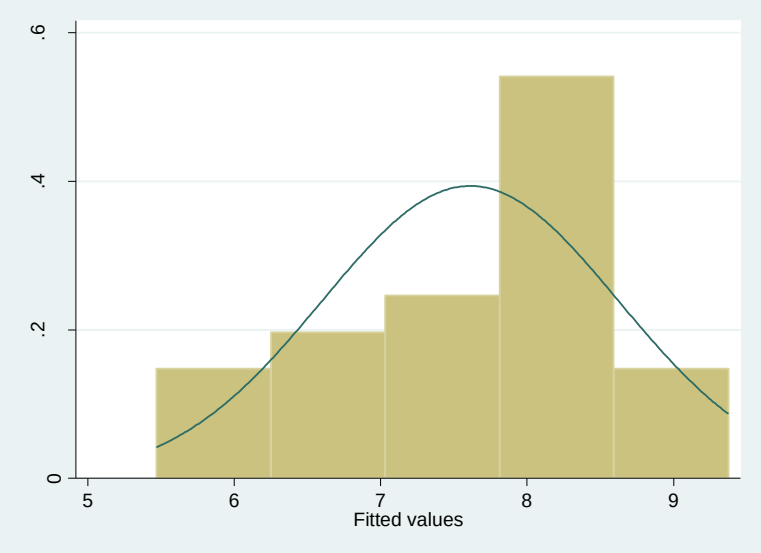

Figure 8: STATA, distribution of residuals

Shapiro Wilk Test:

Prob>z = 0.18973

Kolmogorov-Smirnov Test:

Prob>z = 0.3627

The two tests demonstrate that the residuals show no statistically significant difference from the normal distribution. Thereby, the normality assumption for an OLS regression is not violated.

Appendix B –Multicollinearity

A test is performed to test for multicollinearity, providing the following results.

Opium Production	Opium Price Proxy	Opium Yield	Security Proxy	Poverty Proxy	GDP Capita	Wheat Prod
Opium Price Proxy	1.0000					
Opium Yield	0.4168	1.0000				
Security Proxy	0.6745	0.6015	1.0000			
Poverty Proxy	-0.2419	0.3348	0.4018	1.0000		
GDP Capita	0.0113	-0.1371	-0.5668	-0.7703	1.0000	
Wheat Prod	-0.1251	-0.5734	-0.6891	-0.4716	0.5129	1.000

Figure 9: Stata, Correlation matrix of coefficients of regress model

As can be seen in the figure above, no two variables show a correlation of 0.8 or higher and thus multicollinearity is not a concern for the regression.

Appendix C - Heteroskedasticity

The Breusch-Pagan Test is applied to test for heteroskedasticity in the regression.

Breusch-Pagan Test

Chi2(1) = 2.21

Prob > Chi2 = 0.1372

The Breusch-Pagan test performed shows signs of heteroskedasticity. To correct for this, robust standard errors are applied in the regression.

Appendix D - Robustness tests

In this appendix, two different robustness tests are employed to test the strength of the performed regression. In one test, a different measurement for heroin price is employed. In the other test, wheat production is complemented by wheat yield to further illustrate the relevance of wheat as an alternative crop.

Robustness Test 1: *Heroin price in kilograms has been employed as a proxy for opium price, but is now replaced by heroin price in gram.*

Official statistics on heroin prices are usually presented in both kilograms and grams. The price per gram differs between the two measures, as it is less expensive per gram if one buys a larger amount of heroin. Therefore, including prices in gram tests the robustness of the regression.

Opium Production	Coef.	Robust Std. Err.	t	P > |t|	[95%Conf	Interval]
Opium Price Proxy	1.02425	.4243582	2.41	0.026	.1360578	1.912442
Opium Yield	3.017176	.8680018	3.48	0.003	1.200427	4.833924
Security Proxy	.0211169	.0087216	2.42	0.026	.0028624	.0393713
Poverty Proxy	-58.65378	13.57392	-4.32	0.000	-87.06432	-30.24324
GDP Capita	.526109	.3933759	1.34	0.197	-.2972362	1.349454
Wheat Production	-.1443579	.4790194	-0.30	0.766	-1.146957	.8582412
Constant	315.872	70.90946	4.45	0.000	167.4568	464.2872

Figure 10: Stata, Robustness Test 1

Robustness Test 2: *The variable for wheat production in tons is complemented by a variable for Afghan wheat yield to further illustrate the relevance of wheat as an alternative crop.*

Afghan wheat prices would have been applied if they had been available for the entire time period. As a second-best alternative, American wheat prices are used. The USA is one of the world's largest wheat producers and has furthermore gathered statistics on wheat prices for a long time, making American prices accessible for the full time period analysed (United States Department of Agriculture, 2010).

Opium Production	Coef.	Robust Std. Err.	t	P > |t|	[95%Conf	Interval]
Opium Price Proxy	1.044689	.5858495	1.78	0.091	-.1861351	2.275513
Opium Yield	2.824248	.8920135	3.17	0.005	.9501969	4.698299
Security Proxy	.0161161	.0095112	1.69	0.107	-.0038661	.0360984
Poverty Proxy	-59.78294	13.95721	-4.28	0.000	-89.10595	-30.45992
GDP Capita	.7304235	.4278668	1.71	0.105	-.1684912	1.629338
Wheat Production	-.025572	1.062009	-0.02	0.981	-2.256771	2.205627
Wheat Yield	-.2522207	1.618659	-0.16	0.878	-3.652898	3.148456
Constant	315.5158	73.14418	4.31	0.000	161.8456	469.186

Figure 11: Stata, Robustness Test 2

Both robustness tests show that the regression is robust to the changes performed. The proxies for opium price as well as the yield variable remain positive and significant in both tests. The proxy for security is significant in one robustness test and just above significant in the other. The proxy for poverty, as well as the variable for GDP per capita, show the same signs and approximately the same p-values as in the main regression. Wheat production and wheat yield are negative and insignificant in both of the robustness tests, confirming the pattern from the main regression.