

**Opium for the masses?
Conflict-induced narcotics production in
Afghanistan**

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Motivation

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- *Drugs-for-arms*
- Angrist and Kugler (2008)

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- Opium: minimum involvement and maximum turnover

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- Raise drug production, not to buy arms, but for economic reasons
- Opium: minimum involvement and maximum turnover
- Claim: recent rise in poppy cultivation in Afghanistan is caused by escalating violent conflicts

Conflict-induced narcotics production

Why do production incentives change?

- Opium is more drought resistant than wheat, the main alternative crop
- Opium does not require road transportation
- Military activities that destroy infrastructure such as irrigation and roads therefore make opium relatively more profitable.
- Shift to opium because less affected by fighting and more easily produced and sold in the new conflict environment
- Higher risks of violence and hostile take-overs: less profitable to rebuild destroyed infrastructure

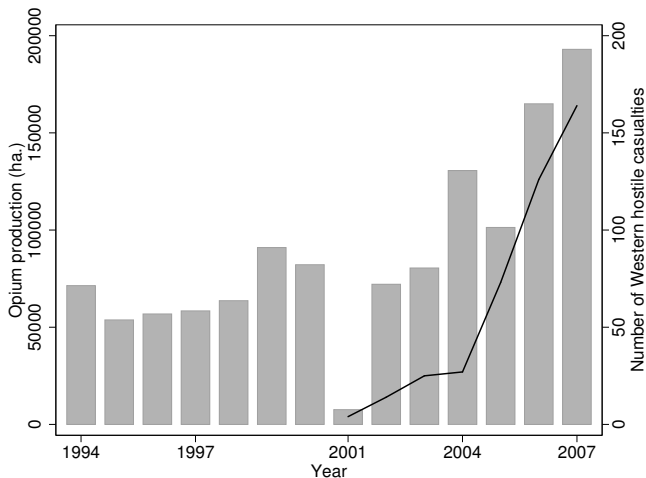
Overview

- Motivation/background
- Brief historical account
- Model
- Data
- Empirics
- Conclusion

Background

- Facts on Afghan opium:
 - More than 90 % of the world's total production
 - 53% of their legal GDP
 - Arable land devoted to opium production: 3% (UNODC (2007a))

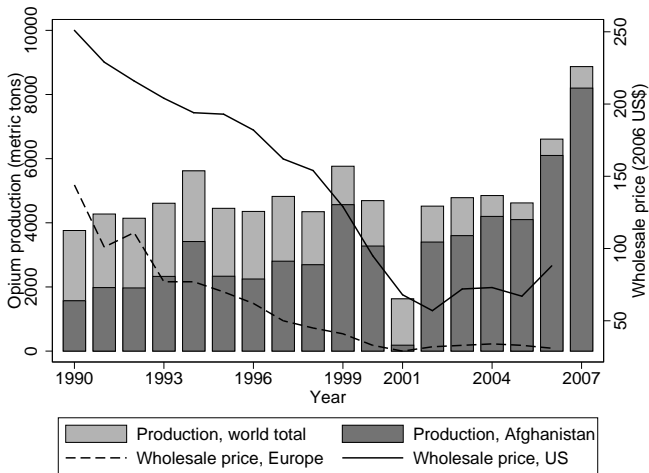
Figure: Opium production and casualties



Notes: Bars depict hectares of land devoted to opium production and the line depicts hostile casualties. The extremely low level of opium production in 2001 is due to the Taliban's ban on poppy cultivation in this year.

Source: UNODC (2007) and iCasualties.org.

Figure: World production of opium and world market opium prices.



Notes: Wholesale price is in 2006 US \$ / gram. Opium production is "Potential opium production" in metric tons, as measured by UNODC (2008). Since 2000, the only competitor to Afghan opium is opium from Myanmar. During the 90's, also Lao PDR, Pakistan, Vietnam, Mexico, and Colombia produced noticeable amounts of opium.

Source: UNODC (2008).

Background (contd.)

- Afghanistan's dominant role in the world opium production does not go back more than three decades:

Year	Production
1932	75
1956	12
1972	100
1980	200
1990	1570
2000	3276
2007	8200

Notes: Production in metric tonnes.

Source: CCINC (1972); UNODC (2003, 2007)

Opium and conflict—recent examples

- 1979-1989: Russian occupation

“Soviet invasion of the country threw the society into chaos, and gave rise to ineffectual governments lacking control of the whole territory. This prompted unscrupulous warlords to take advantage of the situation by encouraging farmers to shift to poppy cultivation”

(Misra, 2004, p. 127)

Opium and conflict—recent examples (cont.)

- 1989-1994 Conflicts

“much of this renewed production took the form of opium growing, heroine refining, and smuggling; these enterprises were organized by combines of mujahedin parties, Pakistani military officers, and Pakistani drug syndicates.”
(Rubin, 2002, p. 183)

- 1994-2001 Varying degrees of Taliban control
- 2001-2008 US and Nato forces

Model: Conflict-induced opium production

- Afghanistan has for long been characterized by ineffectual governments lacking control over the whole territory
- Military invasions and internal conflicts imply less, it seems, not more centralization of power
- But stronger control by local power holders imply monopsony power in the opium trade, and, all else equal, profits up through lower farm gate prices and lower supply
- But that did not happen. Why?

Model: Conflict-induced opium production (cont.)

- All else not equal
- Conflicts imply greater illegal opportunities as central law enforcement becomes weaker
- Infrastructure destroyed by conflict
- Can this story generate falling prices and increasing opium production?

Model: Conflict-induced opium production (cont.)

- Wheat is the main alternative to opium production in Afghanistan
- The cultivation of the two crops differ systematically:
 - Opium less dependent on infrastructure
 - Opium much more labor intensive

Model: Conflict-induced opium production (cont.)

“Opium is relatively drought-resistant, making its cultivation easier than wheat in areas where irrigation is limited. Moreover, dry opium is easy to store and transport, which, given the poor state of roads and stocking facilities in Afghanistan, gives it an advantage over other crops.”

(Martin and Symansky, 2006, p. 26)

Model: Set up

Wheat

- Production $A(1 - n)^\alpha$
- Price unity
- Warlord gets share γ_L
Farmer gets share γ_F
- $\gamma_L + \gamma_F \leq 1$

Opium

- Production Bn^β
- Farmer sells at price p
- Warlord sells at price $P > p$
- Production is confiscated or eradicated with probability $1 - \theta$
 θ measure of rule of law or institutional quality

Model: Price and crop decision

Farmer's choice: $\max_n \left[\theta p B n^\beta + \gamma_F A (1 - n)^\alpha \right] \Rightarrow n = n(p)$

Warlord's choice: $\max_p \left[\theta (P - p) B n^\beta + \gamma_L A (1 - n)^\alpha \right] \text{ s.t. } n = n(p)$

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Fraction n allocated to opium:

$$\theta P \frac{B}{A} = H(n), \quad H'(n) > 0$$

and farm gate price

$$p = M(n)P, \quad M(n) < 1, \quad M'(n) < 0$$

Opium and conflict

Fraction n allocated to opium:

$$\theta P \frac{B}{A} = H(n), \quad H'(n) > 0$$

Proposition

- *the destruction of infrastructure (higher B/A) increases the amount of land dedicated to opium production (n)*
- *opium production goes up even though it is associated with a lower farm gate price p*
- *the increase in opium production as a response to the destruction in infrastructure is stronger the higher is the confidence in local protection (i.e. the higher is θ).*

Data

- Data on area used for opium production from UNODC. 329 districts measured from 1994 to 2007
- Data on area eradicated from UNODC. 2006 and 2007 only
- Data on number of western soldiers killed in combat from 2001 to 2008. Use dummy for casualties or not.
Source: iCasualties.org, mostly based on press releases from the US Department of Defense and CENTCOM
- Geographical data from GIS data made available by Afghanistan Information Management Services
- Rainfall data from Global Precipitation Climatology Project One-Degree Daily Precipitation Data Set

Press release



U.S. Department of Defense
Office of the Assistant Secretary of Defense (Public Affairs)

News Release

On the Web:

<http://www.defenselink.mil/releases/release.aspx?releaseid=11100>

Media contact: +1 (703) 697-5131/697-5132

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IMMEDIATE RELEASE

No. 844-07
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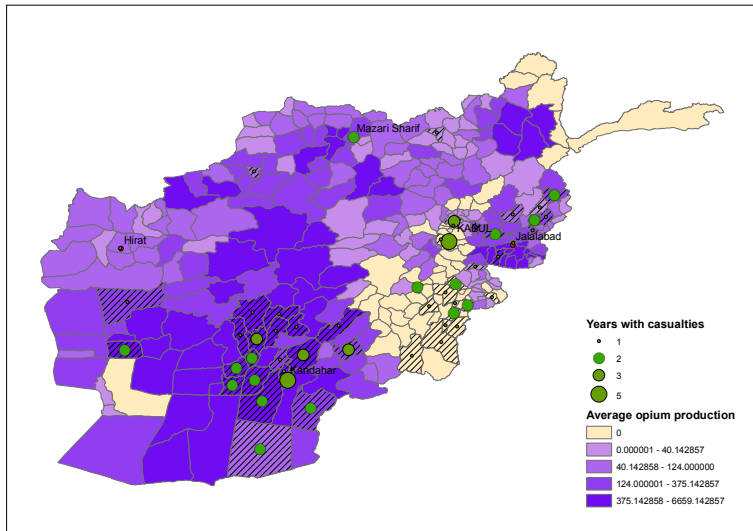
DoD Identifies Army Casualty

The Department of Defense announced today the death of a soldier who was supporting Operation Enduring Freedom.

Spc. Christopher S. Honaker, 23, of Cleveland, N.C., died July 5 of wounds sustained from enemy small arms fire and indirect fire in the Watapor Valley of Kunar Province, Afghanistan. He was assigned to 2d Battalion, 503d Infantry Regiment (Airborne), 173d Airborne Brigade, Vicenza, Italy.

For more information, media may contact the Southern European Task Force public affairs office at 011-39-0444-71-7071.

Conflict and opium production



Exogenous variation in conflict? NATO

- Western ISAF forces do not involve themselves in fighting related to opium production, as they make clear on their web site and in their mandate:

“While supporting the Afghan government counter-narcotics programmes is an ISAF key supporting task, ISAF is not directly involved in poppy eradication, nor does it participate in the destruction of processing facilities, or in any military action against narcotic producers”¹

¹http://www.nato.int/isaf/topics/recon_dev/cn.html, accessed on Aug. 28, 2008

Exogenous variation in conflict? OEF

- “until recently, American officials acknowledge, fighting drugs was considered a distraction from fighting terrorists.” (New York Times, 2007).

Exogenous variation in conflict? OEF

- “until recently, American officials acknowledge, fighting drugs was considered a distraction from fighting terrorists.” (New York Times, 2007).
- But the Taliban offensive in the spring of 2006 and especially the resignation of Secretary of Defense Donald Rumsfeld in December 2006 \implies change in attitude among defense officials on the role of opium in funding the insurgency (New York Times, 2007).
- Since the change of strategy was around the turn of the year 2006-7, we avoid using data on casualties for 2007 to predict opium production in 2008.

Eradication and Western casualties, district level

	(1)	(2)	(3)	(4)
Casualties, district	14.25 (34.69)	-12.92 (31.65)	177.8 (124.0)	157.0 (116.6)
Opium production, lagged		0.0506** (0.0235)		0.0230 (0.0147)
Constant	29.61** (10.95)	15.85* (8.557)	25.64** (9.729)	16.21* (9.417)
Year	2006	2006	2007	2007
R ²	0.001	0.075	0.083	0.111
N	329	329	329	329

Contemporaneous correlation between the area of opium eradicated and Western combat casualties. Both eradicated area and casualties are measured on the district level.

Standard errors are clustered on province-year

Overview

- District estimates
- Casualties in and out of the planting season
- Granger causality
- Where is the effect strongest?
- Conflict or just the presence of Western soldiers?
- Simultaneity bias? Instrument opium production with rainfall
- Artifact of measurement technology?
- Caused by price movements?

District level

	(1)	(2)	(3)	(4)	(5)	(6)
Casualties, district	969.6* (519.6)					565.2* (305.1)
Casualties, district lagged		771.1** (351.2)		490.8** (197.6)	368.3*** (141.5)	392.8*** (144.6)
Casualties, district two lags			229.7 (231.2)			-119.7 (314.2)
District FE	No	No	No	Yes	Yes	Yes
Year FE	No	No	No	No	Yes	Yes
R ²	0.028	0.011	0.001	0.007	0.034	0.040
N	2303	1974	1645	1974	1974	1645

Notes: Effects of contemporaneous and lagged Western combat casualties on opium production (2001-2007). Outcome variable is area of opium cultivation (ha). Casualties on district level.

Standard errors are clustered on province-year.

Province level

	(1)	(2)	(3)	(4)	(5)	(6)
Casualties, province	318.1** (159.9)					-79.81 (115.8)
Casualties, province lagged		387.7* (212.5)		282.2** (138.4)	159.6 (116.7)	193.4 (149.7)
Casualties, province two lags			355.6 (281.1)			158.6 (169.3)
District FE	No	No	No	Yes	Yes	Yes
Year FE	No	No	No	No	Yes	Yes
R ²	0.019	0.023	0.016	0.016	0.034	0.033
N	2303	1974	1645	1974	1974	1645

Notes: Effects of contemporaneous and lagged Western combat casualties on opium production (2001-2007). Outcome variable is area of opium cultivation (ha) on district level. Casualties on province level.

Standard errors are clustered on province-year.

Casualties in and out of planting season

	(1)	(2)	(3)	(4)	(5)
Casualties, planting season (Sept-Nov)	749.7** (361.4)			746.8** (364.5)	760.0** (373.8)
Casualties, non-planting season (Jan-Mar)		118.3 (386.1)		47.63 (389.9)	
Casualties, non-planting season (Jan-May)			-17.40 (233.7)		-96.70 (239.9)
Mean cas.	0.0127	0.00811	0.0157		
District FE	Yes	Yes	Yes	Yes	Yes
Year FE	No	No	No	No	No
R ²	0.009	0.000	0.000	0.009	0.009
N	1974	1974	1974	1974	1974

Notes: Effects of Western combat casualties in and out of the planting season on opium production (2002-2007). The planting season is in October and November. Mean Cas. is the mean of the casualties variable used in the same column. Data on district level.

Standard errors are clustered on province-year

Casualties in and out of planting season

	(6)	(7)	(8)	(9)	(10)
Casualties, planting season (Sept-Nov)	600.8** (292.4)			601.4** (297.6)	619.5** (309.9)
Casualties, non-planting season (Jan-Mar)		43.13 (382.8)		-10.15 (389.1)	
Casualties, non-planting season (Jan-May)			-132.8 (233.1)		-191.9 (246.2)
Mean cas.	0.0127	0.00811	0.0157		
District FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
R ²	0.036	0.030	0.030	0.036	0.036
N	1974	1974	1974	1974	1974

Notes: Effects of Western combat casualties in and out of the planting season on opium production (2002-2007). The planting season is in October and November. Mean Cas. is the mean of the casualties variable used in the same column. Data on district level.

Standard errors are clustered on province-year

Granger test

	Opium prod.	Casualties
Opium production, lagged	0.643** (0.250)	0.0000166 (0.0000121)
Casualties, district lagged	461.8* (261.3)	-0.282*** (0.109)
χ^2	3.123	1.866
p-value	0.077	0.172
District FE	Yes	Yes
Year FE	Yes	Yes
N	1645	1645

Notes: Effects of lagged Western combat casualties and opium production on current Western casualties and opium production. Casualties are measured at the district level. Estimation is by the Arellano-Bond GMM technique. χ^2 is the test statistic of a χ^2 test of lagged casualties being different from zero in column (1) and of lagged opium production being different from zero in column (2). p-value is the p-value of this test.

Robust standard errors in parentheses.

Where is the effect strongest? Distance to Kabul

	(1)	(2)	(3)	(4)	(5)	(6)
Casualties	-583.7* (335.0)					
Casualties lagged		-346.7 (246.1)	-208.7 (141.7)	-313.7* (165.3)	14.68 (136.3)	-55.83 (97.49)
Casualties × Distance	4435.5** (2101.1)					
Casualties lagged × Distance		3234.5** (1250.9)	2017.9*** (745.8)	1970.7*** (685.0)		
Cas. lagged × Far from Kabul					1279.2** (502.2)	758.9*** (284.2)
Distance to Kabul	652.1*** (236.8)	874.3*** (330.4)				
Far from Kabul					421.4*** (122.8)	
District FE	No	No	Yes	Yes	No	Yes
Year FE	No	No	No	Yes	No	Yes
R ²	0.093	0.061	0.014	0.040	0.056	0.038
N	2303	1974	1974	1974	1974	1974

Notes: Effects of contemporaneous and lagged Western combat casualties and interactions with (height-weighted) distance to Kabul on opium production (2001-2007). Outcome variable is area of opium cultivation (ha). Casualties on district level. Distance to Kabul is measured on a 0-1 scale, Far from Kabul is above the median distance to Kabul.

Standard errors are clustered on province-year.

Conflict or just the presence of Western soldiers?

	(1)	(2)	(3)	(4)	(5)	(6)
Hostile casualties	1104.4* (571.4)					569.1* (303.3)
Hostile casualties, lagged		873.9** (371.3)		447.9** (185.3)	340.8** (138.4)	434.0*** (163.0)
Hostile casualties, two lags			335.2 (267.8)			-63.55 (323.3)
Non-hostile casualties	-555.0** (244.7)					-29.88 (129.8)
Non-hostile casualties, lagged		-358.6* (204.0)		288.8 (221.0)	191.6 (210.5)	103.3 (180.8)
Non-hostile casualties, two lags			-348.0* (203.0)			-327.4 (205.5)
District FE	No	No	No	Yes	Yes	Yes
Year FE	No	No	No	No	Yes	Yes
R ²	0.031	0.012	0.001	0.008	0.034	0.041
N	2303	1974	1645	1974	1974	1645

Notes: Effects of contemporaneous and lagged Western combat and non-hostile casualties on opium production (2001-2007). Casualties on district level.

Standard errors are clustered on province-year

Endogeneity—instrumental variables

$$C_{it} = a_i + bO_{it} + d'Z_{it} + \varepsilon_{it}^1$$

$$O_{it} = \alpha_i + \beta C_{it} + \delta'Z_{it} + \phi'W_{it} + \varepsilon_{it}^2$$

Endogeneity—instrumental variables

$$C_{it} = a_i + bO_{it} + d'Z_{it} + \varepsilon_{it}^1$$

$$O_{it} = \alpha_i + \beta C_{it} + \delta'Z_{it} + \phi'W_{it} + \varepsilon_{it}^2$$

	(1) Casualties, district	(2) Opium production	(3) Casualties, district	(4) Opium production
Opium production	0.0000246** (0.00000970)		-0.0000137 (0.0000434)	
Casualties, district		554.0** (251.0)		839.4*** (296.9)
District FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Estimator	OLS	OLS	2SLS	2SLS
First stage F			6.88	61657.90
R2	0.05	0.08	0.02	0.07
N	1974	1974	1974	1974

Notes: Effects of contemporaneous Western combat casualties on opium production and of contemporaneous opium production on Western combat casualties (2001-2007). Casualties are measured on the district level. Instruments for opium production are three principal components of monthly rainfall and their squares. Instrument for casualties is the residuals from the estimations in columns (3), cf. Hausman and Taylor (1983). Weak identification test is the LM version Kleibergen and Paap (2006) rk test for weak identification in the first stage, distributed χ^2 with 6 and 1 degrees of freedom in columns (3) and (4).

Robust standard errors in parentheses.

An artifact of the change in measurement technology?

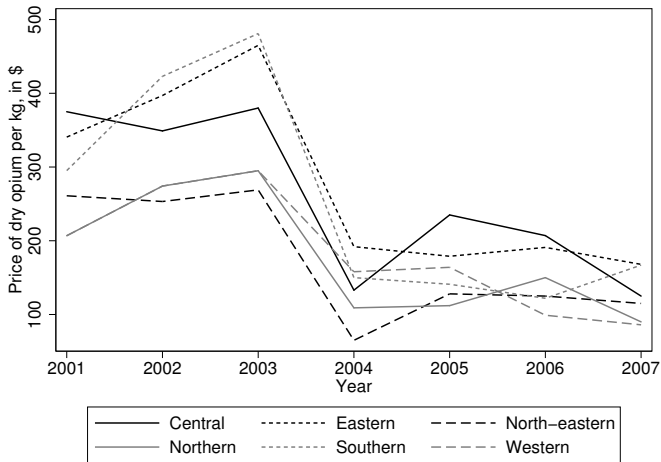
Areas surveyed by satellite

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Casualties, district			805.7* (475.6)					566.7* (299.8)
Casualties, district lagged				623.5** (308.3)		462.7** (200.8)	370.1*** (140.4)	393.7*** (143.1)
Casualties, district two lags					202.4 (209.8)			-117.3 (318.2)
Observation by satellite	234.0* (128.1)	36.36 (129.7)	674.7*** (129.5)	678.5*** (141.5)	670.1*** (158.6)	209.5*** (51.35)	40.36 (127.8)	19.92 (126.5)
District FE	Yes	Yes	No	No	No	Yes	Yes	Yes
Year FE	Yes	Yes	No	No	No	No	Yes	Yes
R ²	0.057	0.030	0.116	0.093	0.073	0.015	0.034	0.040
N	2303	1974	2303	1974	1645	1974	1974	1645

Notes: Effects of observation by satellite and contemporaneous and lagged Western combat and non-hostile casualties on opium production (2001-2007). Data on district level.

Standard errors are clustered on province-year

Caused by price movements?



Note: The graph shows the estimated farm gate value of opium production by year, broken down by six broad regions.

Conclusions

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- Conflicts destructive and creative

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- Conflict-induced narcotics production: rising conflicts change incentives and behavior
- Conflicts destructive and creative
- Western combat casualties used as an indicator of conflict
- Conflict induces opium production
 - This effect is strongest far from Kabul (weak law enforcement)
- Causality
 - Before and after planting season
 - Granger causality
- Military presence in itself not driving the results, only conflict induces opium production
- But of course, it is hard to disentangle the two directions of causality