EC3320

2016-2017

Michael Spagat

Lecture 13.

We continue our discussion of the economic causes of conflict, but now we work with detailed data on a single conflict.

The units of analysis for Collier-Hoefller-Fearon-Laitin are country-time periods. Hopefully, you recall that we were not able to draw very many robust conclusions from this cross-country analysis.

Now we will focus on a single country (Colombia) so we need new units of analysis.

To get anywhere with empirical research you need to have a reasonably large number of data points. (This is a basic fact about empirical analysis that many students beginning research projects overlook)

So we need to ask ourselves – where are all of these data points going to come from?

There are two possible dimensions – time and space, i.e., we can divide a country into geographical areas and we can observe these areas at different points in time.

Dube and Vargas do both of these things in their paper "Commodity Price Shocks and Civil Conflict: Evidence From Colombia."

They divide space into more than 950 municipalities and then divide time into the years between 1988 and 2005.

In doing this they make a key assumption that in each year a municipality is a coherent functioning unit both in terms of the economy and in terms of the conflict.

Before starting you need some minimal background on the conflict during the period of analysis.

The “guerrillas” are left-wing rebels who are trying to overthrow the government of Colombia.

They are also involved in a lot of criminal money-raising activities including the drug trade (mainly coca), kidnapping and extortion.

The “paramilitaries” are illegal right-wing groups that are trying to stop the guerrillas from overthrowing the government and are also involved in a wide range of criminal activities.

In fact, the paramilitaries are generally more involved in these activities than the guerrillas are.

One last thing to be aware of is that the paramilitaries were a pretty minor presence until around 1997 or so – after 1997 they expanded dramatically.

Therefore, we would not really expect paramilitary activity to respond much to economic factors before 1997 because there was very little such activity back then.

Dube and Vargas want to know whether economic factors cause conflict, or at least increase conflict intensity, in Colombia.

Their ideas about the possible relationship between conflict and the economy are more sophisticated than the ideas we encountered in lectures 11 and 12.

In those lectures we were really just investigating whether bad economic conditions cause conflict and good economic conditions prevent conflict.

In contrast, Dube and Vargas look for two possible effects:

1. An *opportunity cost effect* according to which higher wages should reduce conflict.

The idea is that when wages are low then illegal armed groups can lure people into joining up by offering modest economic benefits to joiners.

With higher wages it becomes harder for illegal armed groups to tempt people to join. Wages might rise in coffee growing areas when the international price of coffee goes up.

2. A *rapacity effect* according to which better economic conditions can create pools of wealth that armed groups can expropriate.

For example, some revenue from oil production flows into municipalities that have the oil. Armed groups can then target those municipalities by, for example, kidnapping mayors and demanding payment.

To the extent that the rapacity effect operates we will observe a *positive* relationship between conflict and economic performance, e.g., more oil production means more money to steal, leading to more fighting.

The main idea behind the Dube and Vargas paper is to take advantage of the fact that changes in international commodity prices will play out differently in different regions.

In particular we would expect that an increase in international coffee prices will increase wages in coffee-growing municipalities and have no effect on wages in non-coffee-growing municipalities – the more coffee-focused the municipality the bigger we would expect this effect to be.

Continuing this logic we would expect that in big coffee regions increases in coffee prices should be associated with decreases in conflict intensity as armed groups struggle to sign up and retain fighters when wages are high - as wages will be when coffee prices are high.

The prediction is that conflict intensity is not related to international coffee prices in regions where there is no coffee growing.

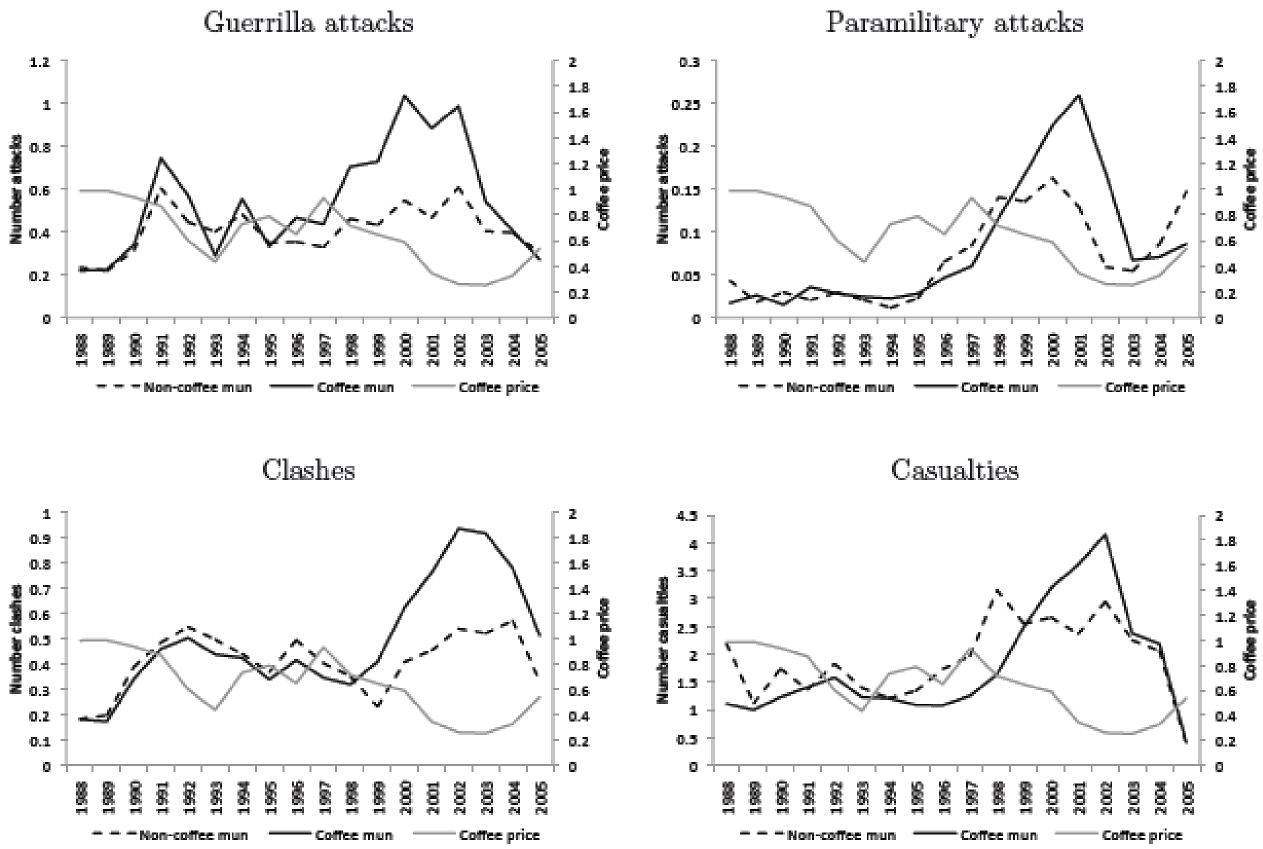
The pictures on slide 11 divide municipalities into coffee and non-coffee ones and suggest that something along the lines of the above predictions might really be happening.

Notice, in particular, how the gap between conflict activities in coffee regions versus non-coffee regions increases during 1997 and 2003, a period during which international coffee prices fell by around 68%.

There is a smaller dip in coffee prices between 1989 and 1993 which, maybe, is associated with a bit of a separation in guerrilla activity between coffee and non-coffee areas although this is a bit of a stretch.

There is no such effect for paramilitaries for this time period, as we would expect since paramilitaries were not very active back then.

Figure IV
The Coffee Price and Mean Violence in Coffee and Non-coffee Municipalities



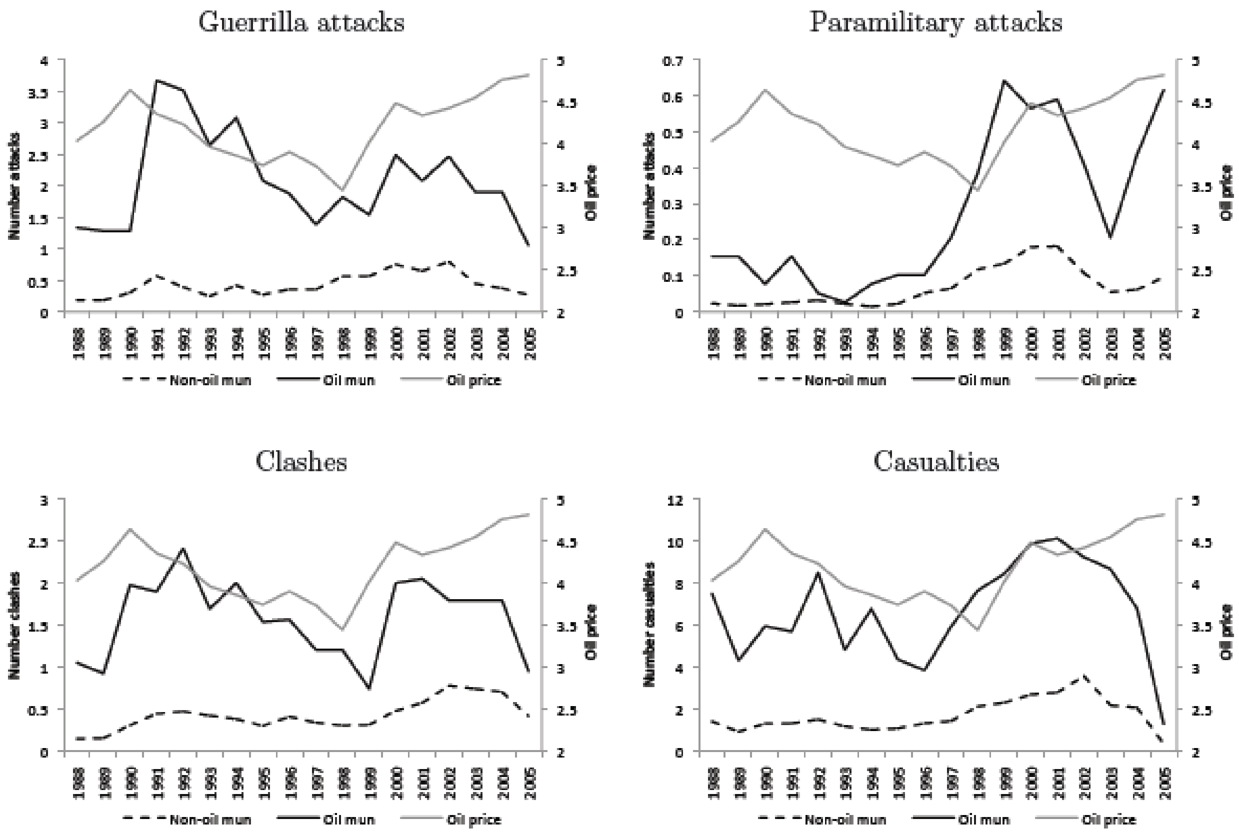
Notes. This figure shows the (log) real internal price of coffee in Colombia, as well as mean violence in municipalities growing coffee in 1997 and mean violence in the non-coffee municipalities.

The pictures on slide 13 show the same conflict activities, but set against international oil prices rather than against coffee prices as in slide 11.

The clearest movement in the picture is an increase in the gap between conflict activity in oil regions and conflict activity in non-oil regions for the paramilitaries when the price of oil rises in the late 1990’s.

This suggests that there may, indeed, be a rapacity effect but, if so, it operates only for the paramilitaries.

Figure V
The Oil Price and Mean Violence in Oil and Non-oil Municipalities



Notes. This figure shows the (log) real international price of oil, as well as mean violence in municipalities producing oil in 1988 and mean violence in the non-oil producing municipalities.

The above pictures show just two-way relationships between either coffee prices and conflict activities or oil prices and conflict activities.

The next step is to use regression analysis to control for various things so that we can have more confidence in the findings than we can get from two-way comparisons alone.

The results on slide 15 include the following controls: log of population, year dummies, region dummies and an indicator for whether or not the municipality is a coca producer which is interacted with the year dummy.

The essence of the estimation can be taken from equation 1 of the Dube and Vargas paper (slide 15). Note that this is a difference in difference ("diff in diff") design (lecture 8).

$$y_{jrt} = \alpha_j + \beta_t + \delta_r t + Coca_{jr} t\gamma + (Oil_{jr} \times OP_t)\lambda + (Cof_{jr} \widehat{\times} CP_t)\rho + \mathrm{X}_{jrt}\phi + \varepsilon_{jrt} \quad (1)$$

where y_{jrt} are conflict outcomes including the number of guerrilla attacks, paramilitary attacks, clashes or casualties in municipality j, region r and year t; α_j are municipality fixed effects; β_t are year fixed effects; and X_{jrt} are time-varying controls which always include the natural log of population, to account for the scale effect since the dependent variable is measured as the number of attacks. Oil_{jr} is the oil production level in municipality j and region r during 1988; OP_t is the natural log of the international price of oil in year t; Cof_{jr} is the municipality-level hectares of land devoted to coffee production in 1997; and CP_t is the natural log of the internal coffee price in year t.[27] In equation (1), λ captures the differential effect of the oil price on violence in municipalities producing more oil and ρ measures the differential effect of the coffee price on violence in regions cultivating more coffee.[28]

We are interested in the oil terms and the coffee terms in Dube and Vagas' equation 1.

Oil_{jr} is a measure of the oil intensity of municipality j in region r and Cof_{jr} is a measure of the coffee intensity of municipality j in region r.

Multiply these by the prices of oil and coffee, OP_t and CP_t respectively, and you get a measure of the quantity of oil money and coffee money present in each municipality at each point in time.

The coefficient λ tells us how oil money translates into conflict and the ρ coefficient tells us how coffee money translates into conflict.

The following table gives the main results of the paper:

Table II
The Effect of the Coffee and Oil Shocks on Violence

Dependent variables:	(1) Guerrilla attacks	(2) Paramilitary attacks	(3) Clashes	(4) Casualties
Coffee int. x log coffee price	-0.611**	-0.160***	-0.712***	-1.828*
	(0.249)	(0.061)	(0.246)	(0.987)
Oil production x log oil price	0.700	0.726***	0.304	1.526
	(1.356)	(0.156)	(0.663)	(2.127)
Observations	17,604	17,604	17,604	17,604

Notes. Standard errors clustered at the department level are shown in parentheses. Variables not shown include municipality fixed effects, year fixed effects, log of population, and linear trends by region and municipalities cultivating coca in 1994. The interaction of the internal coffee price with coffee intensity is instrumented by the interaction of the coffee export volume of Brazil, Vietnam and Indonesia with rainfall, temperature, and the product of rainfall and temperature. *** is significant at the 1% level, ** is significant at the 5% level, * is significant at the 10% level.

The row labelled “Coffee int. X log coffee price” gives evidence for the opportunity cost effect.

You can see significant and negative effects for all the conflict measures, suggesting that higher coffee prices are associated with less conflict.

Dube and Vargas calculate that the fall in coffee prices between 1997 and 2003 translates into an additional 1013 deaths in coffee growing areas that would not have happened without these price drops – so the opportunity cost effect appears to be quantitatively large in addition to being statistically significant.

The row labelled “Oil production X log oil price” gives evidence for the rapacity effect which seems to apply only to the paramilitaries, judging from the fact that only the coefficient in the equation for paramilitary attacks comes out statistically significant.

The higher oil price is associated with more attacks for the paramilitaries, although it is not clear that these effects are very large at all.

Dube and Vargas also extend their results to cover other commodities besides coffee and oil.

The key generalizable characteristic of coffee for this analysis is that coffee is labour intensive.

The authors find similar patterns for other labour-intensive goods such as sugar, bananas, tobacco and palm.

That is, increases in the prices of labour-intensive commodities reduce conflict and vice versa.

Coal and gold are natural resources that have impacts on municipal budgets similar to the impact of oil.

And, reassuringly, the impacts of coal and gold prices on conflict intensity turn out to be similar to the impact oil prices on conflict intensity: higher prices cause more conflict and vice versa.

The table back on slide 17 showed a negative relationship between coffee and conflict but it does not show that *wages* behave in a manner consistent with the opportunity cost effect.

Similarly, the relationship between oil and conflict on slide 17 does not imply that higher oil prices lead to pools of money that can be stolen by the paramilitaries.

In other words, we have established statistical relations for coffee, oil and conflict that are consistent with the opportunity cost and rapacity effect stories but we have not yet seen evidence for the intermediate wage-based steps in the mechanisms that have been proposed to support these stories.

The following table fills in these gaps:

Table III
The Opportunity Cost and Rapacity Mechanisms

	(1)	(2)	(3)	(4)	(5)
	Opportunity cost mechanism		*Rapacity mechanism*		
Dependent variables:	Log wage	Log hours	Log capital revenue	Paramilitary political kidnappings	Guerrilla political kidnappings
Coffee int. x log coffee price	0.372*	0.287**	-0.787	0.022	-0.060
	(0.217)	(0.125)	(0.698)	(0.014)	(0.060)
Oil production x log oil price	1.229	0.078	0.419**	0.168***	-0.066
	(0.895)	(0.314)	(0.203)	(0.009)	(0.206)
Observations	26,050	57,743	11,559	16,626	16,626
Sample period	1998-2005	1998-2005	1988-2005	1988-2004	1988-2004

Notes. Standard errors clustered at the department level are shown in parentheses. In column (1), the dependent variable is the log of hourly wage, defined as the the individuals' earnings in the past month divided by hours of employment in the past month. In column (2), log hours refers to hours of employment during the past month. Variables not shown in all specifications include municipality fixed effects, year fixed effects, and linear trends by region and municipalities cultivating coca in 1994. Columns (1)-(2) also control for education, age, age squared, and indicators of gender and marital status. Columns (3)-(5) additionally control for log population. The interaction of the internal coffee price with coffee intensity is instrumented by the interaction of the coffee export volume of Brazil, Vietnam and Indonesia with rainfall, temperature, and the product of rainfall and temperature. *** is significant at the 1% level, ** is significant at the 5% level, * is significant at the 10% level.

We see that higher coffee prices are associated with higher wages and working hours.

Moreover, higher oil prices are associated with more municipal revenue (column 3) and more kidnapping of wealthy individuals by the paramilitaries.

The Dube and Vargas paper is a nice step forward for research on how the economy affects armed conflict.

However, we have to bear in mind that it is only about one country….we do not know the extent to which it might apply elsewhere.

The Bazzi and Blattman paper returns to the cross-country approach of Fearon-Laitin-Collier-Hoeffler but is still similar to the Dube and Vargas paper because it uses changes in commodity prices to analyse the impact of income on armed conflict.

The paper also clarifies some conceptual issues on the economics of armed conflict so let's take a look at this material before plunging into the empirical work.

Bazzi and Blattman distinguish between three main channels through which the economy could affect conflict:

1. Opportunity cost – In a weak economy people have poor opportunities to earn money in the legal economy so joining a rebel group may look like their best economic opportunity. If this is an important channel then poor economies should suffer more conflict than rich ones do.

2. State capacity – In a weak economy the State cannot raise much tax revenue so it is unable to do a good job of fighting against a rebellion. Again, weak economies suffer more conflict than strong ones do but for a different reason than the opportunity cost theory suggests.

3. State prize – Here the idea is that when the State is poor there is no incentive to rebel to overthrow the State because you receive a very small "prize" if you succeed since the State is so poor. This mechanism suggests that economic strength is associated with rebellion.

Another interesting thing that Blazzi and Blattman do is to distinguish between different kinds of conflict measurements.

1. Conflict onset

2. Conflict ending (sometimes known as “offset”)

3. Conflict intensity, i.e., the number of battle deaths

Many people mix these things together so this attention to detail is welcome.

For onset and ending they estimate the following two equations:

$$\text{(2a)} \qquad Onset_{it} = \alpha_{Oi} + \tau_{Ot} + \alpha_{Oi} \times t + \mathbf{S}_{it}\boldsymbol{\theta}_O + \mathbf{Z}_{it}\boldsymbol{\beta}_O + \varepsilon_{Oit}$$

$$\text{(2b)} \qquad Ending_{it} = \alpha_{Ei} + \tau_{Et} + \alpha_{Ei} \times t + \mathbf{S}_{it}\boldsymbol{\theta}_E + \mathbf{Z}_{it}\boldsymbol{\beta}_E + \varepsilon_{Eit}$$

where α_i and τ_t are country and year fixed effects, $\alpha_i \times t$ are country-specific time trends, $\mathbf{Z}_{it}$ is a vector of time-varying covariates, and ε_{it} is an idiosyncratic error term.[17] Coefficients in the dynamic model confirm that the simple conflict incidence

The S_{it} vectors are prices of various export commodities. These are the main variables of interest for Bazzi and Blattman.

The key idea is that increases in export prices are strongly correlated with increases in income which can be treated as largely exogenous to armed conflict.

The mass of insignificant coefficients on price shocks in the following table of results suggests that there is no connection between price shocks to exports and the onset of armed conflict (or coups):

TABLE 2—IMPACTS OF AGGREGATE EXPORT PRICE SHOCKS ON CONFLICT AND COUP ONSET

	Dependent variable: Indicator for onset							
	UCDP/PRIO Civil War data			Other Civil War datasets			Coups	
	Low (1)	High cum. (2)	High (3)	FL (4)	S (5)	COW (6)	Archigos (7)	PT (8)
Panel A. No consumption shocks								
Price shock, t	−0.0002	0.0019	0.0006	0.0006	−0.0008	0.0017	0.0012	0.0007
	(0.0025)	(0.0017)	(0.0015)	(0.0012)	(0.0014)	(0.0019)	(0.0024)	(0.0026)
Price shock, $t-1$	0.0051	0.0014	0.0003	−0.0005	−0.0007	0.0025	−0.0022	−0.0008
	(0.0033)	(0.0018)	(0.0012)	(0.0015)	(0.0016)	(0.0017)	(0.0032)	(0.0033)
Price shock, $t-2$	−0.0014	−0.0007	−0.0004	0.0011	−0.0012	0.0015	−0.0041	−0.0054
	(0.0027)	(0.0014)	(0.0011)	(0.0011)	(0.0016)	(0.0018)	(0.0022)*	(0.0032)*
Sum of all shocks	0.003	0.003	0.001	0.001	−0.003	0.006	−0.005	−0.005
p-value of sum	[0.527]	[0.395]	[0.836]	[0.600]	[0.433]	[0.115]	[0.315]	[0.276]
Impact of shocks on risk (%Δ)	0.082	0.118	0.028	0.067	−0.124	0.201	−0.106	−0.092
Observations	4,106	4,352	4,748	4,088	4,092	4,398	4,647	5,079
R^2	0.108	0.142	0.086	0.108	0.086	0.068	0.054	0.070
Number of countries	117	117	117	114	117	116	114	117
Mean of dependent variable	0.042	0.022	0.019	0.018	0.022	0.029	0.048	0.06

Notes: All regressions use a linear probability model and include year fixed effects, country fixed effects, and country-specific time trends. Robust standard errors in parentheses, clustered by country. All regressions in panel B

The next table provides some rather weak evidence (a few significant coefficients) that positive export price shocks help to end wars that have already started:

TABLE 4—IMPACTS OF AGGREGATE PRICE SHOCKS ON CONFLICT ENDING

	Dependent variable: Indicator for ending					
	UCDP/PRIO Civil War data			Other Civil War datasets		
	Low (1)	High cum. (2)	High (3)	FL (4)	S (5)	COW (6)
Panel A. No consumption shocks						
Price shock, t	0.0119	0.0284	0.0378	−0.0131	−0.0168	0.0644
	(0.0181)	(0.0184)	(0.0378)	(0.0180)	(0.0143)	(0.0287)**
Price shock, $t-1$	−0.0002	0.0310	−0.0155	−0.0085	0.0103	0.0650
	(0.0265)	(0.0211)	(0.0534)	(0.0141)	(0.0176)	(0.0338)*
Price shock, $t-2$	−0.0344	−0.0031	0.1060	−0.0112	−0.0194	0.0273
	(0.0264)	(0.0252)	(0.0428)**	(0.0148)	(0.0151)	(0.0403)
Sum of all shocks	−0.023	0.056	0.128	−0.033	−0.026	0.157
p-value of sum	[0.617]	[0.176]	[0.211]	[0.223]	[0.385]	[0.053]**
Impact of shocks on risk (%Δ)	−0.141	0.515	0.503	−0.554	−0.295	0.821
Observations	995	749	353	1,013	907	665
R^2	0.207	0.255	0.355	0.256	0.283	0.293
Number of countries	83	52	42	56	61	59
Mean of dependent variable	0.161	0.109	0.255	0.059	0.088	0.191

Note: All regressions use a linear probability model and include year fixed effects, country fixed effects, and country-specific.

The next table provides some rather weak evidence (a few significant coefficients) that positive export price shocks help to decrease (a lot) the number of battle deaths in ongoing wars:

TABLE 7—THE IMPACT OF AGGREGATED COMMODITY PRICE SHOCKS ON BATTLE DEATHS

	Dependent variable: No. of battle deaths			Dependent variable: ln(battle deaths)		
	Static (no lagged DV) (1)	Dynamic (with lagged DV) (2)	Omitting nonannual deaths data (3)	Static (4)	Dynamic (5)	Omitting nonannual deaths data (6)
Panel A. No consumption shocks						
Price shock, t	−377.2	−754.1	−437.6	−0.158	−0.203	−0.158
	(512.0)	(280.2)***	(315.5)	(0.112)	(0.076)***	(0.104)
Price shock, $t-1$	−50.7	436.7	205.3	−0.086	−0.027	−0.104
	(460.4)	(432.6)	(305.5)	(0.132)	(0.131)	(0.103)
Price shock, $t-2$	77.5	25.0	161.7	−0.134	−0.135	−0.089
	(604.5)	(395.1)	(559.7)	(0.152)	(0.124)	(0.143)
Duration	−66.1	−42.9	−14.9	0.007	0.009	0.012
	(50.8)	(26.5)	(19.4)	(0.015)	(0.013)	(0.015)
Indicator for first year of conflict	−2,508.5	422.4	540.4	−1.278	−0.923	−0.912
	(750.0)***	(649.1)	(511.1)	(0.205)***	(0.210)***	(0.251)***
Lagged battle deaths		0.736	0.909		0.0001	0.0001
		(0.138)***	(0.025)***		(0.0000)***	(0.0000)***
Sum of all shocks	−350.4	−292.4	−70.6	−0.378	−0.365	−0.351
p-value of sum	[0.813]	[0.731]	[0.942]	[0.303]	[0.210]	[0.228]
Impact of all shocks on risk (%Δ)	−0.068	−0.057	−0.018	−0.054	−0.052	−0.052
Observations	1,009	1,009	690	1,009	1,009	690
Mean of dependent variable	5,159	5,159	4,016	7.065	7.065	6.706
Number of countries	82	82	74	82	82	74

Notes: All regressions use a maximum likelihood interval regression model and include year and region fixed effects. Robust standard errors are clustered by country. All regressions in panel B also include interactions of

Bazzi and Blattman repeat the analysis for oil and mineral price shocks, again finding that positive shocks are associated with wars having fewer battle deaths and ending sooner but with coefficients that are often not significant at standard levels.

Thinking back to the mechanisms on slide 26 the authors draw some general conclusions:

1. The state prize idea gets no support at all.

2. The opportunity cost and state capacity ideas do get some support.