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Master Thesis

Conflicts in afghanistan and their impact on the opium economy

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Author:
Pol ANTOINE

Supervisor:
Dr. Golvine de ROCHAMBEAU

Department of Economics

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Abstract

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by Pol ANTOINE

In this work, I introduce a new dataset created to track monthly opium prices in afghan regions. I show that opium prices are correlated with conflict incidence, that Taliban-initiated conflicts have a particular positive effect on prices, and discuss the existence of seasonality and labour effects. I also discuss ways for conflicts to influence the "price premium", i.e. the difference between trader and farm gate prices of opium, and how supply-demand mechanisms alone may not be sufficient to explain opium prices.

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Overview of the situation in Afghanistan

1.1 Opium in Afghanistan

Opium, a latex obtained from the seed capsules of the 'opium poppy' (*papaver somniferum*), is widely used in the pharmaceutical industry for its pain-killing properties. However, many people use it recreationally under its dry from or under its more potent, processed and deadly form, heroin. Heroin contains mostly morphine, obtained from opium, as well as other precursor chemicals, and its use is a national security threat in many countries including the U.S where the widespread use of opiates has been coined as the 'opioids overdose epidemic'[1]. 75% of drug overdose in the U.S were due to opiods in 2020, although some claim that this can be attributed to the over-supply of FDA-approved drugs containing morphine and its derivatives. Opiates being very addictive, authorities have been trying to disrupt the trade of opiates for years with varying levels of success; this is because there are very few countries producing opium, and their governments often lack the tools to fight cultivation of the opium poppy. Among these countries, we can find Mexico (the main supplier of illegal opiates in the U.S), Myanmar, Laos PDR and most importantly Afghanistan which is the focus of this thesis.

Afghanistan is located in Asia, between Iran and Pakistan, making the country highly valuable for foreign countries to establish strategic military bases. Most of the country is on a mountain range, the 'Hindu Kush', the south being flatter and arid. The terrain is very rough, making it easy to hide and hard to cross. It is an under-developed country with an HDI of less than 0.5 and a GDP of roughly $20bn since 2012, suffering from a lot of political instability. The U.S-led coalition famously drove the Taliban out of power in 2001, who have now regained control over the country since the departure of the U.S military in 2021; despite these radical changes of political regimes, the opium economy seemed to have remained relatively unbothered appart from the effective ban of poppy cultivation in 2001 put in place by the Taliban, after being in power since 1996.[2] The cultivation of the opium poppy resumed in 2002 and attained levels similar to the pre-ban period. Part of the reason why this happened is because whilst the government enforces the eradication of the poppy, it knows that many afghans rely on its cultivation to survive. In 2009, an estimated 6.4% of the population was involved in the cultivation of poppy, and the potential net value of opiates represented 21% of the country's GDP.[3]

[1] https://www.cdc.gov/opioids/basics/epidemic.html

[2] As per the *Afghanistan Annual Opium Poppy Survey [of] 2001*, the land used for poppy cultivation decreased by 91% compared to 2000. Surveyors did not find evidence of strong displacement of production (p.9), as the eradication efforts led by the Taliban were mostly successful.

[3] The *Afghanistan Annual Opium Survey [of] 2009* [15], uses an average of 6.5 persons per household and a population of 24.5 million people. It is the last annual report which indicates the share of the population involved in the cultivation of poppy cultivation; some reports in more recent years also indicate the net value of opiates as a share of GDP, which remains between 10 and 20 percent.

1.1.1 Producing wheat or opium?

Farmers in afghanistan can grow different types of cereals and/or plants. The alternative, for opium oppy growers, is often wheat. *Opium surveys* of the years 2000's reported the difference in income when growing wheat vs. opium poppies. The 2013 *Afghanistan Opium Survey* reported a gross income ratio from wheat to opium of 1:4. This relies on broad estimations of fixed costs associated with the cultivation of the

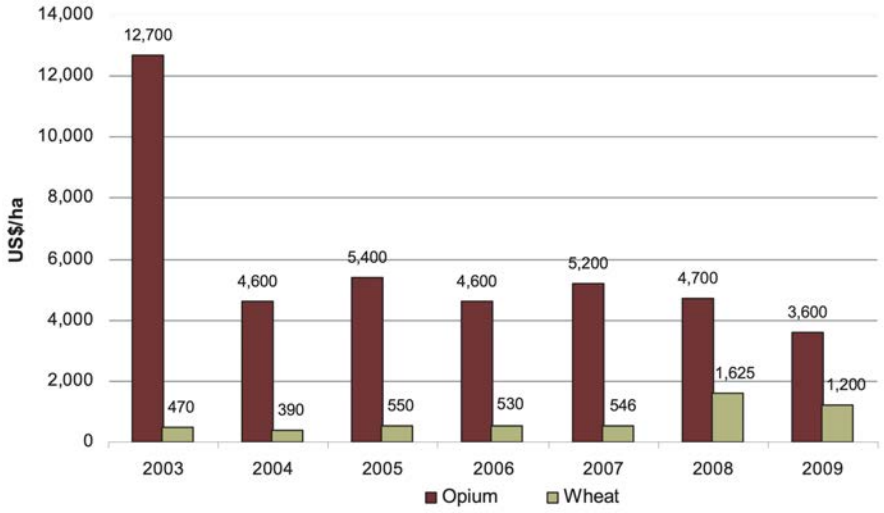

FIGURE 1.1: Gross income per hectare from opium and wheat (US$/ha), 2003-2009 (source: *Afghanistan Opium Survey [of] 2009*[15])

opium poppy, which requires irrigation systems in some parts of the country (especially southern provinces, where access to water streams is more difficult). Nonetheless, Kapoor (1995)[8] reports that the opium poppy requires less water than wheat and Martin & Symansky (2006)[10] indicate that poppies are also more drought-resistant than wheat, making it an "easy-to-grow" crop: although unlikely to be the main parameter when deciding which crop to grow, this highlights that the weather might impact the poppy yield relatively less than the wheat yield. Figure 1.1 reports the gross income ratios for previous years; there is a noticeable downtrend of the ratio for more recent years, though opium remains more profitable. The overall profitability of producing opium makes it an attractive alternative to wheat for afghan farmers, and the government has been trying to de-incentivise this through various policies (anti-poppy awareness campaigns, distribution of licit seeds, fertilizers, eradication campaigns[4]) with, again, varying levels of success.

This extra profit possibility comes at a cost, this time in terms of security. If farmers control their 'own' production, they are often put under the 'protection' of military groups, in particular the Taliban. This allows said groups to extract a rent from the cultivation of poppy cultivation through taxes, requisitions, or other means. In addition to that, local farmers may be incentivised to cultivate opium poppies because of the 'local' effects: the capital used in the cultivation is more accessible/in bigger quantities in some regions, and it might be less/more morally acceptable to grow poppies in certain places. Indeed, the 2001 ban on poppy cultivation was made on religious grounds; we cannot expect all farmers to maximise profits given the prevalence of Islam in Afghanistan, which forbids the cultivation of all drugs.

[4] *Afghanistan Opium Survey [of] 2009*

Lastly, farmers might be used to growing the same crop in which case switching to a different one entails using different methods and having different habits, i.e. having additional constraints.

1.1.2 Conflicts and poverty

On the one hand, the existing literature finds a positive correlation between conflict intensity and poverty incidence in Afghanistan (Floreani et al. (2016)[5]), consistent with the basic intuition that increasingly insecure areas are less prone to economic growth. On the other hand, Ciarli et al. (2015)[3] suggest that conflict intensity only weakly impacts an household's choice to run a small business, using 13 different proxies of subjective and objective conflicts. This may or may not also be the case for other businesses, as the population is forced to acclimate itself to regular conflict occurences.

Indeed, conflicts do not necessarily directly involve citizens (most of the time they do not in Afghanistan), but they can significantly impact the organisation of villages in affected areas. Iyer and Santos (2012)[7] find some evidence that in India, Nepal, Sri Lanka and Afghanistan, conflicts can increase employment in the agricultural sector and informal family labour; a question of interest here, is whether this has an impact on a farmer's decision to grow opium poppies instead of wheat.

When comparing the opium poppy and wheat, it is clear that the poppy requires more human labour since the method used to collect opium latex from the bulbs, lancing, must be done multiple times throughout the harvest season (Lind et al. (2009)[9]).

An arbitrary choice ?

Ciarli et al. (2015) remark that formal employment decreases with conflict intensity and casualties, to the benefit of self-employment, especially in the agricultural sector. However, conflicts often come with a decrease of capital mobility, which is taken into account by agents who choose to switch to self-employement due to the living conditions imposed by conflicts. The opium poppy is a particular case since the infrastructure required to grow it is less important than for wheat (Martin & Symansky (2006)[10]). For these reasons, if conflicts have an impact on the factors of production, we expect it to be mostly on labour. Perhaps more importantly, households will most likely by influenced by the profitability of the poppy and look at current prices of opium to take a decision on what they will grow in a given year.

1.2 Power dynamics

1.2.1 Afghanistan, a tribal country

If efforts were made by the government to fight insecurity and reclaim territory in remote parts of Afghanistan, it remains the host of many tribes (most of which are very old and well established). These tribes do not necessarily recognise the government as legitimate and their organisations come close to mini-states. This is especially important in the context of opium production, since tribal presence will impact taxes levied on opium.

The country's biggest group of tribes, the Pashtun tribes, is reponsible for 37% of its population, and 50% of the population speaks Pashto. For reference, Dari, the official language, is spoken by 78% of the population. Tribes serve their own interests

which may or may not be alligned with that of the government, members of which (along with the Taliban !) can also be tribal members. Townsend and Mili (2010)[13], in a short article about the tribal dynamics of Afghanistan, report the beginnings of tribal tensions (among Taliban commanders) over tax revenue stemming from opium (and cannabis, to a lesser extent). Indeed, in the 2009 Afghanistan Opium Survey, it is reported that in provinces with a "strong influence of insurgents", farmers were paying a 10% tax on opium production called the "ushr" (or "usher"). This territory fight among tribal organisation might be impacted by the potential revenue coming from the production of opium. The *Afghanistan Opium Survey 2017 [-] Challenges to sustainable development, peace and security* provides additional evidence in favour of this (see Table 4.3). In two of the biggest opium producing provinces, Nangarhar and Helmand, 60% and 85% of poppy-producing villages were subject to a tax on their production according to the headmen.

De la Sierra (2020)[12], in the context of coltan mines in DRC, explores the rent mechanisms put in place by armed actors to benefit from the extraction of the material, which involves the creation of customs and "protection" services. It appears that some tribal factions may be incentivised to engage in a similar type of behaviour in order to fund their activities/for their personal wealth in Afghanistan.

1.2.2 A powerful and organised military group in Afghanistan: the Talibans

The Taliban was officially a religous Pashtun nationalist political movement before becoming a state (twice). Originating in the 1990's, it quickly established itself as the main ennemy of the government and eventually took control of the country in 1996. After the U.S.A managed to overthrow them in 2001, the Taliban remained active and led a resistance against the newly created Islamic State of Afghanistan which was eventually taken over in 2021 when U.S troops fully withdrew. The Taliban government is not recognised by any other nation to this date.

The harsh conditions in Afghanistan (extreme temperatures and the Hindu Kush mounthain range) as well as numerous cave systems made it easier for the Talibans to hide during their insurgency, as they established their headquarters in Kandahar (south east of the country). The Pashtun tribe, although being present all over Afghanistan, is especially well settled in the East of the country (there are more Pashtuns in Pakistan than in Afghanistan). This makes Kandahar a strategic place to establish headquarters for the Taliban, all the more so as the proximity with Pakistani borders facilitates illicit international trade.

If opium was definitely not massively grown in Afghanistan in the 20^{th} century, this was not true for much of the 21^{st} century. The settlement of the biggest Taliban cells in the southern and eastern parts of the country coincides with a very steady increase in opium production in these specific regions. For this reason, much of the focus is set on the Talibans in this thesis.

Data

This section discusses the data sources used in the thesis as well as the methodology used to create a new dataset.

2.1 Data access

The dire humanitarian, military and political situations in Afghanistan put the country at the center of many U.N missions[1]. As a result, there are numerous efforts to gather data on various aspects of the country, especially those related to the opium economy. The UNODC[2], through its different missions, extensively uses the local population to collect data, after training those assigned to the task. Not only does this facilitate communication on the field, but there might also be a psychological effect; those surveyed may be more inclined to tell the truth to their own people rather than external actors, especially after the multiple invasions that the country went through in recent history. This matters for data accuracy, since opium prices are actually gathered through surveys.

Regarding conflicts, past papers usually used a combination of different proxies to build their own database for conflicts. Floreani et al. (2016)[5] use a combination of *United Nations Assistance Mission in Afghanistan (UNAMA 2015)*[3] and the *Global Terrorism Database (GTD)*[4] for casualities data. Both international and afghan troops data come from *NATO International Security Assistance Force (ISAF)*. Ciarli et al. (2015)[3] chose to use the *Global Dataset on Events, Location and Tone (GDELT)*[5]. In this thesis, I decided to use *ACLED*[11][6] as the conflict dataset for its rich information sources and consistency.

2.1.1 ACLED

ACLED is a dataset that is updated weekly, containing very rich conflict information coming from international and local sources with precise localisation data. It records conflict events between two or more parties, as well as the casualties for each event and other parties affected by the event but not directly involved. *ACLED* started collecting data for Afghanistan on the 1^{st} of January 2017, which thus sets the beginning of the time period for the analysis.

Most event and sub-event types were selected in the data downloading process. There are 5 different event types and 18 sub-event types, Figure 2.1 showing the distribution of event types. Most conflicts are qualifed as "battles" or "remote violence", though 2020 saw a moderate increase in the share of conflicts qualified as "violence

[1] Among others, the *Afghan Opiate Trade Project (AOTP)*, accessible at https://www.unodc.org/unodc/en/data-and-analysis/aotp.html.

[2] https://www.unodc.org/

[3] https://unama.unmissions.org/

[4] https://www.start.umd.edu/gtd/, maintained by the University of Maryland

[5] https://www.gdeltproject.org/

[6] https://acleddata.com/, data accessed on March 17, 2023.

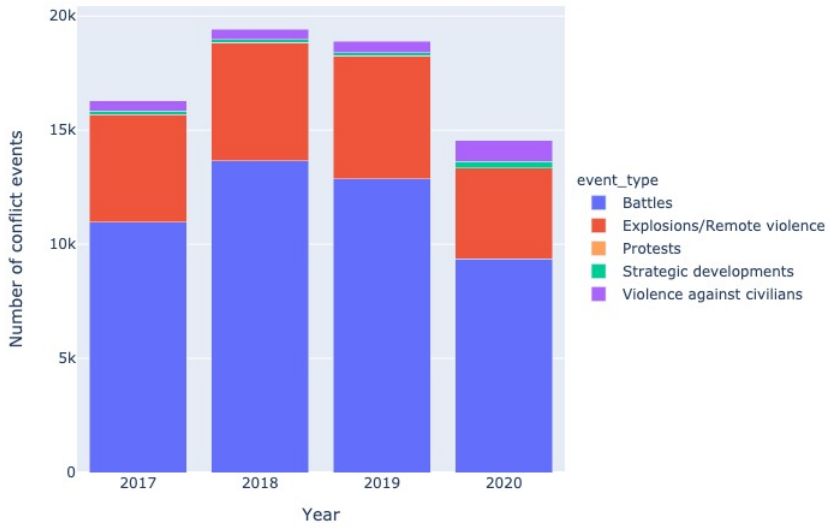

FIGURE 2.1: Conflicts recorded by *ACLED* in Afghanistan, by type (2017 - 2020)

against civilians". This brings the total number of recorded conflicts for this period to 61,295. The ACLED codebook [1] provides the following respective definitions for battle and remote violence: *"a violent interaction between two politically organized armed groups at a particular time and location*" and "*one-sided violent events in which the tool for engaging in conflict creates asymmetry by taking away the ability of the target to respond*". The definition of battles being broader, we can expect it to be the most frequent event in our data. Indeed, Figure 2.1 shows that the downtrend initiated in 2018 can be imputed to the decline in the number of battles. Furthermore, certain actors will engage relatively more in certain types of conflicts due to the constraints associated with them. For example, it is somewhat easier for rebel groups (militias, ethnic or not, Taliban, etc.) to engage in "normal" battles rather than remote violence which often involves expensive/hard to acquire supply (land mines, drone strikes, etc.)

Conflict events are geocoded at the longitude/latitute level, but *ACLED* also reports administrative regions (i.e. provinces in Afghanistan). However, we are constrainted by the precision of opium data which is geocoded at the regional level. We aggregate conflict data at the regional level: this is discussed more in details in the next subsection.

2.1.2 Opium data

Even though the U.N is putting effort through its missions in Afghanistan, most data is not yet easily accessible (either because it is hard to find, not consistent, or even erroneous). For this reason, opium prices (as well as heroin prices) were directly gathered from PDF reports from the joint UNODC/Afghanistan mission (the *Afghanistan Opium Price Monitoring Monthly Reports* in particular[7]). Doing so required guessing

[7]Not all price reports can be found online. A list of most price reports can be found at: https://moi.gov.af/en/social-and-economic-report

the URL addresses of some price reports since Afghanistan's Ministry of Interior's website is difficult to browse and not always available.

The advantage of this approach is that we do not have to rely on annual price averages as reported by UNODC's annual opium survey, as it was done in the past (see Lind et al. (2009)[9]); the geographical precision is the same, but we get 12 times more data. These price reports are available up to June 2020, and they contain prices for dry opium (farm gate and trader), as well as heroin (several different qualities).

An important feat of the tables from the reports is that prices are regional: this implies that each reported price in a given month is a production-weighted average of several prices (usually a few provinces per region (see Table 4.1)). This is because not all provinces produce opium in a region. As a result, there is no data for the central region (where Kabul is located), whilst there are 6 provinces reporting prices for the northern region.

Methodology

Extracting data from PDF reports was a tedious task and required various softwares/libraries. 4 python scripts (entirely my own) were used to extract the data, each one with a respective task:

1. The first script uses the software "skimpdf" to reduce the PDF to a specific set of pages through the command line. For each report, I manually inspected which page(s) contained the table with farm gate and trader opium prices.

2. The second script is used to extract each table with the help of the python library "Camelot"[8]. It creates a zip file containing the unformatted CSV versions of the tables.

3. The third script takes the unformatted CSV files containing the tables and transforms them into tables with a common format (i.e. 3 columns: month, region and price in $.)

4. The last script takes all individual, formatted CSV files and appends them together to generate the final, merged CSV file.

This process was repeated to extract farm-gate and trader prices, which were in different tables. The resulting dataset contains 210 different observations (i.e. 420 prices) for the period Jan. 2017 - Jun. 2020.

It is worth noticing that the reports also include fresh opium prices, in local currencies. Fresh opium spoils quickly, and can only be stored for short periods. In addition to that, dry opium is relatively more resistant to harsh storage conditions and the reduced water content also makes it easy to store and transport. Using dry opium thus reduces the probability of experiencing prices changes related to supply shocks caused by, for example, mold or poor storage conditions.

Finally, I also extracted heroin prices from all available provinces (as discussed in the notes of Figure 4.4) over the same time period, this time manually concatenating the tables together due to the different format in the PDF reports.

[8] See https://github.com/camelot-dev/camelot for more information

Adjusting for inflation

As the monthly price reports suggest (see for example the price report for May 2020, p.16 [14][9]), prices are reported in local currency. If Afghani is the official currency, foreign currencies are the *de facto* currencies in certain areas, especially those closer to international borders. In order to report prices in U.S $, they convert the local currency on the day the sample was collected. The reported prices are thus in nominal terms; I use the food price index to transform them into real terms.[10]

TABLE 2.1: Summary statistics

	Sum	Mean	St.dev	Min	Max	N
Country level variables (full sample)						
No. fatalities	303383	3.03	6.43	0	173	100270
No. monthly battles	-	1476.59	341.41	660	2048	100270
No. monthly remote violence events	-	639.32	206.83	273	1131	100270
No. all monthly conflicts	-	2210.19	515.28	1150	3355	100270
No. monthly conflicts involving talibans	-	875.00	223.76	444	1386	100270
No. monthly conflicts involving military	-	764.89	212.87	301	1275	100270
No. monthly conflicts involving the police	-	170.64	49.66	82	314	100270
Country level variables (restricted sample)						
No. fatalities	226163	3.27	6.44	0	173	69134
No. monthly battles	-	1016.34	202.58	486	1384	69134
No. monthly remote violence events	-	423.23	132.15	178	740	69134
No. all monthly conflicts	-	1501.549	297.01	799	2138	69134
No. monthly conflicts involving talibans	-	580.40	114.50	319	852	69134
No. monthly conflicts involving military	-	521.14	132.80	211	829	69134
No. monthly conflicts involving the police	-	113.38	25.72	66	179	69134
Region level variables (sampled each month)						
Dry opium price (farm gate, 2015 $)	-	89.24	46.19	28.19806	275.208	210
Dry opium price (trader, 2015 $)	-	94.95	47.06	31.37972	288.3131	210
Province level variable (sampled each month)						
Heroin price (2015 $)	-	2145.235	966.7154	772.3398	5370.86	210

Notes: The full sample contains the entire *ACLED* dataset from the 1^{st} of Jan. 2017 until the 31^{st} of Dec. 2020. The restricted sample contains data on the same time period, however reported values only take into account provinces which reported an opium price in the *opium data*. Opium prices, reported in the last two lines, are at the region level. Since no prices are reported for the central region (a poppy-free region), they correspond to 19 provinces in 2017, and 21 provinces in 2018-2020 in the northern, northern-east, eastern, southern and western regions. The time period covered is from Jan. 2017 until Jun. 2020, the last uploaded report. Heroin prices are reported for only a few provinces, as described in the Appendix (notes of Figure 4.4)

[9] Only the May 2020 monthly price report is included in the references for clarity, but all available reports since 2010 were used.

[10] Using food prices is preferred to correct poppy prices for inflation because of the similarity of products that it tracks. Data comes from the Food and Agriculture Organisation of the U.N[6], available at https://www.fao.org/faostat/en/#data/CP.

2.2 Summary statistics

Table 2.1 reports several summary statistics about conflict in Afghanistan, as well as opium prices. In the monthly price reports, prices are aggregated at the region level rather than the province level due to low intra-regional variations - in any case, prices are production-weighted to account for these differences. Figure 4.2 shows an example of price variations at the region level. Similarly, a map with the regions can be found in the appendix (Figure 4.1). In 2017, it was decided to include two more provinces in the southern region sample. Table 4.1 reports which provinces were sampled on the 2017-2020 period, with their corresponding region.

Heroin prices are not used in the analysis because the sample methodology employed is too different from the one used to get opium prices. Firstly, only 6 provinces are sampled. Secondly, quality varies much more for heroin than opium due to the process required to produce it. Figure 4.4 in the appendix shows those prices, but they are only reported to get a broad idea of the relationship between opium and heroin prices.

The first part of the table is also used for comparison purposes since only provinces with both opium prices and conflict data can be used in the analysis.

Channels of effect and findings

This section focuses on the channels through which conflicts can impact opium prices, as well as findings from the estimation procedure.

3.1 Correlations

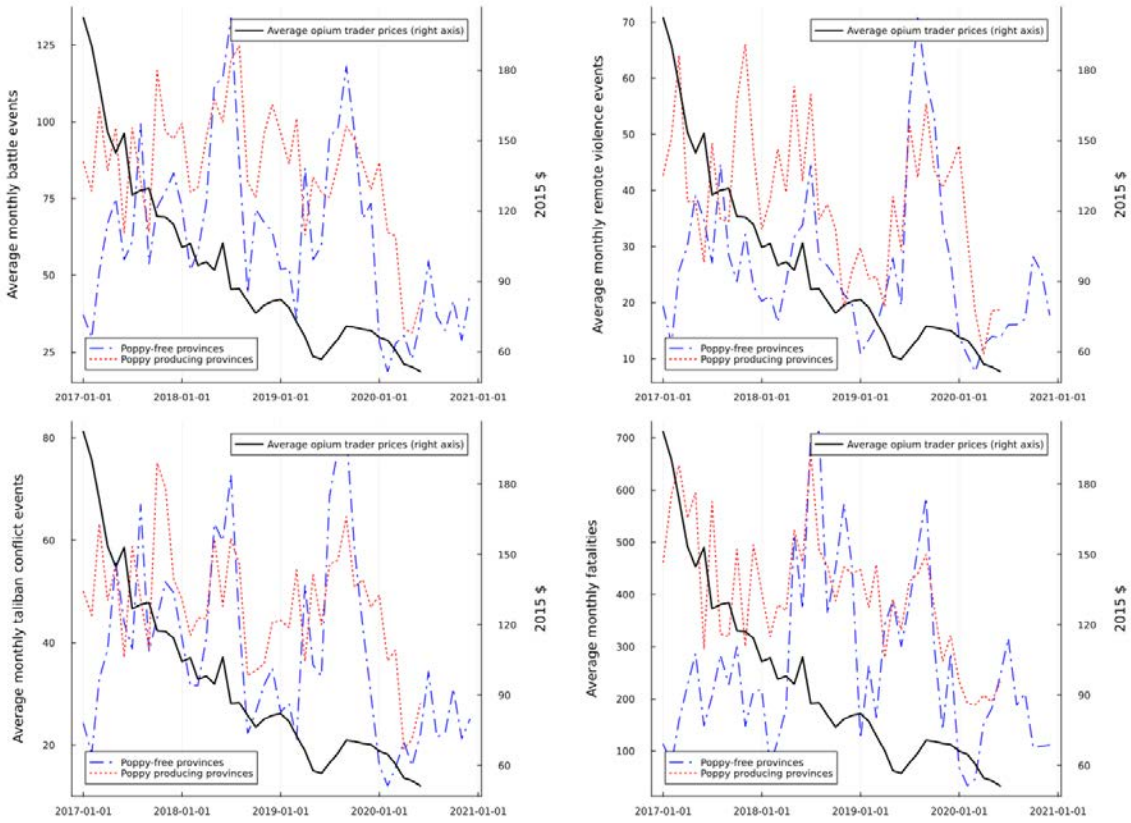

FIGURE 3.1: Mean violence and opium trader prices in Afghan provinces

Notes: price is for 1kg of product. Poppy-free provinces correspond to provinces where opium prices are not reported, because no prices can be sampled. The poppy production is low enough for these to be considered poppy-free.

3.1.1 By event type

The two graphs on the first row of Figure 3.1 report the average number of monthly battles/remote violence events in afghan provinces over the study period plus six months after (essentially showing the full ACLED dataset and the full prices dataset).

There are, on average, more battles and remote violence events in poppy-producing provinces. The correlation between the two types of provinces is positive most of the time, though it appears that the sign of the correlation is inverted at particular points in time. I plot the average opium trader price to see whether these correlation changes and/or spikes are also correlated with opium prices. The trader price of opium is strongly declining over the period, but there is a first small spike in mid 2018 preceded an increase in monthly average battles. The same pattern arises in mid 2019.

In this downward movement of opium prices, there is another price increase around january 2019. This increase is preceded by a drastic inversion of the correlation between the average number of battles in the two types of provinces: it reverses to a positive correlation a few months after, when prices coincidentally decrease. The fact that there is a small lag between the increase (decrease) of conflict events and the increase (decrease) of opium prices gives us an indication on the causal relationship between conflicts and opium prices.

The story is similary for remote violence events, though the magnitude of the changes varies more: we still observe the same increases slightly before the two mid-year price spikes and the inversion of the correlation at the beginning of 2019. It is worth noticing that May and June are harvest months for the eastern, southern and western regions[16]. These regions account for the majority of the production, so they naturally impact opium prices more. This will be discussed more in details in the regression part of this section.

3.1.2 By the Talibans

Table 2.1 reports than more than half of battles involve the Talibans on average in the full sample. This is consistent with the graphs, as the bottom left graph closely resembles the top left one: roughly 72.4% of conflicts involving the Talibans are battles, and 25.4% are remote violence events. The Taliban are especially important in this context since they are the group that is the most likely to establish itself as a "stationary bandit" (following the definition of de la Sierra (2020)[12]) in order to extract a rent from the cultivation of the opium poppy, for the two following reasons:

1. They need a large source of income to continue their activities, as a political and religious group at war with the government until August of 2021 when they got back into the government;

2. Taliban "sub-groups" (or cells) are organised in an authoritarian way, making it easier to forcibly introduce taxes/customs as well as local rules..

3.1.3 By fatalities

During 2017, when opium prices were much higher, poppy producing provinces had more casualties due to conflicts being more frequent, but the correlation between the two types of provinces was not clear until 2018 - lower prices were accompanied by a very positive correlation of fatalities, which appeared to be stronger than for the other graphs.

What is more, the mean number of fatalities (per conflict event) in the full sample is slightly lower than the restricted sample (3.03 against 3.27 as per Table 2.1), implying that conflicts are deadlier (hence more "intense") in poppy producing provinces. It is not possible to determine a unique, direct cause for this, though the

dire situation in some of the poppy producing provinces (security wise) certainly had an impact.

3.2 A supply and demand mechanism ?

The clear downtrend in the trader price of opium over the study period can lead us to believe that there was an increasing supply of opium, or a reduction in demand.

On the supply side, as the executive summary of the *Afghanistan Opium Survey 2020*[17] shows, opium production sharply declined from 2017 to 2019. One might wonder whether this drop is correlated with international opium prices; this is clearly not the case since Afghanistan has a quasi-monopoly over worldwide opium production. If anything, the other producing countries (mainly Myanmar, Lao PDR and Mexico) are the ones impacted by market movements in Afghanistan.

On the demand side, there is evidence that *legal* opioid consumption was stable from 2017 to 2021 (INCB (2021)[2]). Since the legal and illegal markets are not the same entity in the case of opium, and due to the fact that opium is rarely consumed as a recreational drug, one has to look at the behaviour of the heroin market to determine whether the fall in opium prices can be linked to a decrease in demand for the final product. Since drug use is difficult to estimate, I assume that manufacture of the finished product is not in over/under supply and compare it with prices. Figure 4.5 shows that the potential heroin manufacture was very high in 2017, but remained stabled for the 3 following years. The observed decline in heroin prices in Afghanistan over the 4 years of the study period can therefore not be entirely explained by quantity changes. Overall, heroin prices seem to be more stable than opium prices, with the exception of one strong price increase in the western region in mid 2018.

Finally, Lind et al. (2009) find that including opium prices in their analyses does not change their predictions on opium production which confirms the above.

3.3 Heterogeneous actors

From the full ACLED sample, we can distinguish three distinct "main" actors in conflict events in Afghanistan. The most prevalent actors are the Talibans, followed by the state military and the state police (to a lesser extent). These three actors represent more than 70% of the data. Dube & Vargas (2013)[4] use coffee prices to explain different types of conflicts in Colombia, namely guerilla attacks, paramilitary attacks and clashes. This is sufficient in the sense that only specific actors will engage in each type of conflict, but this is not the case in Afghanistan. Talibans, military, police and even foreign actors can all engage in battles as well as remote violence, etc...

In this case, I assume a distortionnary effect of conflict on opium prices depending on the actor engaging in the conflict. This implies that I distinguish conflicts not only on the their type, but also on the actor. The aim of this assumption is to determine which actors in particular are the best predictors of opium prices, and importantly the sign of their effect. In their exercise, Lind et al. (2009) only focus on western hostile casualties as a proxy of conflict intensity: doing so does not allow to observe the effect described above. What is more, the opium dataset allows to examine the "actor effect" on trader and farm gate prices, which are naturally highly correlated, but likely to be impacted by conflict in a different way.

Farm gate price is the price of opium decided by the producers - they usually do not move their product (except on short distances, to the local market for example).

However, trader price is the price decided by the agent who directly bought from the producer and moves the product, either to sell it for direct consumption or to heroin laboratories. This implies that traders are highly affected by the hostility of their environment. If we define the price premium as the difference between the trader and the farm gate prices, then we can expect that in regions with a higher risk of conflict, the price premium is higher. This also highlights the importance of fixed effects in the analysis, as conflicts are not homogeneous across the territory as shown in Figure 3.1.

3.4 Conflict intensity: fatalities

Conflicts are not all of the same intensity. Many small conflict events in one province in any given month might have shorter-lasting consequences compared to one major clash leading to a change in territory borders. I thus introduce fatalities in the specification to account for the deadliness of conflicts, which are expected to have a stronger impact on trader price compared to farm gate price for the reasons stated in section 3.3. Fatalities are essentially used as a "level of insecurity" proxy for opium traders.

Monthly fatalities at the province level are highly correlated with the number of conflicts in that province, we thus use the average number of fatalities per conflict in a month/region, differentiating between each of the three actors. Note that the overall country average is slightly higher in the restricted sample compared to the full sample as Table 2.1 shows.

3.5 Seasonality

Another possible channel for conflicts to have an impact on opium prices is through their timing. In the eastern, southern and western regions, the flowering season for opium poppies lasts for two months, during March and April due to the similar weather and soil composition. In the northern and north-eastern regions, harvest lasts for three months and happens between May and July. It is possible that conflict events are more frequent during these periods as certain actors decide to increase hostilities in producing regions. Again, this effect is likely to be stronger for Talibans compared to the military or the police since only corrupt agents can engage in conflicts with this particular goal in mind.

I use a dummy variable equal to 1 if a region is currently in harvest season to control for this potential effect.

3.6 Specification

A fixed-effects approach is used to estimate the impact of conflicts on opium prices. In particular, I estimate the following model:

$$p_{i,jt} = \alpha + \beta_{jt} Conflicts + \gamma_{jt-1} Conflicts + \theta_{jt} Fatalities + \lambda_{jt} HS + \delta_t + \epsilon_{jt} \quad (3.1)$$

where i is either the farm gate or the trader price, β_{jt} is a vector of actor-specific conflict variables in region j and month t, γ_{jt-1} is 1 month lagged version of β_{jt}, θjt is a vector of actor-specific fatalities variables, λ_{jt} is the coefficient associated with a dummy variable equal to 1 if region j is in harvest season at time t and δ_t is a time

trend. Note that the same model is used in the appendix (Table 4.2) using the price premium as the dependent variable.

3.7 Results

Table 3.1 reports the regression output of the various variables discussed above on both types of opium prices.

3.7.1 Main variables

Fixed effects

The disparity in the production of opium across different Afghan regions makes the inclusion of fixed effects essential when analysing opium prices. Indeed, only the time trend remains significantly positive through the different specifications. Therefore, columns (1) and (4) are simply used as a reference and their results are not interpretable. As Dube & Vargas (2013) explain in the context of coffee in Colombia, this allows to capture (time-invariant) region characteristics correlated with conflicts. For example, one such effect could be the fact that the Taliban headquarters were located in Kandahar (southern region) until 2021 (outside of the study period), or the fact that the north-eastern region is very difficult to cross due to the mountains and close international borders.

Including region fixed effects most importantly make two of the most important regressors statistically significant.

Battles

We first focus on columns (2) and (3) which apply to the farm gate price of opium. It appears that battles have a contradictory effect on the farm gate price. Battles engaged by the Taliban have a positive impact on price, whilst battles engaged by the afghan military have a negative effect on price. In any region in a given month, one extra battle engaged by the Taliban is predicted to increase the farm gate price by 0.23$, whilst one extra battle started by the military is predicted to decrease the farm gate price by 0.237$.

There are several possible explanations for this symmetrical effect. Firstly, it could be that farmers react in similar way to traders when it comes to increasing insecurity. Growing poppies in a conflict-intensive area makes it easier for external militias to set up appropriations and establish themselves as stationary bandits (as described by de la Sierra (2020)), one reason for which farmers may also include a "security premium" in their prices. This would imply that Talibans are perceived more negatively than the military, and the increase in the perceived level of insecurity is higher for Taliban-initiated conflicts compared to military-initiated ones.

Secondly, there could be an effect through the labour supply. It is safe to assume that conflicts (especially battles and remote violence) impact population movements, and poppy lancing requires a lot of manual labour compared to wheat. Moreover, profitability of opium poppy is higher than wheat: as a result, labourers may come from far away for the harvest season. The *Afghanistan Opium Survey 2009* suggests that population movements to the southern region were more frequent before the harvest season, providing evidence in favour of the labour channel. A negative shock to the labour supply due to an increase in conflicts would have a negative impact on price because of the higher compensation required by already present

TABLE 3.1: Regression results

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variables	Farm gate price	-	-	Trader price	-	-
Taliban battles	-0.113	0.230**	0.289*	-0.127	0.230**	0.295*
	(0.215)	(0.0791)	(0.111)	(0.212)	(0.0801)	(0.108)
Taliban remote violence	0.201	0.0553	0.0609	0.215	0.0138	0.0201
	(0.251)	(0.259)	(0.342)	(0.274)	(0.280)	(0.359)
Afghan military battles	-0.0201	-0.237**	-0.262*	-0.0264	-0.236**	-0.264*
	(0.0984)	(0.0826)	(0.0964)	(0.101)	(0.0823)	(0.0921)
Afghan military remote violence	-0.0334	-0.112	-0.0893	-0.0412	-0.0889	-0.0610
	(0.0767)	(0.147)	(0.248)	(0.0864)	(0.156)	(0.254)
Afghan police battles	-0.152	-0.252	-0.383	-0.0429	-0.233	-0.390
	(0.639)	(0.265)	(0.351)	(0.623)	(0.271)	(0.350)
Afghan police remote violence	1.510	0.596	0.431	1.319	0.516	0.348
	(1.030)	(0.298)	(0.503)	(1.000)	(0.307)	(0.514)
Average fatalities, Taliban conflict			-9.137			-8.969
			(6.431)			(6.158)
Average fatalities, Af. military conflict			-1.749			-1.957
			(8.072)			(8.230)
Average fatalities, Af. police conflict			16.30			18.99
			(13.98)			(13.12)
Harvest month			0.428			0.0705
			(2.368)			(2.548)
Time trend	-2.025**	-2.174**	-2.169**	-2.191**	-2.327**	-2.328**
	(0.910)	(0.737)	(0.718)	(0.919)	(0.754)	(0.734)
Constant	1,513**	1,616**	1,622**	1,635**	1,730**	1,739**
	(665.2)	(523.7)	(521.7)	(670.4)	(535.3)	(533.5)
Observations	205	205	205	205	205	205
R-squared		0.610	0.625		0.627	0.641
Number of regions	5	5	5	5	5	5
Region FE	NO	YES	YES	NO	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: The first lag of Taliban, military and police battles/remote violence events are included in the regressions but not displayed in the table for clarity. Robust standard errors are displayed in parentheses. Dependent variables are in 2015$ per kg.

labourers for the extra work, but it could also be related to the "security channel" in that working conditions are worse than in a less conflict-intense area. One would have to look at population movements over the year and analyse whether the harvest season is a good predictor of population movements towards poppy-growing areas to isolate this effect.

Fatalities

None of the fatalities variables are significant in these specifications. This means that the "security effect" that fatalities were meant to capture is already possibly captured by the absolute number of conflicts. However, there is one subtle element to this effect. For fatalities to be significant, then traders would need to be aware that conflicts are getting deadlier on average. It is clear that perceived changes in levels of security are more easily seen in the overall increase in conflicts, which can for example be reported in the news, compared to the average number of casualties per conflict.

Seasonality

The "harvest effect" is also not significant, perhaps because the effect it is trying to identify is actually due to the population movements highlighted above. Another possible explanation is that there is a "harvest effect", but it only applies to fresh opium. Fresh opium prices are more sensitive to supply shocks due to the short storage period of the product. Contrary to dry opium, supply cannot be "smooth" throughout the year and fresh opium is only available around harvest season. Nonetheless, including fatalities and the harvesting month dummy removes a downward bias on the battles variables, although increasing the standard erros in the process.

3.7.2 The opium price premium

Although the results focus on prices separated, the opium dataset created for this thesis allows us to look at the difference between the selling price of traders and farmers, which I define as the price premium.

Figure 3.2 shows that much like opium prices, the price premium decreased for all regions over the study period. Interestingly, the variance also diminishes for the western and north-eastern regions, where the price premium was varying more at the beginning of the study period. The magnitude of the decrease is also very similar: average trader prices went from more than 180$ per kg. to less than 60$ per kg., whereas here the price premium went from between 15 and 10$ to less than 5$ per kg. The coefficients on battles are very similar for both dependent variables, however the time trend coefficient for trader opium price is more negative which helps understand this decrease. To further investigate this, I report the regression output of the same model on the price premium in the appendix (Table 4.2). Including fixed effects remove the statistical significance of the lags, however remote violence conflicts initiated by the afghan police seem to remain robust. We also have a significant, negative effect of the time trend which is consistent with the observation above.

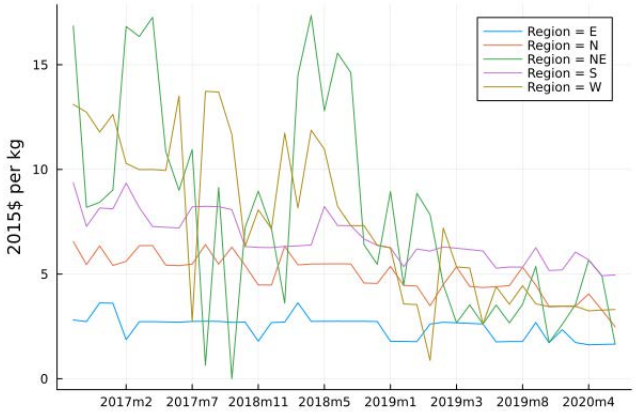

FIGURE 3.2: Trader and farm gate opium price difference in afghan provinces

Note: a data point represents the difference between the trader price and the farmgate price in each of the 5 sampled regions each month.

3.8 Addressing simultaneity

So far, we have looked at how conflicts can impact opium prices and discussed various channels of effect. However, what if conflicts increased because of rising opium prices ? I suggest, in section 3.7.1, that stationary bandits can use hostile environments to their advantage as the lack of law enforcement makes it easier for them to set up appropriations. Knowing this, if prices start rising in a province/region, they might be incentivised to go there and also start conflicts in order to extract a rent from the cultivation of poppies. The nature of the Taliban organisation from 2001 to 2021, in cells scattered throughout the country, makes this especially plausible.

This potential endogeneity issue is the reason why we cannot claim a direct causal effect of conflicts on opium prices. However, there are some elements that are in favour of a causal effect. Figure 3.1 shows that shocks on opium prices appear after increases in conflicts which is consistent with the "security effect" described above, assuming that Talibans do not purposely destroy opium supply in order to provoke supply shocks. It is true that at least one such event was recorded in 2001 when the Taliban decided to eradicate poppy production in the country - such eradications effort were never seen again (by any actor). One could use an IV strategy to make Taliban-initiated conflicts exogenous, or simply only consider conflicts that are assumed to be exogenous to opium production, such as U.S-led coalitions in Afghanistan during the first 20 years of the 21^{st} century (which is debatable).

3.9 Conclusion

In this thesis, I explored a self-created dataset to analyse the relationship between opium prices and conflict in Afghanistan. Combining this with the rich *ACLED* dataset, I find that opium prices are correlated with conflicts but the effect is different depending on the actor. In periods with more conflicts initiated by the talibans, opium prices tend to rise whilst in periods with more conflicts initiated by the afghan military, opium prices tend to decrease. I also argue that the fall in opium prices during the 2017-2020 period cannot be entirely caused by supply-demand mechanisms

and that this decrease was also accompanied by a decrease in the "price premium", the difference between the trader and farm gate prices of opium. Finally, I remark that a causal effect cannot be claimed since conflicts are hardly exogenous in this setting, one of the reasons why Lind et al. (2009) do not attempt to use afghan-related casualities, reducing available information in the process. This thesis nonetheless sets the groundwork for more research on this question by using the new dataset and, for example, augmenting the *ACLED* dataset with other sources in order to fully exploit opium prices which cover the period 2010-2020.

Appendix

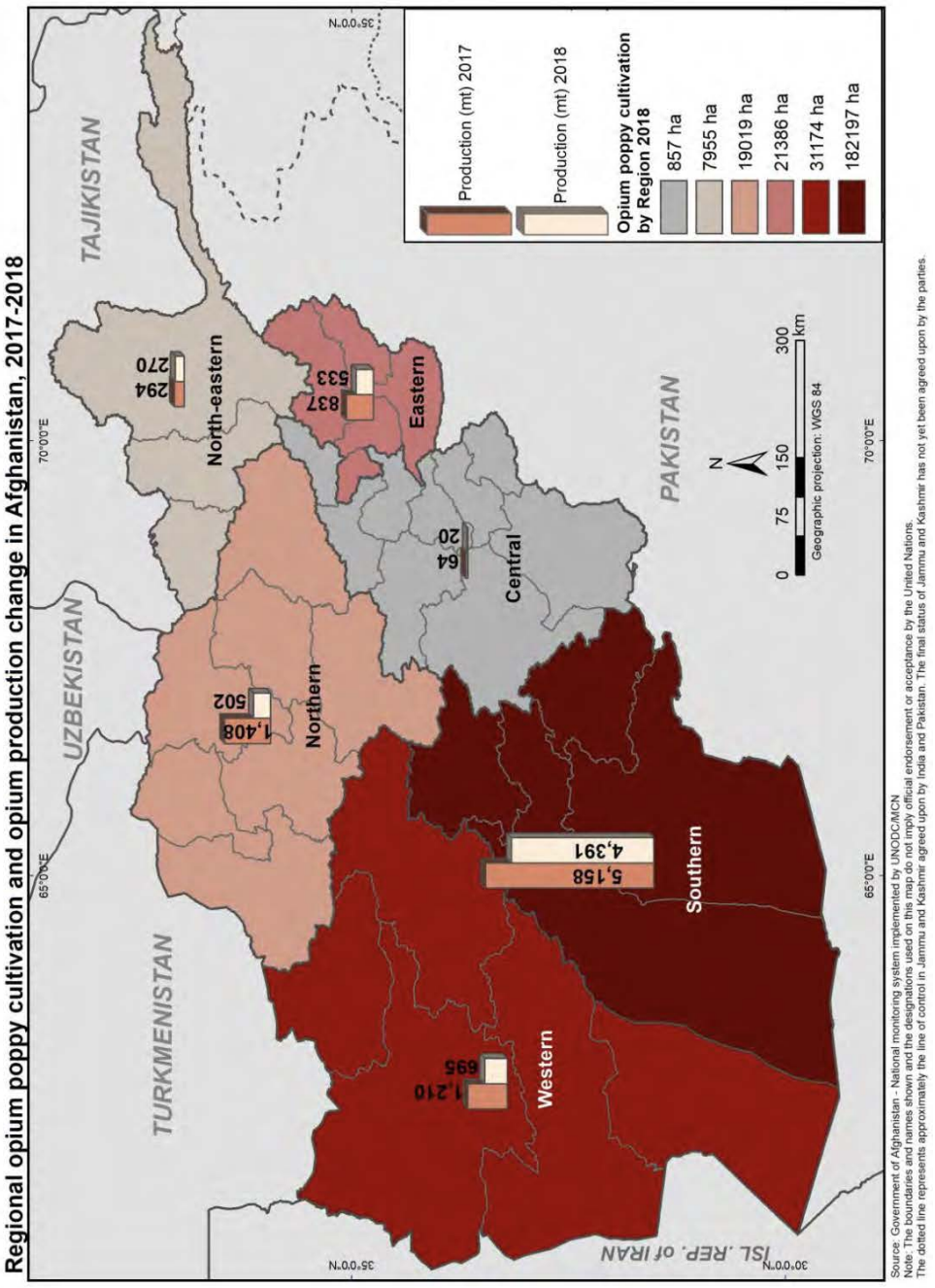

FIGURE 4.1: Afghan regions as of 2018

Source: *Afghanistan Opium Survey 2018*. Production of opium varied throughout regions in the 2000's and the 2010's, but the Central region remained poppy-free which is why it is not included in the monthly price reports.

Region	2017	2018-2020
North	Baghlan, Balkh, Faryab, Sar-e Pol, Jowzjan, Samangan	Baghlan, Balkh, Faryab, Sar-e Pol, Jowzjan, Samangan
North-East	Badakhshan, Takhar, Kunduz	Badakhshan, Takhar, Kunduz
East	Kunar, Laghman, Nangarhar	Kunar, Laghman, Nangarhar
South	Helmand, Kandahar	Helmand, Kandahar, Urozgan, Zabul
West	Badghis, Farah, Ghor, Herat, Nimruz	Badghis, Farah, Ghor, Herat, Nimruz

TABLE 4.1: Provinces in different regions

Table 4.1 reports the different provinces sampled in the monthly price reports. The only difference between the two sample is the inclusion of Urozgan and Zabul, two previously popp-free provinces of the southern region. In each region, prices are weighted by production at the province level. This does not impact the price much since there is already little variation each region.

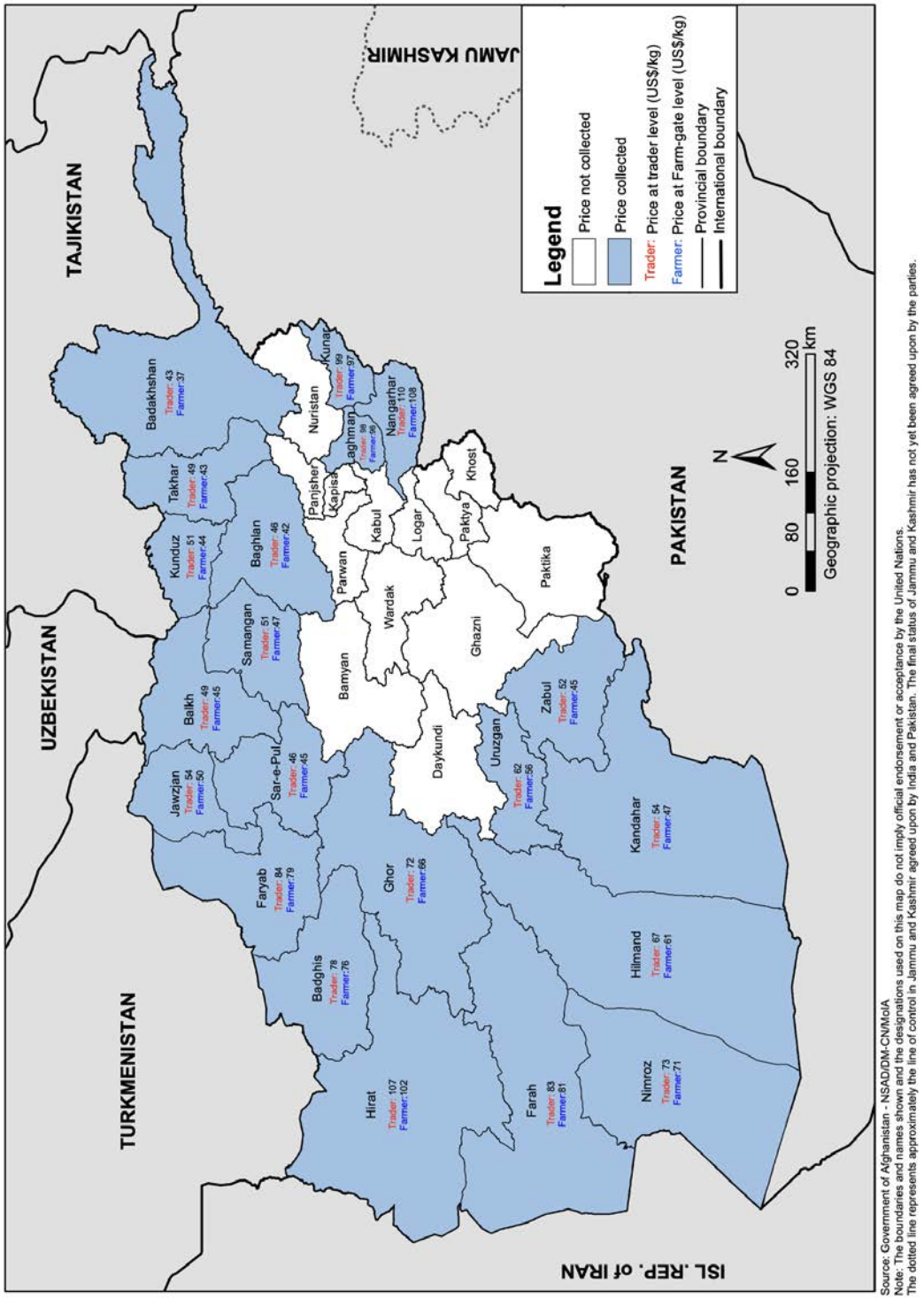

FIGURE 4.2: Average dry opium prices, May 2020

Province	Percentage of poppy villages paying taxes on opium poppy
BADAKHSHAN	20%
BADGHIS	73%
BAGHLAN	7%
BALKH	0%
BAMYAN	0%
DAYKUNDI	0%
FARAH	80%
FARYAB	64%
GHAZNI	67%
GHOR	88%
HELMAND	85%
HERAT	67%
JAWZJAN	0%
KABUL	0%
KANDAHAR	25%
KAPISA	13%
KHOST	0%
KUNARHA	0%
KUNDUZ	0%
LAGHMAN	17%
LOGAR	100%
NANGARHAR	60%
NIMROZ	0%
NOORISTAN	0%
PAKTIKA	0%
PAKTYA	0%
PARWAN	100%
SAMANGAN	0%
SAR-E-PUL	0%
TAHKAR	0%
UROZGAN	80%
WARDAK	0%
ZABUL	20%
National	62%

FIGURE 4.3: Taxing of opium poppy and usher, by province and region

Source: *Afghanistan Opium Survey 2017 [-] Challenges to sustainable development, peace and security*. *Notes:* the numbers were obtained by surveying village headmen which are usually responsible for paying the tax to the collector, which can either be an insurgent group, a local leader, or a state agent.

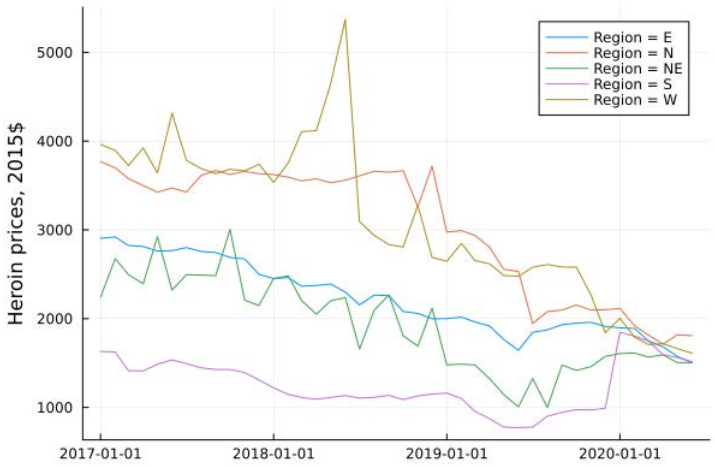

FIGURE 4.4: Heroin prices in different Afghan regions

Notes: the monthly price reports sample only a few provinces in the country, usually one per region except for the north-eastern region: the price is a simple average of the two sampled provinces, Takhar and Hirat. The data is thus at the province level, though the number of monthly samples is 6. In all 5 regions, The reported price is that of the highest quality of heroin to allow for comparisons and ranges from 70% purity in NE to 100% (theoretically) in the eastern region (batan quality).

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Total potential opium production	4 953	4 730	6 983	4 831	6 810	7 735	4 659	5 976	10 270	7 618	7 616	7 413
Potential opium not processed into heroin	1 680	1 728	3 400	1 850	2 600	2 450	1 360	2 510	1,100 - 1,400	1,225 - 1,525	*1,180 - 1,480*	*1,177- 1,477*
Potential opium processed into heroin	3 273	3 002	3 583	2 981	4 210	5 285	3 299	3 466	8,870 - 9,170	6,093 - 6,393	*6,136 - 6,436*	*5,936-6,236*
Total potential heroin manufacture	427	383	467	377	555	544	319	368	677 - 1027	468 - 718	*474 - 724*	*454 - 694*

FIGURE 4.5: Global manufacture of heroin from global illicit opium production, 2009-2020 (tons)

Source: UNODC[18]. *Notes:* numbers also include other producing countries. The estimated heroin manufacture uses a ratio of 7:1 (volume of opium required to produce 1 volume of heroin) for Afghanistan, and 10:1 for other countries (which have a much lower weight).

VARIABLES	(1) Price premium	(2) -	(3) -
Taliban battles	-0.0139	-0.000403	0.00551
	(0.0185)	(0.0116)	(0.00688)
Taliban remote violence	0.0142	-0.0415	-0.0408
	(0.0250)	(0.0309)	(0.0313)
First lag taliban battles	0.0274	0.0356	0.0336
	(0.0189)	(0.0201)	(0.0181)
First lag remote violence taliban	0.0534**	-0.00844	-0.0116
	(0.0265)	(0.0138)	(0.00569)
Af. military battles	-0.00636	0.000974	-0.00147
	(0.0128)	(0.00586)	(0.00643)
Af. military remote violence	-0.00779	0.0234	0.0282
	(0.0145)	(0.0201)	(0.0219)
First lag af. military battles	-0.0196	-0.0188	-0.0155
	(0.0149)	(0.00999)	(0.00910)
First lag af. military remote violence	-0.0275**	0.00106	0.00418
	(0.0137)	(0.00755)	(0.0114)
Af. police battles	0.109***	0.0188	-0.00693
	(0.0311)	(0.0235)	(0.0146)
Af. police remote violence	-0.191**	-0.0793*	-0.0830**
	(0.0818)	(0.0294)	(0.0278)
First lag af. police battles	-0.0332	-0.0973	-0.0931
	(0.0473)	(0.0550)	(0.0492)
First lag af. police remote violence	-0.211***	-0.0155	-0.0106
	(0.0779)	(0.0404)	(0.0386)
Average fatalities, taliban conflict			0.168
			(0.438)
Average fatalities, af. military conflict			-0.209
			(0.842)
Average fatalities, af. police conflict			2.685*
			(1.059)
Time trend	-0.166***	-0.153**	-0.158**
	(0.0516)	(0.0488)	(0.0481)
Harvest month			-0.358
			(0.332)
Constant	122.7***	114.2**	117.6**
	(37.37)	(34.87)	(34.31)
Observations	205	205	205
R-squared		0.371	0.388
Number of regions	5	5	5
Region FE	No	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

TABLE 4.2: Regression results for the price premium

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