Oil Price Shocks and the Onset of Civil War

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Preliminary work.†

Abstract

This paper looks at the potential effects of price shocks of natural resources on the onset of civil war. I find that one-year oil price shocks are *not* related to the onset of civil war. Please note: this is preliminary work.

1 Introduction

Many large-N studies link natural resources − whether oil, gas, gemstones, nonfuel minerals, timber, agricultural commodities or illicit drugs − to the onset of civil war.[1] In their seminal article, Collier and Hoeffler (2004) argue that countries with high levels of natural resources − proxied by the value of primary commodity exports over GDP − face a higher risk of civil war than resource-poor states; a similar result is obtained in a recent update.[2] However, in another seminal article, Fearon and Laitin (2003) do not find a significant relationship between the value of primary commodity exports over GDP and civil war onset. They argue − together with De Soysa (2002) and Fearon (2005) − that oil-exporting states are more likely to suffer from civil wars.

The value of primary commodity exports over GDP − a relic from the resource curse literature − has been the most widely used measure to capture the notion of natural resources.[3] However, other measures have been used in the literature as well. Fearon and Laitin (2003) use a binary variable that takes a value of one when fuel exports exceed one-third of export revenues. De Soysa (2002) uses a binary variable that takes a value of one when an economy is dominated (50% and

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[1]See Ross (2004b) for an overview.

[2]Collier, Hoeffler, and Rohner (2009).

[3]The resource curse literature − dealing with the puzzling paradox suggesting that resource-rich countries tend to grow more slowly than resource-poor ones − was inspired by Sachs and Warner (1995), who made use of this proxy for natural resources. This measure, however, has been severely critized. Firstly, it doesn't include diamonds, gems, and drugs. It picks up mainly cashcrops (like coffee or wheat) and oil exports. Secondly, it is sensitive to changes in the size of the nonresource sector and the size of GDP. Thirdly, it fails to capture natural resources that are produced and consumed domestically, or exported illegally.

above) by revenues from oil exportation.[4] Fearon (2005) uses fuel exports as a percentage of total exports, and Humphreys (2005) makes use of the production levels of diamonds and oil, and the amount of proven oil reserves.

In contrast to these previous large-N studies this paper will not look directly at measures for the abundance or dependence of a country on natural resources. This paper will look at the effect of a shock in the price of these natural resources. This is for three reasons. Firstly, in general, price changes seem to be important. A vivid example are the riots that took place less than a year ago from Haiti to Bangladesh to Egypt over the soaring costs of basic foods. Secondly, the price of a country's natural resources can't be influenced by small − often developing − countries; changes in the international price level are exogenous shocks. Thirdly, while there exist many mechanisms of how natural resources can lead to civil war (as I will discuss below), none of them seem to provide a satisfactory answer to what triggers a civil war. I hypothesize that oil price shocks could explain the onset of civil war.

The paper is organized as follows. Section 2 will discuss the mechanism that have been proposed in the literature. Section 3, will discuss how fluctuations in the price of natural resources can lead to civil war. Section 4 and 5 will introduce the data and the estimating equation, respectively. Section 6 will give use results. I conclude in section 7. Section 8 − very important − discusses the changes that will be made to this paper.

2 Natural resources and civil war onset

A battery of different mechanisms on how natural resources can lead to the onset of civil war have been proposed in the literature. For example, Collier and Hoeffler (2004) argue that natural resources provide the funding for rebels in the prewar phase to cover the start-up costs of initiating a rebellion (mechanism [1.1] in table 1 below).[5] In strong contrast, Fearon and Laitin (2003) and Fearon (2005) argue that natural resources cause civil wars because oil producers have relatively lower state capabilities than one would expect given their level of income because the rulers have less need for a socially intrusive and elaborate bureaucratic system to raise revenues (mechanism [5.2]). In addition, they argue that oil makes state or regional control a tempting prize for rebels (mechanism [1.2]).

[4] De Soysa (2002), in addition, also makes use of a measure of total per capita stock of natural capital, which are renawable plus sub-soil assets. This measure is not significant.

[5] Collier and Hoeffler (2004) reject the possibility that natural resources lead to conflict through a grievance mechanism; mechanism [3] below.

Humphreys (2005) provides an overview of the different mechanisms that have been proposed in the literature. The six different mechanisms − three of which have different variants − are reproduced in table 1 below. By making use of finer natural resource data than has been used in the past, gathering and presenting new data on oil and diamonds production and oil stocks, Humphreys (2005) tries to empirically separate the different mechanisms. His results are reproduced in the table; where an * behind the mechanism's number indicates that he finds a significant relationship. The greedy rebel, the grievance, the weak state, and the sparse network mechanisms seem to be of importance. Humphreys (2005), however, is unable to separate between its different variants. For completeness, the results of Ross (2004a) − another seminal study that, in contrast to a large-N approach, took a case study-based approach − are also reproduced. By looking at thirteen cases, Ross (2004a) tries to find which of six possible mechanisms (mechanisms [1.1], [1.3], [2], [3.3], [4], [5.2] in the table) are important for the onset of civil war; three of which he finds to be significant. For a complete discussion on each mechanism please see Humphreys (2005).

Table 1. Mechanisms proposed in the literature

[1.]* Greedy rebel mechanisms:	.
[1.1] quasi-criminal activities;	Ross
[1.2] the prize to capture the state;	.
[1.3] secession.	Ross*
[2.] Greedy outside mechanism: foreign (state or corporation) intervention.	Ross*
[3.]* Grievance mechanisms:	.
[3.1] increase in inequality as part of the development progress;	.
[3.2] terms of trade shocks;	.
[3.3] process of extraction may result in grievances;	Ross
[3.4] more unjustly distributed than other wealth.	.
[4.] Feasibility mechanism: future contracts for resource booty.	Ross*
[5.]* Weak state mechanisms:	.
[5.1] less taxes and therefore less control over the government;	.
[5.2] lack of state capacity.	Ross
[6.]* Sparse network mechanism: absence of a dense trade networks.	.

Note: Mechanism [1.1] is proposed by Collier and Hoeffler (2004). Mechanisms [1.2] and [5.2] are proposed by Fearon and Laitin (2003) and Fearon (2005).

3 Price shocks and civil war onset

The six mechanisms discussed in the previous section each indicate how a country's dependence on or abundance of natural resources could lead to civil war. However, while each of these discuss the possible roots of a civil war, they do not indicate what triggers a civil war. For example, Collier and Hoeffler (2004) − mechanism [1.1] − argue that natural resources provide rebels with the funds to cover the start up costs of a civil war. However, this mechanism does not answer the question: Why would we see a civil war from one year to the next? It is unlikely that a rebel leader "just" wakes up one morning and starts a rebellion. For example, mechanism [1.3], which Ross (2004a) argues to be an important mechanism, argues that natural resources give people the need to secede. However, again, why would this lead to a civil war from one day to the next? For example, Fearon and Laitin (2003) propose mechanism [5.2], which argues that natural resources lead to a weaker state and therefore leads to civil war. Again, why would we see a civil war from one year to the next? One could ask similar questions for the other mechanisms. This paper will investigate whether the possible answer to these questions is: a sudden change in the price of the natural resources in question.

Let me give one more illustration. There were multiple roots for the First World War: Austro-Hungaria was determined to impose its will upon the Balkans; Germany had a desire for greater power and international influence, which sparked a naval arms race with Britain; France had a desire for revenge against Germany following its disastrous defeat and the lost of Alsace and Lorraine in the 1870-1871 war; Russia wanted to restore its national prestige after almost a decade of civil strife and a battering at the hands of the Japanese military in 1905. In a similar way a country's dependence on or abundance of natural resources can be seen as roots for a potential civil war. However, each of the mentioned roots doesn't say what triggered the First World War, which was the assassination of Archduke Franz Ferdinand − heir to the Austro-Hungarian throne − in Sarajevo on 28 June 1914. This is important, because while assassinations of Heads of State are not a common occurrence, price fluctuations of natural resources are. This paper asks whether periods in which Heads of States are assassinated (i.e. periods in which there is a sudden rise or decrease in the price of a natural resource) also have a higher likelihood to see the start a First World War (i.e. civil wars). This is an important question knowing that many countries are too small to influence the international price level of their own natural resources, and therefore have to take the international price as given. *[PW: Change this to a civil war illustration.]*

There is obviously more than one mechanism how a sudden price change can lead to a civil war from one year to the next. I propose five mechanisms below; many of them resemble the

mechanisms discussed in table 1. To separate between the two groups of mechanisms, I indicate the mechanisms in this section with a letter (A to E).

3.1 Mechanism A: greedy rebel

Mechanism A.1 (Start-up): An increase in the price of a natural resources could make the financing for a war by rebel groups easier from one year to the next.[6] For this mechanism to hold the rebel group should already have access to the natural resources, should be able to extract it, and should be able to sell it on the domestic/international/black market. It is likely that this condition is only satisfied for particular types of natural resources, such as alluvial diamonds that are easy to extract. Natural resources such as oil and primary diamonds are difficult to extract and need substantial amounts of investment in order to do so. This mechanism is most relevant for countries with natural resources.

Mechanism A.2 (Capture): An increase in the price of natural resources could make it more profitable to capture the state.[7] Again, this is likely to be more important for particular types of natural resources, such as oil and primary diamonds. That is, natural resources for which large investments are necessary for extraction.[8] For natural resources that do not need large amounts of investment this mechanism seems less important; why would a rebel group go through the trouble of capturing the state if the only thing that they have to capture are the places where the natural resources are to be found? Also this mechanism seems only relevant for countries with natural resources.

Mechanism A.3 (Secession): An increase in the price of natural resources could make secession more beneficial from one day to the next and therefore make civil war is more likely. This mechanism only holds when the area that wants to secceed has a large amount of natural resources and is able to exploit the resources without the central government. This mechanism is only relevant for countries with natural resources.

3.2 Mechanism B: greedy outsider

A sudden increase in the price of natural resources can make foreigners − companies and/ or governments − more interested in profiting from a country's natural resources, making civil war more likely. Examples are abound. In two recent books, for example, Prunier (2009) and Turner (2008) discuss how foreign countries benefited from the 1996 and the 1998 war in the Democratic

[6] See, for example, Collier and Hoeffler (2004).
[7] In a recent paper, Dube and Vargas (2008) find evidence for this "rapacity effect" for the oil sector in Colombia.
[8] Capturing the government gives access to public finances, legitimacy that attracts foreign investment, etc.

Republic of Congo. As Turner (2008, 24) notes: "'During both wars, vast quantities of Congo's wealth flowed across its borders, into Rwanda, Uganda, Angola, Zimbabwe and other countries."[9] This mechanism is only relevant for countries with natural resources.

3.3 Mechanism C: grievances

Mechanism C.1 (Welfare): A sudden increase in the price of a natural resource provides the government with more public finances, making it possible to provide more services and/or resources to bride (potential) rebel leaders. Grievances and civil war are therefore less likely. An interesting discussion is given in Dunning (2008) for Venezuela. In addition, these additional revenues may lead to a higher level of wage and thereby increasing the opportunity cost of rebelling and thereby decreasing the probability of war.[10] However, this effect on civil war onset is unlikely to be the case for countries without natural resources. In these countries it is likely that an increase in the price of a natural resources, if it is imported, leads to the increase of the domestic level of inflation and thereby causing grievances. The riots that took place less than a year ago from Haiti to Bangladesh to Egypt over the soaring costs of basic foods − while not natural resources − is a good illustration.

Mechanism C.2 (Production): Secondly, an increase in the price of natural resource could lead to a sudden increase in the production of that natural resource, which could lead to more grievances making civil war more likely. Also this mechanism is only relevant for countries with natural resources.

Mechanism C.3 (Inequality): An increase in the price of natural resources can emphasize and highlight existing levels of grievances. For example, a price shock could lead to relatively more benefits going to the rich, thereby increasing grievances among the poor and the potential for civil wars.[11] Consider the case of Nigeria, where, in the words of Bill Dudley (1982, 92) "[T]he oil boom was a disaster..." because "[T]he effect of the oil boom was to convert the military political decision-makes ... into a new property-owning, rentier class working in close and direct collaboration with foreign business interests with the sole aim of expropriating the surpluses derived from oil for their private and personal benefit (Dudley, 1982, 116).[12] This mechanism is only important for countries with natural resources.

[9] Note that this illustration only indicates what happened during the two wars, not why the war started.

[10] In a recent paper, Dube and Vargas (2008) find evidence for this "opportunity cost effect" for the coffee sector in Colombia.

[11] It is often argued that greater economic inequality creates broad grievances that favor civil conflict (see, for example, Muller 1985)

[12] From Bates (2008, 28).

3.4 Mechanism D: feasibility

As discussed in Ross (2004a), an increase in the price of natural resource makes it easier for rebel groups to give out future contracts for resource booty; thereby increasing triggering a civil war. This mechanism is only important for countries with natural resources.

3.5 Mechanism E: the state

An increase in the price of natural resource could provide the government with more revenues, thereby providing it with more resources. With these additional resources the government can have a potentially stronger military; making civil wars less likely. This mechanism only holds for countries with natural resources. The effect of a price shock can also work indirectly, and in the opposite direction. Bates (2008), for example, argues that in the 1970s the sharp increase in the oil price triggered a global recession, which resulted in lower demand for Africa's exports by the developed world. Because taxes on trade constitute one of the most important sources of public revenue African government saw their public finances shrink. Bates (2008) argues that elites are then more likely to prey upon its people.

Table 2. Mechanisms and expected effects

	∂(onset)/∂(positive price shock) for	
	resource-rich	resource-poor countries
[A.] Greedy rebel mechanisms:		
[A.1] start-up;	+	.
[A.2] capture;	+	.
[A.3] secession.	+	.
[B.] Greedy outsider mechanism.	+	.
[C.] Grievance mechanisms:		
[C.1] welfare;	+	−
[C.2] production;	+	.
[C.3] inequality;	+	.
[D.] Feasibility mechanism.	+	.
[E.] The state mechanism.	+/−	−

It is, as a result, understandable to expect a relationship between price fluctuations of natural resources and the onset of civil war. The above discussed mechanisms are summarized in table 2 above. For now I do not ask myself which of the mechanisms is most likely, this paper will try to

find whether such a relationship indeed exists. That is, this paper will try to figure out whether or not a sudden change in the price of natural resources triggers a civil war. In addition, it is likely that different types of price fluctuations have different effects in different environments; I will discuss that next − together with the rest of the data.

4 Data and variables

This paper will focus solely on oil as the type of natural resource. The reason for this is fourfold. Firstly, there is data on oil prices. Secondly, the price of oil fluctuates much over time. Thirdly, there are a lot of countries that produce oil and/or have oil reserves. Finally, if there is one type of natural resource that seems to have an influence on the onset of civil wars, it seems to be oil. While Collier and Hoeffler (2004) argue that natural resources in general lead to more civil war; they actually mainly look at cash crops and oil. Fearon and Laitin (2003), De Soysa (2002) and Fearon (2005) find significant results only for oil. In addition, also a case-based study approach seems to find a significant relationship between oil and civil war onset. Ross (2004a, 61), for example, argues that: "while oil, nonfuel minerals, and illicit drugs appear to influence conflict, other types of primary commodities − notably legal agricultural commodities − seem to be unrelated to civil war, at least in these thirteen cases." It is therefore a good starting point to look at oil as the type of natural resource to see whether price fluctuations have an influence on the onset of civil war.

This paper builds on previous work by Fearon and Laitin (2003). The data includes 161 countries that had a population of at least half a million in 1990. The data for most countries spans the period 1945 to 1999.[13] The dependent variable in this paper is civil war onset, which is given by the variable $ONSET_{it}$. The variable is "1" for all country-years in which a civil war started and "0" for all others. Fearon and Laitin (2003) identify 114 conflicts for the 1945-1999 period that meet criteria similar to those stated by the Correlates of War (COW) project.[14] In addition to the dependent variable, the control variables in this paper are the same as the ones used by Fearon and Laitin (2003).[15] What this paper does it to add a number of independent variables that proxy for oil price shocks, and the different environments in which these price shocks can take place. The estimations, which are described in the next section, make use of the following additional cross-sectional time series.[16]

[13]The dataset used by Fearon and Laitin (2003) can be found at: http://www.stanford.edu/group/ethnic/. The additional variables that this paper makes use of can be found at http://www.petervanderwindt.eu/oilprice.htm.

[14]Actually Fearon and Laitin (2003) identify 127 civil wars. The reason is that their data differs from the COW in one significant way: 13 anti-colonial wars are included. Similar to Fearon and Laitin (2003) I will exclude these 13 wars from my main regressions.

[15]To be precise, the regressions given in this paper build upon model 1 of Fearon and Laitin (2003, 84). The control variables are: prior war, per capita income, log(population), log(% mountainous), noncontiguous state, oil exporter, new state, instability, democracy, ethnic fractionalization, and religious fractionalization.

[16]In the appendix the descriptive statistics are given of these additional variables.

4.1 Different types of price fluctuations

- The change in the price of oil is given by: $CHANGE1_t$, where t is the time indicator. It is the percentage increase in price from period t-1 to period t. In other words, $\Delta_t = (100 * P_t/P_{t-1}) - 100$, where P_t is the international dollar price of a barrel of oil at period t. The data for P_t has been obtained from the IMF's International Financial Statistics database.[17] For illustrative purposes, the top figure in figure 1 below gives the change in the oil price from period t-1 to t − i.e. Δ_t − and the number of civil war onsets for all 114 civil war.

- The previous variable has only the subscript t, because all countries face the same international price of oil. However, it is likely that what matters for the onset of a civil war is the change in the domestic price level of oil. From the IMF's International Financial Statistics database I obtain exchange rate data for our 161 countries and compute the variable:[18] Δ_{it}. $\Delta_{it} = (100 * P'_{it}/P'_{it-1}) - 100$, where P'_{it} is the international price of a barrel of oil in domestic prices. That is, $P'_{it} = P_{it} * E_{it}$, where E_{it} is the exchange rate.[19] An increase in Δ_{it} indicates that oil becomes worth more *at home*, and can occur for two reasons. Firstly, an increase in the international price of oil (in dollars). Secondly, a depreciation of a country's currency.

4.2 Different environments where these price fluctuations occur

It is also likely that oil price shocks have different effects in different environments. As an analogy, think of the influence of a fertilizer, say nitrate, on the growth of wheat.[20] Everybody knows that wheat plants grow bigger in the presence of nitrate than in its absence. But nobody would be so foolish as to claim that, on its own, nitrate can make a wheat plant. Seed, soil, sun, water, and various minerals are obviously all necessary as well. But if all these other factors are held constant,

[17] For completeness, P_t indicates the UK Brent spot price average for December for period t; series 11276AAZZF... in the IMF's International Financial Statistics database. I obtain 5,699 observations. Consequently, Δ_t indicates the percentage change in the dollar price from December in period t-1 to December in period t. Important: Data on oil prices are given as an average over a period: either a year (data starting in 1948) or a month (data starting in 1957). Both, however, are suboptimal. For example. If in year t-1 the price per barrel falls from \$100 to \$50 and then in year t goes up again from \$50 to a \$100, the $Delta_t$ variable will indicate no change in the price of oil when measured as yearly averages. Similarly, if within a year the price of a barrel falls from \$100 to \$50 and then increases again to \$100, the Δ_t variable will indicate no change in the price of oil when measured as December averages. As a robustness check, the regressions will also be run with yearly average oil price levels in updated versions of the paper.

[18] There is no data on exchange rates in the IMF's IFS for Cuba, Ecuador, East Germany, Czechoslovakia, Yugoslavia, Russia before 1992, Somalia, Libya, Yemen ar, Yemen pe, Turkmenistan, Uzbekistan, Taiwan, and North Korea. By making use of DATASTREAM, however, I was able to add: Ecuador from 1987-1999 and Taiwan from 1986-1999. This is data from the GTIS - FTID via DATASTREAM. In total I have 5,584 observations. For completeness, in the IMF's IFS the UK, Ireland, Jordan, Kuwait, Bahrain, Australia and New Zealand are indicated as USDs per national currency; while all other countries are indicated as national currency per USDs. I made adjustments accordingly.

[19] For example, if i is the United Kingdom, $E_{it} = 0.5$ indicates that one needs only half a Pound to buy a Dollar (or two Dollars to buy one Pound).

[20] I took this illustration from Dawkins (2006).

and even if they are allowed to vary within limits, addition of nitrate will make the wheat plants grow bigger. The effect of a price shock depends on its environment, comparable to temperature, food, predators, or companions. Sometimes a price shock has one effect in one environment, and a completely different effect in the presence of another set of companion genes. In this subsection I provide two types of environments − additional types of environments will be included in updated versions of this paper.[21]

- It is likely that a shock in the price of oil only increases the likelihood of civil war for countries that actually have oil in the ground. I therefore create the dummy variable RES_i for countries that have proven oil reserves as indicated in the PennWell Corporation's Oil & Gas Journal, World Proved Crude Oil Reserves, January 1, 1980 - January 1, 2009 Estimates.[22] For illustrative purposes, the bottom figure in figure 1 below gives the change in the oil price from period t-1 to t − i.e. Δ_t − and the number of civil war onsets for the 74 civil wars that took place in countries that have $RES_i = 1$.

- It is likely that a shock in the price of oil only increases the likelihood of civil war for countries where the government is very dependent on oil revenues. Therefore I use a binary variable that takes a value of one when fuel exports exceed one-third of export revenues − indeed the Fearon and Laitin (2003) variable that I discussed before. I denote this variable as DEP_{it}.

5 Econometric specification

After having introduced the variables, I am ready to estimate whether an oil price shock as an effect on civil war onset, and whether this effect is different in different environments. Our dependent variable, consequently, will be $ONSET_{it}$. Because this is a binary variable a linear regression model is inappropriate.[23] I therefore make use of a binary choice model and derive our results from a latent variable model[24] that is given by

$$ONSET^*_{it} = \alpha_1 \Delta + \beta \mathbf{Y} + \gamma \mathbf{Z} \tag{1}$$

[21] See section 8.

[22] Countries that were indicated as not having oil reserves were doublechecked with the CIA World Factbook on whether they really do not have proven oil reserves. I did not make use of the BP Statistical Review of World Energy/BP Statistical Review of the World Oil Industry. The latter does not separately report information on proven oil reserves for a large number of countries: Barbados, Bolivia, Chile, Cuba, Guatemala, Suriname, Albania, Austria, Bulgaria, Croatia, Czech Republic, France, Germany, Greece, Hungary, Netherlands, Poland, Serbia, Slovakia, Spain, Turkey, Belarus, Georgia,Kyrgyzstan, Lithuania, Tajikistan, Ukraine, Bahrain, Israel, Jordan, Benin, Cameroon, Congo (Kinshasa), Ivory Coast, Ethiopia, Ghana, Morocco, South Africa, Bangladesh, Burma (Myanmar), Japan, New Zealand, Pakistan, Papua New Guinea, Philippines, Taiwan. For now this variable does only change across countries; I will change this also to change across time. The variable will then be denoted as RES_i.

[23] Because $ONSET_{it}$ has only two outcomes (0 or 1), the error term has only two possible outcomes. The variance of the error term is therefore not constant but dependent upon the explanatory variables.

[24] For completeness, that is $ONSET_{it} = 1$ if $ONSET^*_{it} > 0$, and $ONSET_{it} = 0$ otherwise.

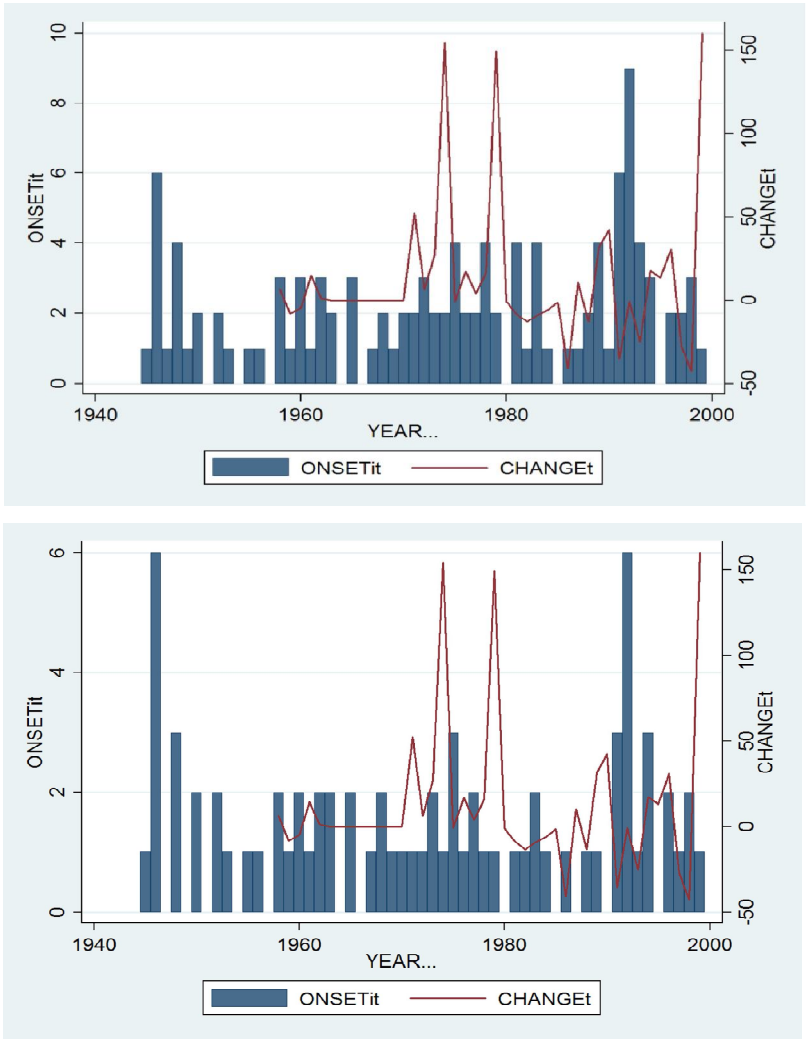

Figure 1: Yearly oil-fluctuations and civil war onset.

where, first of all, **Z** includes the Fearon and Laitin (2003) model, including a constant and error term. X is one of two types of oil price shock, depending on the regression that is run. From subsection 4.1 we have that Δ is either Δ or Δ. Y includes the interactions terms of the price shock variable. It is here that we will also introduce the different environments − as discussed in subsection 4.2− in which price shocks can take place. Consequently, β and γ are vectors with estimators. I follow Fearon and Laitin (2003) and assume a logistic distribution for the error term; that is, I make use of a logit model.[25] The method of maximum likelihood is used to estimate the results. The results are given in the next section.

6 Results

In this section I will give the results of the regressions. First I will look at the direct effect of the oil price shocks on civil war onset. Then I will discuss causality and check my results for robustness. Finally, I will include the different environments in which price shocks can take place.

6.1 Direct effects of an oil price shock

For completeness I first run the model 1 of Fearon and Laitin (2003, 84); this is our baseline model. The results are given in regression 1 in table 4 in the appendix. I then ran two additional regression. One in which Δ_t is included and one in which Δ_{it} is included.[26] The results are given in regression 2 and 3 in table 4 in the appendix, respectively. For illustrative purposed I reproduce the results for regression 3 below in whiskerplots − the results for regression 2 look similar.

While a change in the international price of oil (Δ_t) is not significant, a change in the *domestic price* of oil (Δ_{it}) is significant. This is, however, only clear from table 4 in the appendix. All of the variables that were in the Fearon and Laitin (2003) model − our baseline model − remain similar. However, as we discussed above a change in the domestic price level of oil can occur for two reasons: 1. An increase in the international price level, and/or 2. a depreciation of the exchange rate with regards to the Dollar. Because Δ_t is not significant we expect the latter to be the case here. To check this I run another regression − regression 4 in table 4 in the appendix − that separately adds the change in the international price level, the change in the exchange rate ($ER\Delta_{it}$) and an interaction between both to our baseline model. I obtain that it is indeed the change in exchange rate that is significantly related to civil war onset, and not the change in the price level.[27]

[25] Both a standard normal distribution and a standard logistic one have an expectation of zero, while the latter has a variance of $\pi^2/3$ instead of 1. The two distribution functions are very similar if one corrects for this difference in scaling. The logistic distribution, however, has slightly heavier tails.

[26] Note that I interact these variables in these − and all upcoming regressions − with Fearon and Laitin (2003)'s variable "Prior war". The reason for this is that it is (very!) likely that a price shock has different effects for countries that are already in war and those that are not.

[27] This results hold for different specifications of the model.

How does this result relate to our story regarding oil price shocks and civil war onset? The mechanisms still holds, but just for a change in the domestic price level. *[PW: Discuss this in more detail.]*

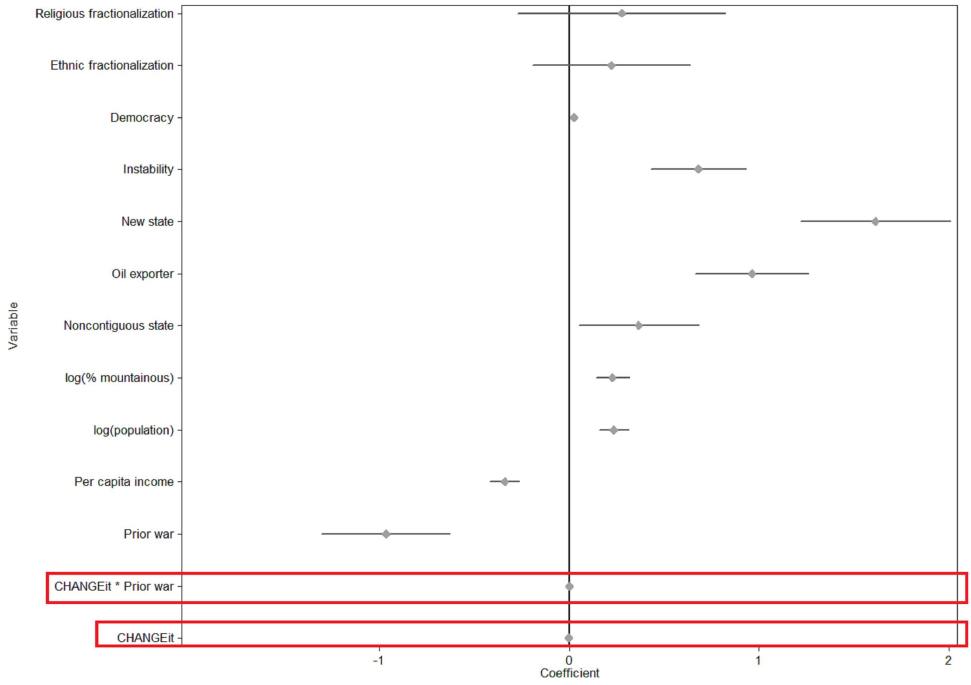

Figure 2: Price shocks and the probability of war onset.

6.2 Robustness

While we have some evidence that the exchange rate is significantly related to civil war onset, we still do not know which way the causality runs. It makes intuitive sense that a significant depreciation leads to a civil war − for example because of the influence it has on the domestic price of natural resources. On the other hand, it is also intuitively appealing to think that a civil war leads to a depreciation. That is, it is intuitively possible that the causality runs the other way. With our current measures it is difficult to sparse out which of the two holds because our variables for change measure the change from December in period t-1 to December in period t, while our variable for onset is whether a civil war started in period t. To at least partially look at this, we run regression 3 again, but now including a one-year lag (Δ_{it-1}). If a domestic price

shock causes a the onset of civil in a future period we expect this variable to be positive and significant. The result is given in regression 5 in table 5 in the appendix. While the coefficient for the lagged variables Δ_{it-1} is positive, it is not significant indicating that a change in the price level from December in period t-2 to December in period t-1 does not cause a civil war in period t.[28]

Figure 3 gives the probability for the onset of civil war for different values of Δ_{it}. It is clear from the figure that something strange is going on; it seems likely that the result is driven by a few outliers. Returning to the data this observation seems to be correct. Out of the 4915 observations for Δ_{it} only 17 of them are over 2,000 percent.[29] As a robustness check I therefore rerun regression 3 excluding the observations for which $\Delta_{it} > 2,000$. The results are given in regression 6 in table 5 in the appendix. While a change a domestic price shock still seems to have a positive effect on the onset of civil war its significance is gone. The bottom figure in figure 3 gives the simulation again. Indeed, the effect of an oil price shock on the onset of civil war is extremely small. Taking 2,000 as the cutoff value seems − and is − arbitrary. However, similar results are obtained if one takes any other value.[30]

6.3 Different environments

Finally, I ran regression 3 by including the two different environments that were discussed in section 4.2. That is, by making use of variable RES_i, I ran a regression that separates countries with oil reserves from countries without oil reserves. The results are given in regression 7 in table 5 in the appendix. In addition, by making use of variable RES_i, I ran a regression that separates countries that are dependent on oil revenues from countries that are not. The results are given in regression 8 in table 5 in the appendix. We do not obtain shockingly new results.

7 Conclusion

This paper looked at the potential effects of shocks in the price of natural resources on the onset of civil war; this is in contrast to previous large-N studies that solely look at the abundance or dependence of a country on natural resources. Theoretically there are reasons why we should expect that a sudden shock in the price of a country's natural resource could trigger a civil war from one year to the next. By looking at the yearly change in the price of oil, I do not find evidence that an oil price shock leads to civil war.

[28] Running the same regression but completely excluding Δ_{it} gives the same results. Also, if I only look at the lag of exchange rate change (so erchange, erchange*prior war, and prior war) also gives insignificant results.

[29] In updated versions of this paper I will look at these outliers in more detail. Providing figures and discussions for each.

[30] For example, taking 1,000 (500) [200] deletes another 19 (42) [126] observations and give similar.

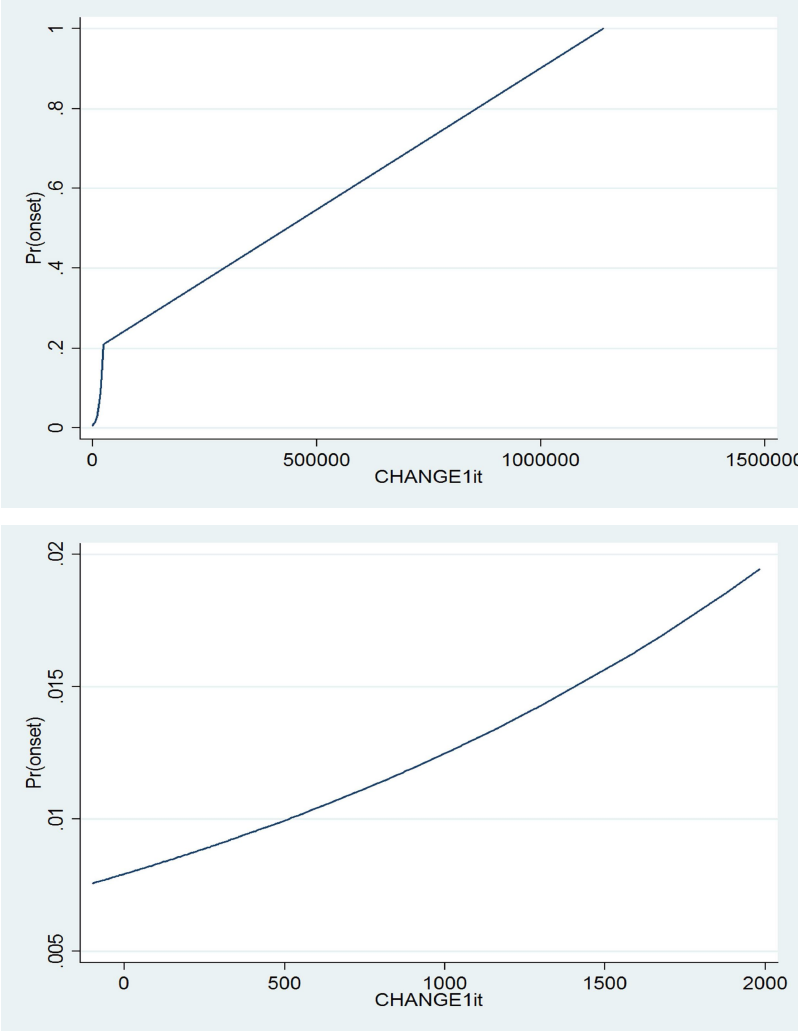

Figure 3: Price shocks and the probability of war onset.

8 Discussion

As was clear throughout the paper, this is work in progress. In upcoming weeks the following changes will be made/ points will be added:

- More literature will be taken up in section 3, and the mechanisms will be discussed in more detail. At the moment I am reading Karl (1997) and Dunning (2008).
- Section 4.1 will be richer. That is, I will include different types of price fluctuations. That is, I will not only look at the change in price over a one-year period, but also over two, three-, four- and five-year periods;
- Also, section 4.2 will be richer. That is, I will add additional environments in which these price fluctuations occur. At a minimum, I will also include the following variables: poverty, inequality, the amount of oil reserves, and the amount of oil production, and political regime;
- Several additional robustness checks will be included. For example, I will collect additional data so that instead of only looking at the change from December t-1 to December t, I also run the regressions with changes that are based on the change from period t-1's average to period t's average. Also, I will take another dataset − Collier, Hoeffler and Rohner (2009) − and see whether the same results appear;
- Importantly, a more microlevel discussion will be included. While data is difficult to obtain it would be interesting to look at the daily levels of oil prices, exchange rates, and civil war onset.
- I took 17 countries to be outliers; that is, with $\Delta_{it} > 2,000$. In the next update I will provide figures and a discussion for each of these outliers. Why are they outliers? What happened there?
- Several case studies will be included. Nigeria (2004), Venezuela 1970s, and Irak-Kuwait (1990-92) seem to be interesting cases;
- The latter brings me to the fact that it would be interesting to include dependent variables different than civil wars. It is likely that some mechanism will lead to riots, but not to civil war. A first step in this direction would be to look at the PRIO dataset for civil war onset, instead of the COW dataset. The first has a less demanding definition for civil war;
- Because it is likely that an oil price shock will lead to war − that is, decrease the period of peace − it would be interesting to run a few duration models;

- For future work it is important to see which of the mechanisms discussed in this paper (mechanism A-E) are of importance. It is for example, likely that no result is found because these mechanisms offset each other;
- It will be important to look at elasticities; some countries are able to influence the international price level of oil, while others are not;
- Is the oil sector nationalized? This is an important question. If much of the revenues from a price shock goes to international oil companies instead of the government many of the discussed mechanisms may not be at work;
- Oil is often sold for years in advance by governments. How does this influence my results?

9 Appendix

9.1 Data description

TABLE 3.Descriptive statistics

Name	Obs.	Mean	St. Dev.	Min.	Max.
Δ_t	5612	12.7153	45.3225	-42.6901	160
Δ_{it}	4893	32.3223	111.7167	-99.84	1982.96
$ER\Delta_{it}$	4893	18.6983	94.0990	-99.9395	1638.61
RES_i	6610	.6079	.4883	0	1
DEP_{it}	6610	.1295	.3357	0	1

Note: Descriptive statistics for $\Delta_{it}$and $ER\Delta_{it}$are taken for values less than 2,000.

9.2 Estimation results

TABLE 4. Estimates of civil war onset.

	Dependent variable: $ONSET_{it}$			
Regression:	1	2	3	4
Δ_t		-.0018558		-0.0003927
		(0.00304)		(0.003058)
Δ_{it}			0.000151**	
			(0.0000645)	
ΔER_{it}				0.0001609**
				(0.0000691)
Δ_t * Prior war		-.0013001		.0000652
		(.0078518)		(.0073436)
Δ_{it} * Prior war			-.0007445	
			(0.0015466)	
ΔER_{it} * Prior war				-.0006113
				(.0014323)
Δ_t* $ER\Delta_{it}$				-2.77e-06
				(8.16e-06)
Prior war	-0.954***	-0.966***	-0.839**	-.846**
	(0.314)	(0.338)	(0.358)	(.363)
Per capita income	-0.344***	-0.341***	-0.284***	-.282***
	(0.718)	(0.077)	(0.077)	(.077)
log(population)	0.263***	0.236***	0.232***	.234***
	(0.073)	(0.078)	(0.084)	(.084)
log(% mountainous)	0.219**	0.229***	0.222***	.222**
	(0.085)	(0.089)	(0.097)	(.097)
Noncontiguous state	0.443	0.367	0.281	.274
	(0.274)	(0.314)	(0.355)	(.355)
Oil exporter	0.858***	0.963***	0.788***	.778**
	(0.274)	(0.299)	(0.352)	(.354)
New state	1.709***	1.614***	0.809	.785
	(0.339)	(0.393)	(0.778)	(.794)
Instability	0.618***	0.681**	0.684***	.679**
	(0.235)	(0.251)	(0.267)	(.267)
Democracy	0.021	0.026	0.031	.031
	(0.017)	(0.018)	(0.020)	(.020)
Ethnic fractionalization	0.166	0.223	0.435	.428
	(0.373)	(0.414)	(0.470)	(.470)
Religious fractionalization	0.285	0.274	0.797	.812
	(0.509)	(0.545)	(0.622)	(.622)
Constant	-6.731***	-6.434***	-6.823***	-6.833***
	(0.736)	(0.791)	(0.885)	(.885)
# Observations	6327	5430	4790	4791
psuedo-R^2	0.1080	0.1027	0.0935	0.0940

Notes: ***(**)[*] significant at the 1% (5%) [10%] significance level. Standard errors in parentheses. The dependent variable is coded "1" for country years in which a civil war began and "0" in all others. Regression 1 refers to model 1 on page 84 in Fearon and Laitin (2003).

Table 5. Estimates of civil war onset.

	Dependent variable: $ONSET_{it}$			
Regression:	5	6	7	8
Δ_{it}	-0.000073	.000458	.002874*	.0006679
	(0.0003016)	(.0007578)	(.0016572)	(.0008006)
Δ_{it-1}	-0.0002395			
	(0.0005106)			
Δ_{it}* Prior war	-0.0004685	-.0009801	-.0114921	-.0020513
	(0.0014839)	(.0020277)	(.0157225)	(.0048696)
RES_i			-.2306155	
			(.3449482)	
DEP_{it}				.6952427
				(.4290711)
RES_i* Prior war			.0398008	
			(.8722738)	
DEP_{it}* Prior war				.9232464
				(.8023511)
Δ_{it}* RES_i			-.0028792	
			(.0019527)	
Δ_{it}* DEP_{it}				-.0009677
				(.0020839)
Δ_{it}* Prior war * RES_i			.011184	
			(.0158443)	
Δ_{it}* Prior war * DEP_{it}				.0016832
				(.0055762)
Prior war	-0.908**	-.861**	-.826	-1.042**
	(0.361)	(.363)	(.762)	(.433)
Per capita income	-0.308***	-.295***	-.273***	-.292***
	(0.081)	(.079)	(.079)	(.078)
log(population)	0.231***	.225***	.272***	.234***
	(0.086)	(.084)	(.098)	(.085)
log(% mountainous)	0.242**	.244**	.244**	.249**
	(0.100)	(.098)	(.099)	(.099)
Noncontiguous state	0.331	.284	.279	.174
	(0.358)	(.356)	(.364)	(.369)
Oil exporter	0.925***	.860**	.965***	
	(0.354)	(.352)	(.370)	
New state		.217	.295	.182
		(1.035)	(1.036)	(1.033)
Instability	0.763***	.715***	.745***	.727***
	(0.267)	(.266)	(.268)	(.266)
Democracy	0.038*	.034*	.032	.038*
	(0.020)	(.0204)	(.020)	(.021)
Ethnic fractionalization	0.512	.447	.462	.471
	(0.481)	(.471)	(.472)	(.474)
Religious fractionalization	0.685	.897	.875	.901
	(0.632)	(.626)	(.634)	(.627)
Constant	-6.807***	-6.860***	-7.268***	-6.934***
	(0.903)	(.892)	(.956)	(.897)
# Observations	4648	4774	4774	4774
psuedo-R^2	0.0963	0.0919	0.0965	0.0944

Notes: ***(**)[*] significant at the 1% (5%) [10%] significance level. Standard errors in parentheses. The dependent variable is coded "1" for country years in which a civil war began and "0" in all others.

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