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Title thesis: The Effect of Cocoa Prices on Civil
Violence in Africa

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Abstract

This paper argues that cocoa price fluctuations have enough explanatory power over civil violence conflicts in 9 African countries. The methodology comprises lagged prices as an instrument variable for the regression. There are two main findings 1. An increase in world cocoa prices decreases the number of civil violence events and fatalities per month. 2. An increase in export cocoa prices also decreases the number of civil violence events by a smaller magnitude. I highlight that adverse conditions along the cocoa value chain can cause people to become so dependent on the prices that it can dictate a country's political stability.

1. Introduction

Most of us enjoy the occasional guilty treat of a delicious chocolate bar. Chocolate is a luxury available to us all over the world. But do we know what the implications are of eating that treat? What does it look like for the other side of the coin?

This paper looks at the shortcomings of cocoa production in Africa, through the implications of cocoa price changes on civil violence conflicts. It can sound counterintuitive that prices affect the violence in a country. However, when a country's GDP becomes so reliant on one commodity, people's livelihoods depend on those prices. If they fall short or rise too high, they are likely to cause grievances that lead to conflicts in the country.

I demonstrate that a decrease in the prices of cocoa can cause an increase in civil conflicts in a selection of African countries and vice-versa. The study spreads across nine countries ranging from high cocoa-producing to low-producing cocoa countries (table 1). Given that on average export prices from these countries are 22% lower relative to the world price, I used both world cocoa prices and countries' export prices.

For the methodology, an instrument variable approach is used. Where lagged cocoa prices of 6 months prior are regressed on the current civil violence event using 12-month lagged prices as an instrument. The results suggest that a decrease in prices can explain an increase in civil violence events monthly; when prices decrease 6 months prior, civil violence events increase. This causal relationship is found not only for the number of events per month but also for the fatalities associated with that event. Finding that a decrease around of 1% in the world price increases 0.95% of civil violence events per month. Furthermore, a decrease of 1% in a country's export price, increases civil violence by 0.31%.

These results are in line with violence being associated with situations of high economic stress. Many farmers in West Africa are living on around \$ 0.52 per day from cocoa farming according to data from 2017. (Ewers, 2022). In addition, since cocoa prices fluctuate with so much frequency these prices are also not guaranteed. The findings are consistent with violence increasing when prices of labor-intensive goods decrease. This is because of offsetting wage effects that have a larger effect on these goods. A mechanism is shown previously by, Dube and Vargas (2013).

This paper adds to previous literature by expanding the scope to the cocoa sector in Africa. Studies have been conducted on Bananas in the Philippines (Crost and Felter, 2020) and coffee in Colombia Dube and Vargas (2013) but none on cocoa in Africa. Given that the cocoa value chain is not stable, I was intrigued to find out if that effect was the same. It is important to do this research as it globalizes the effect of people's dependencies on agricultural trade and the influences the country's political stability. By

expanding this to Africa we also can understand why these areas in Africa are in such turmoil. Although countries face internal conflicts, cocoa prices also have explanatory power in the conflicts.

2. Literature Review

It's no surprise that there is the possibility that commodity trade might be a cause for war in various countries. In the renowned 2007 paper "Make Trade Not War" Martin, Meyer, and Thoenig discuss that trade deters the probability of global conflicts but increases the probability of internal civil conflicts. This is further backed up by Schneider and Schulze (2005) who look at potential internal conflicts between factors of production being attributed to the opening of trade.

2.1 Commodity Trade and Civil Conflicts

Beginning with literature that analyses civil violence from overarching economic variables, Collider and Hoeffler looked at the three financial sources for violence: natural resources, diaspora donations, and hostile governments. Their regression suggests that the risk of civil violence increases when countries are highly reliant on primary exports (around 33% of GDP). This risk is increased by 22% as opposed to a country that doesn't have these exports where the risk is 1%. Primary export markets have a high opportunity for extortion which could be an explanation for their results. Alternatively, they suggest that the strong dependence on primary commodities worsens governance which leads to economic mismanagement and corruption (Collider and Hoeffler 2004). In this research on the cocoa industry, these results are important since they create a key link between primary commodities and civil violence.

However, Collider and Hoeffler 2004 are criticized by Fearon 2005. Where using the same data he concludes that the findings of the paper are unlikely to hold. He finds that many countries have oil as one of their main exporting commodities. This suggests the increased risk of civil war is due to the high oil exports instead of the dependence on primary commodity exports. (Fearon, 2005)

In the same field, Martin, Thoenig, and Mayer 2008, observe the impact of trade openness on civil war. They identify two variables to do so: deterrence and insurance. As well as distinguish between low and high intensity conflicts. Their results show that the probability of high-intensity conflicts is deterred with more open trade. The opposite is true for low-intensity conflicts where trade openness increases the probability of conflict events (Martin et al., 2008). Given that the share of primary exports is controlled for in their regression, this suggests that the positive effect does not come from higher exports of primary commodities. This result directly goes against the findings of Collider and Hoeffler 2004 and suggests that low-intensity violence is not affected by commodity exports through the financing of rebellion.

2.2 Commodity prices and Civil Violence

Changing the scope slightly, let us look at the effects that not only production has on civil violence but also the effects of specific commodities and their prices. Many countries have a large dependence on primary commodities which makes them susceptible to volatile prices. Extensive work has been done on these effects on a larger scale variable such as economic growth. A paper that largely inspired this thesis is that of Angus Deaton, 1991. The work analyses the movements of African economic development compared to the price movements of the country's main commodity export. It indicates a strong correlation between the patterns in economic growth and primary commodity prices. The volatility of these prices leaves economies very vulnerable. Furthermore, the article suggests that logically these nations would be better off if the prices of these commodities remained higher (Deaton, 1999).

Building on the work of Deaton 1999; Brückner, M., & Ciccone extend the analysis to see the effects of prices on civil wars. They used evidence of Rwanda and Ugandan civil wars beginning after a 40% fall in coffee prices. Concluding that a drop in commodity prices can increase the chances of civil war. Using a probability model, they concluded that between 1981 and 2006 where a country's 20% drop in commodity prices increased the probability of civil war outbreak by 2.8 percentage points. (Brückner et al., 2008) This work also connects to that of Collier and Hoeffler 2004 and other works on the African “Resource Curse”¹, by providing further evidence that commodity prices do have the power to influence civil violence.

Specifically looking at agricultural price commodities; the work of Fjelde in 2015, observes the effect of income fluctuations (representing price changes) in the agricultural sector and their influence on civil violence. Her models point out that there is significant explanatory power of prices predicting the timing and location of violence. This is explained through lower prices, which imply lower incomes and higher unemployment. This leads to increased civil uprising. (Fjelde, 2015)

Narrowing it down, Dube and Vargas 2013 conducted similar research but separated labor- and capital-intensive industries. They use goods such as coffee and oil to analyze the different effects of commodity prices and civil violence. This distinction eases the bias that the work of Fearon in 2005 finds, as it allows for oil production to be looked at separately. They conclude that a fall in the prices of labor-intensive industries increases the violence in areas where there is a high level of production (Dube and Vargas, 2013). This result is in line with Fjelde 2015, further supporting the idea that conflict arises from the economic stress of lower incomes. Interestingly, the opposite is true for capital-intensive industries. Where a rise in prices is associated with a rise in civil conflicts. This could be explained by the ideas of Collier and Hoeffler 2004, which indicate that the violence is funded by these exports.

A similar study is done by Benjamin Crost and Joseph H Felter 2020. They look at the movements in the world prices for bananas and the effect on civil violence in the Philippines. Which, they find that most cases of civil violence are funded by extorting agricultural exports. This result is largely in line with Collier and Hoeffler 2004. Interestingly, the methodology of this paper conducts a difference in difference analysis between the provinces that export bananas and the ones that do not (Crost and Felter, 2020). Although this methodology is incredibly intriguing it unfortunately doesn't apply to many African nations, due to the lack of data on provincial level.

As such I have decided to use the instrument variable approach inspired by Miguel et al. 2004 natural experiment. They look at the effect of economic growth on civil violence by instrumenting precipitation. In their model, they found a negative association of the variables, where a rise in economic growth decreased civil violence events. In their case, the instrument variable was used to decrease the level of reverse causality. This research faces a similar issue with reverse causality, where civil violence can be affected by cocoa prices, but it can also be the other way around for nations that have a strong influence on the price of cocoa (Ghana, Ivory Coast).

3. The Cocoa Market

To understand the scope of the research, one must first capture the mechanisms of the cocoa value chain.

¹ Resource Curse: A situation where a country has low economic development despite the country's abundance of resources (Fernando, 2022)

3.1 Cocoa market fluctuations and current situation

In addition to farmers getting a low value for their crops, prices also fluctuate significantly. Although it is common for commodity prices to fluctuate with frequency cocoa prices are very dependent on Africa's environment, and social and political situations (Zucci, 2021). Environmental elements can have an impact, with evidence from rising natural disasters in West Africa such as drought in Nigeria, Ivory Coast, Ghana, and Cameroon where 75% of all world cocoa is located. (Adesina, 2024). Many say that the recent hike in cocoa prices is also due to El Niño, which has led to higher temperatures tree pests, and diseases such as the black pod disease.

Social norms can also have a high impact on world prices as many farmers lack knowledge of agricultural practices, such as lack of replanting and keeping old trees on their lands.

Finally, these fluctuations in prices can also be dependent on the country's political situation. Increasing investment in the cocoa sector could reduce the impact of political situations on prices. Given that most of these African countries are indebted, this limits the structure and investment of the sector. A lack of structure means that any minor problem can blow up to impact a large part of the production and impact the world prices.

Several external and internal factors affect cocoa prices. High price volatility has an enormous effect on farmers and other agents in the cocoa value chain. This can easily become a vicious cycle with limited infrastructure and control over the value chain.

3.2 Context on the Cocoa Value Chain

The cocoa chain is similar to other large commodities like coffee and cashews. The chain starts when farmers cultivate and dry the cocoa, then the harvest is sold to a middleman collector who sells it to local buyers. In several cases, the government buys local production and supports the export process. Once the cocoa is sold to multinationals it gets shipped to warehouses in Amsterdam or New York where the process of chocolate is begun (The Cocoa Value Chain, 2022). Although this process is easy enough to list out, it goes without saying that it faces various problems outside of low prices. These problems make the value chain highly unstable which means that any adversity causes a large problem.

One of which is deforestation. Cocoa farming has been linked to the destruction of a quarter of forests in Ivory Coast (Schneider et al, 2024). This makes sense as it is considered a "pioneer crop" where farmers prefer to reallocate to forested areas for new crops, rather than replanting their own. Further explaining some of the challenges of the value chain (Post, 2018). Moving away from environmental issues, the value chain has caused large social problems as well. One of the main ones is child labor. Given the low prices, many farmers turn to child labor to remain competitive. It is estimated that there are 2.1 million children that are part of the cocoa labor force in Ghana and Ivory Coast. Some cases also include child trafficking. Where children are abducted or sold by their families to work on cocoa plantations. (International Labor Rights Forum, 2022). This further amplifies the country's reliance on the crop to the point of committing acts against basic human rights. It also tells us that the value chain is built on a very unstable basis. Where farmers do not get enough for their yields and social, political, and environmental issues arise.

Several external and internal factors affect cocoa prices. High price volatility has an enormous effect on farmers and other agents in the cocoa value chain. This can easily become a vicious cycle with limited infrastructure and so many issues within the value chain.

3.3 Cocoa Value chain and Civil Violence

Given the various social issues and poverty in the value chain, it may not be surprising to know that many have also linked it directly with civil violence. An example is the Ivorian Civil War of 2002-2007. Félix Houphouët-Boigny, first president of Ivory Coast, planned to expand the cocoa industry as a main priority of the country². A lack of labor availability incentivized workers from nearby countries such as Burkina Faso to farm virgin forests for cocoa. Eventually, the forest began to run out, which increased tensions between native workers and immigrants, as a result, a 5-year bloody war (Post, 2018).

Conflicts related to the cocoa chain in West Africa date back to colonial times. A newspaper article written by George Padmore from 1938, details how farmers on the Gold Coast (now known as Ghana) began to rebel from the low prices they were given for their cocoa. To which the author refers to this as "a strike against European capitalists". This information shows that the structure built up in the cocoa sector from colonialist times is still having similar issues today. The article further describes West Africans attempting to form farmer cooperatives but the "attempt being crushed" by large corporations such as Unilever (Padmore, 1938).

This paper will look at the possible effect of cocoa prices on civil violence in African countries. For this purpose, I am looking at monthly world cocoa prices and regress this on the number of civil violence events per month. In this investigation, I will use nine African countries as can be seen in table one below.

The reason for choosing countries in all of Africa rather than just the West African cocoa belt, is because I wanted to see if the effect prevailed even when the country was not known for producing cocoa. Furthermore, as can be seen below the countries are listed from most cocoa produced to least. Due to data availability, I was limited to these.

Another reason for choosing these countries was because they display various government structures of the cocoa market. Where in Ghana the market is heavily regulated, and farmers must sell at the government-set price. In contrast, Ivory Coast has a less regulated market that allows farmers to sell at the market price.

Table 1: Country selection

Country	Average quantity of cocoa produced per year in tons
Ivory Coast	1132803.00
Ghana	537576.80
Nigeria	230332.90
Cameroon	184901.60
Togo	32316.94
Guinea	12779.15

² Félix Houphouët-Boigny lead Ivory Coast for 33 years after the independence.

Democratic Republic of Congo	12460.21
Madagascar	7698.29
Equatorial Guinea	1381.16

Notes: The data displayed in the table is found from the FAOSTAT 2024 databases. The data displayed the average quantity produced in 2022 which is also the latest year of data included in this study. Values are given as cocoa tons produced.

4. Hypothesis

In this paper, I will use an instrument variable to determine the effect of cocoa prices on civil violence. I will be looking at the following hypothesis:

1. The higher the world price of cocoa, the lower the frequency and intensity of civil violence events.

Since so many people are dependent on the crop as their main source of income, having lower prices will increase most people's income. This increase in income will lead to a decrease in poverty and strains in daily life, hence lowering civil violence. This hypothesis is largely based on the results of Dube and Vargas 2013. Who found the same effect with coffee crops in Colombia. Alternatively, they found that an increase in prices could increase the opportunity cost of in sighting violence and hence deter civil unrest (mostly with capital-intensive goods). Given that cocoa is a labor-intensive good like coffee, I believe the effect will be the same for Africa and cocoa production.

2. The higher the export values of cocoa, the lower the amount of civil violence.

As can be observed from the descriptive values, the export prices are not always the same as the world prices. They tend to deviate negatively from the suggested world price. Using this variable, I can further exemplify the level of importance of this crop from many smallholder farmers.

5. Data

Table 2: Descriptive statistics

		Mean	Standard deviation	Observations
Dependent Variables	Civil Violence Events	35.92	107.05	2376
	Civil Violence Fatalities	105.85	290.89	2376
Independent Variables	World Prices	2272.80	632.31	2376
	Export Price	1927.60	664.20	2376
Control Variables	Inflation	10.69	36.62	2376
	Corruption	-0.96	0.43	2376
	GDP per capita	2166.48	3545.84	2376

Notes: This table is comprised of data that is used throughout the model. These databases are outlined below and include; FAOSTAT, ACLED and the Federal Reserve Bank of St. Louis. Civil violence events is given in absolute value, as well as fatalities. All prices listed are in US Dollars.

The observations for all the variables range from 2000- 2022 monthly. It is important to note that 2001 is left out of the model due to a lack of data for the control variables.

5.1 Dependent Variables

The dependent variable of this model is monthly civil violence events per country. For the data the well-known Armed Conflict Location & Event Data Project (ACLED database) is used. The NGO collects disaggregated information on dates, actors, and locations of civil violence events from all over the world. The variable measures political civil violence, defined as “a category grouping all events targeting the civilian population” (ACLED Definitions of Political Violence and Protest, 2019). This includes a subset of battles, explosions/remote violence, attacks, abduction, sexual violence mob violence, etc. (ACLED Definitions of Political Violence and Protest, 2019). This broad definition of violent events allows this investigation to isolate events due to political grievances, which are more likely to be correlated with cocoa prices. As an example, in Ghana cocoa production is regarded as a political crop due to the country’s high reliability. (Future Agricultures, 2021).

Many papers in the field of economic studies of civil violence (including the work of Miguel et al. 2004) use the PRIO/Uppsala database. This database was developed by the International Peace Research Institute of Oslo, Norway, and the University of Uppsala, Sweden. This database only reports violence per year. Given that prices fluctuate with a high frequency, I preferred to do the analysis on monthly level. Furthermore, the database is more targeted towards armed conflicts exclusively, whereas this paper is more targeted at political civil violence effects. Moreover, this database does not include the number of casualties associated with each civil violence event per month.

The other dataset that is commonly used is the Correlates of War (COW) database. This database was not used by Miguel et als. 2004 paper as it has a 1000 death threshold which does not account for major conflicts in smaller regions that are detrimental to those places. I agreed with their argument. In addition, it is more focused on the possibility and number of wars which is difficult to attribute solely to cocoa price fluctuations. As this model focuses on civil violence (not always war), I have used ACLED’s data instead. Furthermore, similarly to the PRIO/Uppsala case the COW database also only records the events per year and is limited to data until 2007, whereas I wanted this study to focus on more recent times.

Table 2 contains the descriptive statistics relevant to the paper. There is an average of 35 civil violence events per month, this number does seem high, although a high standard deviation implies high variation of the events. To control this, I have included country-fixed effects in the regressions. In addition, there is an average of 105 fatalities a month as a result of civil violence, again this has a high standard deviation of 290 deaths making it clear that the events included in the regression vary greatly in intensity.

5.2 Independent Variables

World Prices

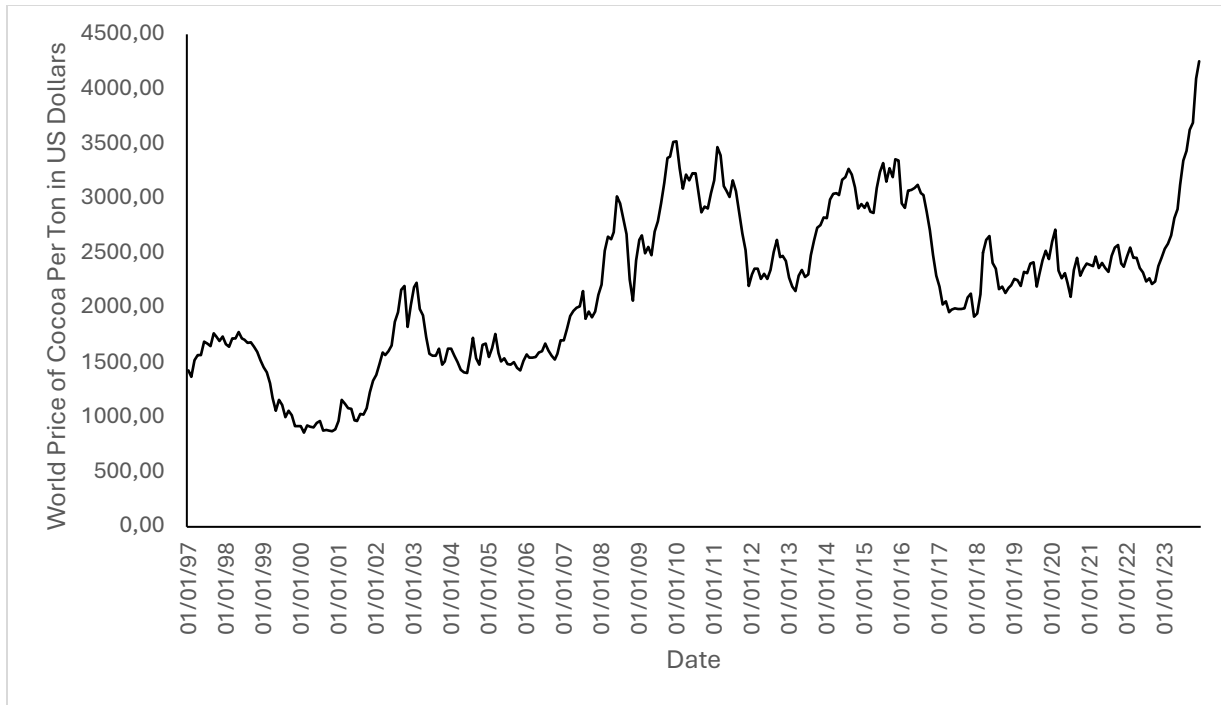


Figure 1: World cocoa price fluctuations from the data.

Notes: the graph is compiled from the data that is later used in the regressions. Prices are shown in 6-month intervals, however in the investigating monthly prices will be used.

The data for the world prices has been extracted from the Federal Reserve Bank of St. Louis. The indicator gives the mean value of cocoa per ton, per month. Above, we can see the extent to which cocoa prices have changed since 1997, these fluctuations are quite drastic even when looking at them every 6 months as the graph shows. It is important to note that these prices are listed in nominal US dollars and are not seasonally adjusted.

Looking at Table 2, the mean of the world price of cocoa over time is around 2272 US dollars per ton. This value has also fluctuated very much with a standard deviation of 632 dollars over time. Further supported by the volatility observed in Figure 1.

Export Prices

Not all countries manage to export at the world price. For this reason, I decided to include data on the actual prices of exports. This data was collected from the Food and Agricultural Organization's databases (FAOSTAT). The data is processed by the Standard International Merchandise Trade Statistics (IMTS) Methodology and compiled from Eurostat and UNSD (FAOSTAT, 2024). Where the data includes the annual production of exported cocoa and the value of these exports. Given that this data was annual I used an average value of export for each month to align it with the civil violence data. This is a downside of the variable as it is not as precise in measuring the actual monthly changes in the prices.

According to the data, the selection of these 9 countries only exports at or above the world price 22% of the time. This is evident from the descriptive variables where the average export price is around 1928 US dollars. In addition, there is a high variation in the prices of exports of 664. Meaning that the prices of exports fluctuate more than the world price.

5.3 Control Variables

The control variables were chosen to reduce the highest level of bias from the instrument. The three variables used to control are GDP per capita, inflation and a corruption index.

Gross Domestic Product per Capita

GDP per capita is controlled as it represents income fluctuations and poverty. Incomes are likely to have a direct effect on civil violence as it can arise from grievances of having a low quality of life. For many countries, a majority of the population relies on cocoa farming as their main source of income. Hence controlling for GDP can further help isolate the effect of cocoa prices directly on civil violence. For this variable, I used data from the FAOSTAT database, specifically their macroeconomic indicators. The data is compiled from different UN departments and the National Accounts Questionnaire (FAOSTAT, 2024). It is expressed in nominal dollars per capita.

Across all countries, the average income is 2166 US Dollars. Meaning, over time people in these countries have earned less than 6 dollars a day on average.

The standard deviation of the GDP per capita variable is larger than the average itself at around 3545. This indicates that even though income levels are low, they also vary greatly over time and in the countries.

Inflation

Inflation is controlled for two main reasons. First, all the prices in this paper are displayed as nominal prices. To resemble true prices, we need to control inflation, also since a lot of these countries have had high levels of inflation over time. As an example of this, we can take Congo where in 2000 they saw inflation of up to 500% (FAOSTAT, 2024). The second reason is that it is a good measure of the country's relative stability. If the inflation is high this can also be a reason as to why civil unrest is insightful. Keeping with the example of Congo (DRC), the hyperinflation they saw in the late 1990s and early 2000s left various consequences such as decreasing wages and overall lowest national investment. (Jean et al., 2005).

The data for this variable was extracted from the World Bank databases, specifically from their world development indicators. Although this is where the data was downloaded from it is originally from the IMF database. The variable is measured by the consumer price index, reflecting annual changes. It is important to note that for Guinea values were missing for inflation from 2001-2005. For this, I filled in the values with data from the World Data Atlas.

In Table 2, there is an average inflation over time of 10.96 %. This level of inflation high given that ideally inflation should stay at around 2% over time (Nasdaq, 2021). Furthermore, the standard deviation of the variable is around 36%, indicating a large variability in the data across time and countries.

Corruption

High levels of corruption can undermine a government, causing grievances that can lead to civil violence. Moreover, high levels of corruption also mean that politicians may not be as dedicated to catering to society but rather more interested in keeping funds of social expenditure to themselves. This will affect

incomes and cause anger within populations. There is also the element of trust, if people do not trust in their government, then they are more likely to protest and cause violent uprisings.

For this variable, I also used data from the World Bank also within their development indicators. The variable reflects the extent to which public power is used for private gain, as well as petty and grand forms of corruption (World Bank, 2024). The variable ranges from -2.5 to 2.5, where the higher the value the more transparent a county is (the less corruption). As an example, the average for all these nations in 2022 is -0.93 whereas the Netherlands has a score of 1.9.

In Table 2, the average corruption for all these countries over time is -0.96, indicating a relatively high level of corruption. Furthermore, the standard deviation is 0.43 which given the variable range is high.

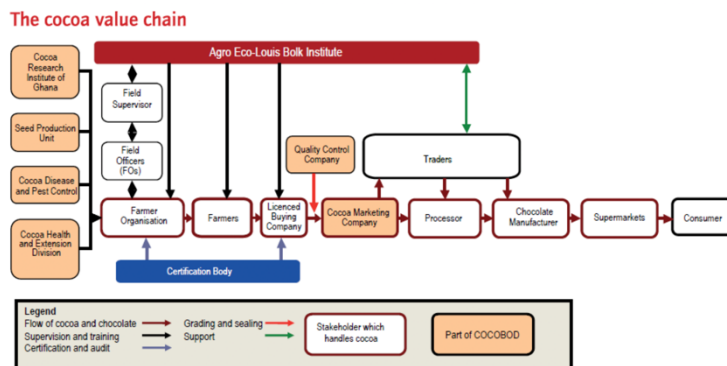
Fixed effects

In the regression, I will also be controlling for fixed effects. This will include country-fixed effects as well as country-time-specific effects. Country-fixed effects control the between-country variation, given that all these countries are very different. Country-specific time effects, control a country's change over time (within country variation). This is also known as a country linear trend control. This control was redacted from Miguel et al. 2004 methodology.

1. Methodology

5.1 Mechanism of prices

In this paper, prices will be lagged by 6 months and then regressed on civil violence. The first reason for this is that it is unlikely that the effects of civil violence of the current month are caused by low prices in that same month. It is more likely that a person's grievances arise from past cocoa harvests that were sold at lower prices. Cocoa production is characterized by two harvesting periods during the year the first is from April to September and the second from October to March (Gro Intelligence, 2022). Depending on when farmers harvest their crops these two periods are roughly six months apart. As an example, a farmer sells a ton of cocoa in April for a low price, they have to wait until October until they can get their next batch out. That means that the effects of that batch of cocoa sold at a low price will only show through later on.



Secondly, lagged prices are used given that the cocoa value chain is quite vast. This means that a price change of month 't' might only be reflected on the farmer at t-6. We can see a diagram of the cocoa value chain in figure 2. Where a price change might be directly reflected at the trader stage but then must work its way to affect the farmer.

Figure 2: The cocoa value chain ((Value Chain – Agro Eco, 2023)

5.4 Instrument variable

For the instrument variable, 12-month lagged cocoa prices are used. This will be six months from the 6-month lagged dependent variable. The main reason for using lagged prices is that they will affect prices one year later but will have no direct impact on today's civil violence, unless through past civil violence events. For this reason, I have also added 12-month lagged civil violence as a control variable.

Furthermore, using past cocoa prices ensures that there is no reverse causality between the current prices and past prices, as past prices cannot be influenced from current prices.

The reason for choosing a 12-month lag, is time separation allowing a smaller chance of affecting current civil violence but retains enough predictive power over the independent variable (6-month lagged prices). This is a trade-off that is challenging to satisfy however after running various test with different lags this is what made the most sense.

To further justify this instrument, I will use the three conditions of instrument variables.

1. Instrument must have a clear and strong causal effect on the variable of interest (strong 1st stage)

The equation for the first stage of the main test in this paper can be found below. Where I regress 12-month lagged world cocoa prices on six month lagged world cocoa prices to test for a strong first stage. Where 'i' represents the individual countries and 't' represents the time effect.

$$\begin{aligned} \ln 6 \text{ Months Lagged World Cocoa Price}_t & \\ &= \alpha_0 + \alpha_1 \ln 12 \text{ Months Lagged World Cocoa Prices}_t \\ &+ \alpha_2 12 \text{ Months Civil Violence Events}_{it} + \alpha_3 \ln \text{ GDP per capita}_{it} + \alpha_4 \text{Corruption}_{it} \\ &+ \alpha_5 \text{Inflation}_{it} + \alpha_6 \text{Country fixed effects}_i + \alpha_7 \text{Country Linear Trends}_{it} + \epsilon_{it} \end{aligned}$$

Table 3: First Stage Regression of 12- Month Lagged World Cocoa Prices on 6-Month Lagged World Cocoa Prices

	OLS (1)	OLS (2)	OLS (3)	OLS (4)
(ln) 12- Month Lagged World Cocoa Prices	0.85*** (0.01)	0.76*** (0.01)	0.71*** (0.02)	0.59*** (0.02)
12-Month Lag Civil Violence Events	0.00* (0.01)	-0.00*** (0.00)	-0.00** (0.00)	
12-Month Lag Civil Violence Fatalities				0.00 (0.00)
(ln) GDP per capita			0.15*** (0.01)	0.15*** (0.00)
Corruption			-0.016 (69.35)	-0.01 (0.025)
Inflation			-0.00***	-0.00***

			(0.00)	(0.00)
Country Specific Effects	No	Yes	Yes	Yes
Country Linear Trends	No	Yes	Yes	Yes
R^2	0.76	0.77	0.79	0.79
F-Statistic	6694.683	4084.138	3179.025	3445.416
Observations	2376	2376	2376	2376

Notes: Robust standard errors are shown in parenthesis. Variables not shown include country specific effects and country linear trends. *** Significance to the 99th percentile, ** significance to the 95th percentile and * significance to the 90th percentile.

The table above displays the first stage of a partial elasticities model, with natural logarithms of prices and GDP per capita. In the first stage of all of these options, the IV is strong with an F- statistic much higher than 10 (Staiger and Stock, 1997). The F-statistic included is a Kleibergen-Paap rk Wald F statistic. The values are high due to a high correlation of past prices with current ones. Beginning with the first test, there is a high correlation between these 6-month lagged cocoa prices and 12-month lagged cocoa prices of 0.85 which is significant and positive. The F-value of this regression is the highest at 6694.683. Despite this, the R-squared is the lowest at 0.76, which means that this model can explain 76% of the variation in the data. Moreover, the first test doesn't include any fixed effects or controls which makes it likely to exhibit large bias.

The second and third tests both include fixed effects with the only difference being that regression (3) includes the control variables. We can see that the difference in the coefficient of 12-month prices on 6-month lag prices is rather small. This could mean that when excluding the control variables (2) the model had positive omitted variable bias. We can also note that when including the controls the R-squared is higher than when excluding them.

The last regression shows the first-stage results using fatalities as a dependent variable. For this, I included past fatalities as a control. Despite the change in controls, the first stage coefficient remains positive and significant at 0.59. The R-squared for this test remains at 79% and the F-statistic is 3445.416 making it a strong instrument according to the first stage.

Overall looking at table 3, the instrument has a strong first stage. Similar results can be observed when using export prices rather than world prices in the appendix table 1.

2. Instrument should be uncorrelated with the error term (independence)

As always there is a possibility that the instrument is correlated to the error term. One of the ways this could be a problem is through poverty. Given that people are reliant on the price of cocoa in these countries, it could be the case that past prices affect people's earnings and hence could be a reason to

explain current uprisings. For this reason, I have chosen to include a control for this by using GDP per capita.

Furthermore, the instrument could be related to inflation as for some countries (Ivory Coast/ Ghana) cocoa is the main export crop. The higher the inflation the fewer exports there will be, which directly affects the world prices from variability of exports in large producing countries. Furthermore, if there is more inflation this can also be an indicator of political instability and potentially a cause for civil unrest. For these reasons, inflation will be controlled.

3. The instrument has no direct effect on the outcome (exclusion restriction)

The main reason why this instrument is valid with a one-year lag is that it introduces a temporal separation between the instrument and the dependent variable (civil violence). This time gap makes it more independent of any exogenous shocks that could affect civil violence in the respective month. However, is it entirely possible that past prices can have an indirect effect on civil violence. This could be through past conflict, for which reason it has been included in the model.

Second stage regression

$$\begin{aligned}
 & \text{Civil Violence Events}_{it} \\
 & = \alpha_0 + \alpha_1 \ln 12 \text{ Months Lagged World Cocoa Prices}_t \\
 & + \alpha_2 12 \text{ Months Civil Violence Events}_{it} + \alpha_3 \ln \text{ GDP per capita}_{it} \\
 & + \alpha_4 \text{Corruption}_{it} + \alpha_5 \text{Inflation}_{it} \\
 & + \alpha_6 \text{Country fixed effects}_i + \alpha_7 \text{Country linear trends}_{it} + \epsilon_{it}
 \end{aligned}$$

$$\begin{aligned}
 & \text{Civil Violence Fatalities}_{it} \\
 & = \alpha_0 + \alpha_1 \ln 12 \text{ Months Lagged World Cocoa Prices}_t \\
 & + \alpha_2 12 \text{ Months Civil Violence Fatalities}_{it} + \alpha_3 \ln \text{ GDP per capita}_{it} \\
 & + \alpha_4 \text{Corruption}_{it} + \alpha_5 \text{Inflation}_{it} \\
 & + \alpha_6 \text{Country fixed effects}_i + \alpha_7 \text{Country linear trends}_{it} + \epsilon_{it}
 \end{aligned}$$

6. Results

Hypothesis 1- The higher the world prices of cocoa, the lower the frequency and intensity of civil violence events.

Table 4: 6- Months lagged World Cocoa Prices on Civil Violence Events and Fatalities. Partial Elasticities Model.

Dependent Variable: Civil Violence Events			Dependent Variable: Civil Violence Fatalities
OLS (1)	IV-2SLS (2)	IV-2SLS (3)	IV-2SLS (4)

(ln)6- Month Lagged World Cocoa Prices	-65.07*** (5.11)	-34.94*** (4.86)	-36.67*** (5.61)	-134.51*** (27.49)
12-Month Lag Civil Violence Events		0.78*** (0.02)	0.78*** (0.02)	
12-Month Lag Civil Violence Fatalities				0.10 (0.02)
(ln)GDP per capita	-17.35*** (3.53)		2.11 (4.33)	6.25 (22.03)
Corruption	-22.89*** (6.20)		-17.50** (7.27)	-120.53** (36.84)
Inflation	0.07** (0.02)		-0.01 (0.02)	-0.06 (0.13)
Country Specific Effects	Yes	Yes	Yes	Yes
Country Linear Trends	Yes	Yes	Yes	Yes
F-Statistic		4084.138	3179.025	3445.416
Observations	2376	2376	2376	2376

Notes: Robust standard errors are shown in parenthesis. Variables not shown include country specific effects and country time fixed effects. *** Significance to the 99th percentile, ** significance to the 95th percentile and * significance to the 90th percentile.

In Table 4, the results of the first hypothesis are shown, where world prices of cocoa are regressed on civil violence. In the regressions, there is a natural logarithm of the price variables and GDP per capita. This was done to linearize the percentage change and interpret the coefficient with more ease. Starting with the first regression it displays a simple linear regression of world prices on civil violence including fixed effects and controls. It was important to include this regression as it shows an association of the variables that is negative and significant. Although this result is hard to interpret due to high bias, we can still see that higher prices are associated with less civil violence. This is precisely the effect that I was looking for in the investigation.

In results 2 through 4 the instrument is used. Result 2 shows, a negative and statistically significant coefficient of 6-months lagged prices. This means that an increase of prices of 1% will decrease civil violence events by 0.3494 (0.01* 34.94). More intuitively, an increase of 10% in prices will decrease civil violence per month by 3.494 events. This result although significant and positive still contains some bias from excluding the controls, hence we move to regression 3.

Regression 3 is the most complete of this model as it includes controls and fixed effects. In this regression, the main variable of interest doesn't vary much from regression 2. This indicates that the controls may not have as much influence as previously assumed. Where the coefficient for (ln) GDP per capita is and inflation is not significant. The coefficient of corruption is positive and significant at 95%. Its magnitude is also quite large at -17.50. This means that in the corruption index if a country's corruption worsens from -1 to -2 then civil violence events would go up by around 17 events. This shows that corruption has a large influence in determining the frequency of events. Going back to the main coefficient of lagged world prices, we can see that an increase of 1% in prices would decrease civil violence by 0.3667 events. In other words, an increase of around 10% in world prices would decrease 3.667 civil violence events. Although this result might not be so exact in reality it does show an association that prices can influence civil violence events.

Lastly in regression 5, I used fatalities from civil violence events as the dependent variable. There is a change in the regression using past fatalities are included as a control. The purpose of doing this was to understand if prices could also have explanatory power when it came to the intensity of these events. According to the coefficient, this is indeed the case. Where an increase of 1 % in prices from 6 months ago decreases the number of deaths due to civil violence by 1.34. To make this clearer if prices go up by 10%, then there will be more than one less death per month from civil violence events. This means that the intensity of civil violence events is more sensitive to price changes than the frequency of events.

Another interesting result from this regression is how sensitive the variable is to corruption. Where if corruption worsens by 1 point, there is to be an increase in around 120 deaths from civil violence events per month. This result although very large could be realistic when considering corrupt governments can have little control over their populations and police forces.

Log-Log Model

Table 5: Log of 6- Months lagged World Cocoa Prices on Log of Civil Violence Events and Fatalities. Full Elasticities Model.

	Dependent Variable: (ln) Civil Violence Events			Dependent Variable: (ln)Civil Violence Fatalities
	OLS (1)	IV-2SLS (2)	IV-2SLS (3)	IV-2SLS (4)
(ln)6- Month Lagged World Cocoa Prices	- 0.73*** (0.07)	-0.92*** (0.08)	- 0.95*** (0.10)	-0.74*** (0.15)
(ln) 12-Month Lag Civil Violence Events		0.11*** (0.02)	0.11*** (0.02)	
(ln)12-Month Lag Civil Violence Fatalities				0.16 (0.02)
(ln)GDP per capita	- 0.11** (0.05)		0.03 (4.33)	-0.02 (0.09)
Corruption	-0.21		-0.27**	-0.80**

	(0.13)		(0.13)	(0.19)
Inflation	0.00 (0.00)		-0.00 (0.00)	-0.00 (0.00)
Country Specific Effects	Yes	Yes	Yes	Yes
Country Linear Trends	Yes	Yes	Yes	Yes
F-Statistic		3373.19	3246.82	3400.84
Observations	2376	2376	2376	2376

Notes: Standard errors are shown in parenthesis. Variables not shown include country specific effects and country time fixed effects. *** Significance to the 99th percentile, ** significance to the 95th percentile and * significance to the 90th percentile.

In the table above the test is redone using a log-log model. In the first regression we can observe an ordinary least squares regression with a coefficient for prices of -0.73, negative and significant to the 99%. This means that an increase of 1% in the world prices will decrease civil violence events by 0.73%. In this test the coefficient for GDP per capita is negative and significant to the 95%.

The second and third regressions relatively similar. In the third regression we can observe a coefficient of -0.95 which is significant to the 99%. This means that a 1% increase in the world prices from six months prior, decreases civil violence events by 0.95% per month. This value is much more intuitive than that of the previous model. In addition, the controls remain insignificant with the exception of corruption. corruption has a larger effect on the intensity of events (measured through fatalities) than on the frequency of them.

In the last regression, we can observe a coefficient of -0.74 significant to the 99th percentile. Here an increase of 1% in the prices decreases fatalities from civil violence by 0.73%. Overall, from both models, a clear association between world cocoa prices and civil violence can be observed.

Hypothesis 2- The higher the export values cocoa, the lower the amount of civil violence.

Table 6: Log 6- Months lagged Export Cocoa Prices on Log Civil Violence Events and Fatalities. Full Elasticities Model.

	Dependent Variable: (ln) Civil Violence Events			Dependent Variable: (ln) Civil Violence Fatalities
	OLS (1)	IV-2SLS (2)	IV-2SLS (3)	IV-2SLS (4)
(ln) 6- Month Lagged Export Cocoa Prices	-0.31*** (0.07)	-0.36*** (0.07)	-0.31*** (0.08)	-0.17 (0.12)
(ln)12-Month Lag Civil Violence Events		0.16*** (0.02)	0.15*** (0.02)	

(ln) 12-Month Lag Civil Violence Fatalities				0.17*** (0.02)
(ln) GDP per capita	-0.33*** (0.04)		-0.26*** (0.07)	0.29** (0.10)
Corruption	-0.14 (0.13)		-0.16 (0.12)	-0.67*** (0.19)
Inflation	0.00 (0.00)		-0.00 (0.00)	0.00** (0.00)
Country Specific Effects	Yes	Yes	Yes	Yes
Country Linear Trends	Yes	Yes	Yes	Yes
F-Statistic (First Stage)		400.21	353.66	352.92
Observations	2376	2376	2376	2376

Notes: Standard errors are shown in parenthesis. Variables not shown include country specific effects and country time fixed effects. *** Significance to the 99th percentile, ** significance to the 95th percentile and * significance to the 90th percentile.

Above we can see the results when using export prices rather than world prices. There is a significant difference between this table and when using world prices. Where world prices and export prices have the same signs of the effect but different magnitude.

Beginning with the first OLS regression, there is a clear difference. Here an increase in prices of export prices of 1% decreases civil violence events by 0.31%. This is the same sign as with world prices but of smaller magnitude. This could be due to the fact that world prices are more exogenous than export prices. Exports are more likely to be influenced by country factors, also these prices are listed yearly not monthly, hence they don't follow the actual fluctuations as closely. World prices on the other hand are determined from all cocoa producing countries.

From regression 2 to 3, there is a larger effect here from the controls as there was in table 5. Where the coefficient for not using control variables is -0.36 (negative and significant) and the coefficient when controlling is -0.31 (also negative and significant). The change on the effect tells us that there was previously a negative bias from excluding the controls. The controls also vary, where Log GDP per capita is now significant contrary to inflation and corruption.

From the results, civil violence is more sensitive to a 1% change in world prices as compared to export prices according to the models. In this case, export prices are more subject to reverse causality. Where export prices can be influenced more easily from civil violence events, since they are determined by each country. Whereas world prices are also based on production in Latin American and other African cocoa producing areas, making the shock more exogenous to the country's situation. The effect is likely to lie between a 36% and 95% range according to the two models.

In regression four, the variable of prices does not have a significant effect of event fatalities. This is very different than when working with world prices. A reason for this could be that export prices are not as precise in measure actual changes. Alternatively, the intensity of events could be attributed to other country specific effects rather than a change in prices. This is clear from all controls being significant in this regression, indicating they have a larger explanatory power on the fatalities in civil violence events.

7. Discussions and limitations

As seen in the results above it is clear that there is an association between world and export prices with civil conflicts. But to what extent can we call this relationship a causal one? Whilst results show a strong connection from significant coefficients, all bias is unlikely to be controlled for. Including an instrument can be a good control for this but the instrument is also not perfect. In this paper I assumed that the only way that the past cocoa prices could affect the current civil violence was through corruption, inflation, past civil violence and GDP per capita. There is the possibility that past prices affect people through other variables that are exogenous to the model that were unable to be included. An example of which could be consumer confidence, and speculations. If people see that past prices were low, then there are more likely to assume that the next prices will also be low. This might cause agents within the value chain to actually sell for lower or farmers to protest from lower prices. This is a variable that is hard to include in the model since it is hard to quantify people's thoughts. Hence it is something that could cause bias in the study.

More generally civil violence can be caused from a variety of reasons. In a lot of countries there is conflicts for historical tribal reasons, religion and land. All of which are hard to quantify and were also not in the model. Although I controlled for fixed effects, it cannot be trusted that all exogenous effects are accounted for.

Another limitation of this paper comes from the fact that in both of the results tables (table 4 and 5) the coefficients for inflation and GDP per capita are either not significant, or very small numbers. This is an indicator that these coefficients have little to no explanatory power in the model. Although, it was important to include these for reasons of bias on the main effect it is clear that they do not have much meaning in the model. This could be caused from a high multicollinearity. Where the linear regression has a Vif of 8.60 average in the model. The multicollinearity is over the accepted range of 1-5. Regardless, in table 4 and 5 where the model was run without the controls the effect remains very similar to the one that has all controls.

Another interesting outcome of the model is that there is a large variation from running the model with export and world prices. As discussed earlier it could be a result of high reverse causality with the export prices. This however makes the magnitude of the effect of prices harder to detect. Overall, the sign of the effect remains the same. Interestingly, with world prices in table 5 the results from regression 3 indicate nearly a 1-1 percentage relationship. This means that a 1% increase in cocoa prices six months ago can account for a 0.95% decrease in current conflicts. From the model this shows that cocoa prices could potentially have a large explanatory power over conflicts in Africa.

8. Conclusion

In this paper I have discussed the extent to which cocoa price fluctuations can affect civil violence in 9 African countries. This study took place in the range of 2000 and 2022 with monthly cocoa prices and

monthly civil violence events. The first and second hypotheses were correct, demonstrating that when world and export prices of cocoa decrease, civil violence cases increase. Interestingly, the effect varies from using export prices and world prices, which could be attributed to reverse causality. This paper looked at the frequency of civil violence events as well as the intensity of them. Finding that the frequency of events is more sensitive to price changes than the intensity of them when using world prices. If world prices have a 1% increase, then civil violence is expected to decrease by 0.95%.

This result is largely in line with Dube and Vargas 2013 prediction. Where cocoa as a labor-intensive good shows similar pattern to those in Colombian coffee. In term of policy recommendations, the bottom line is that multinational firms must begin to incentivize more sustainable cocoa production. Largely by paying farmers a higher price to cover the costs of their production and to stabilize the market. The sector must also invest in better regulation of child labor, and environmental damages. All which as incentivizes a countries civil violence. If poverty can be alleviated from higher prices people will still be dependent on the crop but the income from it will be more reliable. During a price increase in September of 2023 Professor Michael Odijie from University College London suggests that these price hikes can be a good opportunity for farmers to capitalize and begin to sell their cocoa for higher prices (Odijie, 2023). Although this is true, it is hard when the farmers are so reliant on the crop, they have to be price takers. The change in the cocoa sectors must be a structural one.

An extension to this research could be by looking at the effects of different crops simultaneously to cocoa and effect of those on civil violence. This would give an insight on the countries overall agricultural sector which might be useful when determining better structures. Furthermore, it would be interesting to look at the effect of a countries cocoa trading partners on civil violence. As some trading partners might be more prone to inflicting practices that damage society.

Overall, the hypothesis of this paper was proven correct through the data, despite the caveats there is a suggestion of a significant effect between cocoa prices on civil violence.

Appendix

A.1 First stage regression of log-log model including civil violence and world prices.

$$\begin{aligned}
 \ln 6 \text{ Months Lagged World Cocoa Price}_t & \\
 &= \alpha_0 + \alpha_1 \ln 12 \text{ Months Lagged World Cocoa Prices}_t \\
 &+ \alpha_2 \ln 12 \text{ Months Civil Violence Events}_{it} + \alpha_3 \ln \text{GDP per capita}_{it} \\
 &+ \alpha_4 \text{Corruption}_{it} + \alpha_5 \text{Inflation}_{it} \\
 &+ \alpha_6 \text{Country fixed effects}_i + \alpha_7 \text{Country Linear Trends}_{it} + \epsilon_{it}
 \end{aligned}$$

Regression 4 pertains to the following formula:

$$\begin{aligned}
 \ln 6 \text{ Months Lagged World Cocoa Price}_t & \\
 &= \alpha_0 + \alpha_1 \ln 12 \text{ Months Lagged World Cocoa Prices}_t \\
 &+ \alpha_2 \ln 12 \text{ Months Civil Violence Fatalities}_{it} + \alpha_3 \ln \text{GDP per capita}_{it} \\
 &+ \alpha_4 \text{Corruption}_{it} + \alpha_5 \text{Inflation}_{it} \\
 &+ \alpha_6 \text{Country fixed effects}_i + \alpha_7 \text{Country Linear Trends}_{it} + \epsilon_{it}
 \end{aligned}$$

Appendix Table 1: First Stage Regression of log 12- Month Lagged World Cocoa Prices on log 6 Month Lagged World Prices

	OLS (1)	OLS (2)	OLS (3)	OLS (4)
(ln)12- Month Lagged Export Cocoa Prices	0.85*** (0.01)	0.76*** (0.01)	0.71*** (0.01)	0.71*** (0.01)
(ln)12-Month Lag Civil Violence Events	-0.02** (0.00)	-0.02** (0.00)	-0.01** (0.00)	
(ln)12-Month Lag Civil Violence Fatalities				-0.00 (0.00)
(ln)GDP per capita			0.15*** (0.01)	0.16*** (0.01)
Corruption			-0.01 (0.03)	-0.02 (0.03)
Inflation			-0.00*** (0.00)	-0.00*** (0.00)
Country Specific Effects	No	Yes	Yes	Yes
Country Linear Trends	No	Yes	Yes	Yes
R ² (First Regression)	0.76	0.78	0.79	0.79
F-Statistic	6544.3	3373.19	3246.82	3400.84

Observations	2376	2376	2376	2376
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Notes: Robust standard errors are shown in parenthesis. Variables not shown include country specific effects and country time fixed effects. *** Significance to the 99th percentile, ** significance to the 95th percentile and * significance to the 90th percentile.

A.2 First Stage Regression of Log-Log model of Export Prices on Civil Violence.

First regression of export prices on civil violence, using an instrument of 12-months lagged export prices.

$$\begin{aligned}
 &6 \text{ Months Lagged Export Cocoa Price}_{it} \\
 &= \alpha_0 + \alpha_1 12 \text{ Months Lagged Export Cocoa Prices}_{it} \\
 &+ \alpha_2 12 \text{ Months Civil Violence Events}_{it} + \alpha_3 \text{GDP per capita}_{it} + \alpha_4 \text{Corruption}_{it} \\
 &+ \alpha_5 \text{Inflation}_{it} + \alpha_6 \text{Country fixed effects}_i + \alpha_7 \text{Country Linear Trends}_{it} + \epsilon_{it}
 \end{aligned}$$

Appendix Table 1: First Stage Regression of log 12- Month Lagged Export Cocoa Prices on log 6 Month Lagged World Export Prices

	OLS (1)	OLS (2)	OLS (3)	OLS (4)
(ln)12- Month Lagged Export Cocoa Prices	0.84*** (0.02)	0.69*** (0.02)	0.67*** (0.03)	0.67*** (0.03)
(ln)12-Month Lag Civil Violence Events	0.01** (0.00)	-0.02** (0.00)	-0.01** (0.00)	
(ln)12-Month Lag Civil Violence Fatalities				-0.002 (0.00)
(ln)GDP per capita			0.12*** (0.02)	0.12*** (0.02)
Corruption			0.01 (0.04)	-0.01 (0.04)
Inflation			-0.00 (0.00)	-0.00 (0.00)
Country Specific Effects	No	Yes	Yes	Yes
Country Linear Trends	No	Yes	Yes	Yes
R ² (First Regression)	0.74	0.76	0.77	0.77
F-Statistic	2913.19	768.28	649.65	669.49
Observations	2376	2376	2376	2376

Notes: Robust standard errors are shown in parenthesis. Variables not shown include country specific effects and country time fixed effects. *** Significance to the 99th percentile, ** significance to the 95th percentile and * significance to the 90th percentile.

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