Foreign Perception of Sovereign Risk: An Event Study of the Colombian Armed Conflict*

Andrés Castañeda† ‡

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Abstract

This paper studies the relationship between some of the most important recent events of the Colombian armed conflict and the foreign perception of risk of investment, as measured by the Credit Default Swap (CDS) for the Colombian government. Combining two recent methodologies I estimate the *causal* effect of conflict events widely publicized by the international media on the CDS. I construct a synthetic control group to use as the non-conflict counterfactual of the actual Colombian CDS and compare its behavior around conflict-event days with that of the actual (conflict-affected) Colombian CDS. Results suggest that the impact of conflict on the foreign perception of risk depend on on the specifics of each event: Some events are perceived as good and some other as bad investment signals by foreign investors.

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†Universidad del Rosario, e-mail: r.andres.castaneda@gmail.com

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1 Introduction

Violent conflicts have numerous effects on affected countries, their neighbors and the whole world. There are reasons to believe that armed conflicts have also effects on the financial markets, for instance, the conflict might affect the risk perception of the foreign investors. This paper assesses the effect of conflict on the foreign perception of sovereign risk using recent milestone events of the Colombian armed conflict as case studies.

The Colombian armed conflict has been one of the world's longest civil wars and it is still ongoing. This study focuses on the main events of the last two years of conflict. Examples include the death of Raúl Reyes, one of the most important leaders of the biggest insurgent group in Colombia, FARC (from the Spanish *Fuerzas Armadas Revolucionarias de Colombia*, Revolutionary Armed Forced of Colombia); the release of political hostages; and the rescue of Ingrid Betancourt, a top politician with international ties. These events arguably shaped the Colombian risk perception of foreign investors and the confidence in the Colombian economy. I focus the analysis on four landmark events and analyze their effects on the financial markets and the foreign perception of sovereign risk.

To this end I use a methodology called Cumulative Abnormal Returns (CAR), popularized by Campbell et al. (1997). *Abnormal* returns are the residuals computed from regressing an asset's return on its structural determinants. If such regression is well-specified the residuals are expected be *white noise* and hence their cumulative value across out-of-sample periods should be zero. Non-zero CAR are then attributed to specific exogenous events that affect the market and are not captured by the structural regression.

CAR has had widespread applications in the finance literature, specifically event studies and forecasting. MacKinlay (1997) reviews the event study literature on stock markets and concludes that, when the event date is identified accurately, CAR is a technique that performs better than others in observing the impact of certain events on the development of firms' prices. In cases in which the date of the event is not clear or it is partially anticipated by the agents, however, the technique is not as useful. Abarbanell and Bushee (1998) examine the importance of properly obtained *abnormal* returns in order to provide information about the future returns of specific firms and thereby expected earnings for potential investors. Seiler (2000) points to the misuse of the CAR methodology when the variance is not controlled for within the *event window*[1]. This is important

[1] An interval of time surrounding the event date which will be explained below.

as the event itself often induces variance increases that might affect inference. In particular, Seiler suggests that when the variance of the *estimation window*[2] is extrapolated into the event window the null hypothesis of zero *abnormal* returns will be rejected more than it should be.

In addition, I use the *Synthetic Control Group* methodology (SCG) –Abadie and Gardeazabal (2003) and Abadie et al. (2007)– to construct an artificial control group that replicates closely the pre-event behavior of the Colombian financial assets. This allows me to contrast the actual post-event abnormal returns to the counterfactual of what they would have looked like in the absence of the conflict episode, thereby determining whether specific conflict events have had any impact on the foreign perception of sovereign risk.

Abadie and Gardeazabal (2003) first implemented *SCG* as they investigated the economic impact of ETA terrorism in the Spanish Basque Country. For over 30 years the Basque Country was besieged by the violent actions of ETA, leaving behind dozens of terrorist attacks and hundreds of victims. Much of the economic downturn of the Basque Country is attributed to the effect of the terrorism. Using a synthetic region to simulate a conflict-free Basque Country, Abadie and Gardeazabal estimate that the Basque Country had a 10% average drop in GDP per capita due to the ETA terrorism over a 20-year period.

This paper is, however, closer in spirit to Guidolin and La Ferrara (2007) who use CAR to assess the effect of the death of rebel leader Jonas Savimbi on the value in foreign financial markets of diamond firms doing business in Angola. The authors show that, counterintuitevely, Savimbi's death (and the subsequent end of the civil war) drove *down* the price of the incumbent diamond firms, suggesting a *negative* effect of the end of conflict on specific private business. This gives evidence that conflict events may have positive or negative effects on foreign perceptions depending of the the specific of the event. In the case of Angola, Guidolin and La Ferrara argue that Savimbi protected the interest of diamond firms and exerted entry bearriers in exchange for material benefits. Savimbi's death then constituted a sizable threat to the rents that the relationship with the rebels meant for some firms.

Using CAR, Guidolin and La Ferrara compare the *abnormal* returns and the *cumulative abnormal* returns of a portfolio of diamond firms holding concessions in Angola with those of a "control" portfolio contructed using other African diamond mining firms with no investments in Angola. The authors find a 5 percentage points difference in the CAR the two portfolios favoring the control

[2] An interval of time before the event window, not affected by the event, where the structural parameters are estimated. See below.

group.

Other related literature includes Addison et al. (2004), who investigate the effect of social conflict on the financial development on a sample of 79 countries in a cross-country regression setting. According to the authors conflict leads to a poor quality government because of the diversion of resources toward violence and the opposition of several groups to the end of conflict given the high private rents that war creates for some. In addition, they argue that conflict reduces the demand for domestic currency thereby hurting the stock value of domestic firms. The authors argue that these mechanisms weaken the regulation of financial systems in countries experiencing social unrest and hence conflict reduces the social return of financial liberalization. The authors find support to this prediction in the data, as countries with higher levels of conflict intensity are estimated to have lower degrees of financial development.

My findings suggest that, in the case of the Colombian civil war, different conflict events have different mappings in the way the market perceives the investment risk. While hostage rescue or releases are valued positively by the market, the latter do seem to penalize actions that are found objectable by the international community. In particular, I show that both the release of politician Clara Rojas and the rescue of public figure Ingrid Betancourt where positively rewarded by the market. However, the killing of rebel leader Raul Reyes features two opposing effects. While there was a clear hit against the main insurgent group, this came at the expense a diplomatic *impasse* with neighboring Ecuador. My results suggest that these two forces cancel each other out and while the event does generate longer fluctuations of risk assessment, there is no a clear upward of downward trend in the returns after the event.

This paper is organized as follows: Section 2 provides a background on the Colombian conflict and the role in it of the rebel group FARC, and discusses the selection of the specific conflict events to be investigated. Section 3 describes the data and discusses the methodology employed and why the inference provided here can be interpreted as *causal*. Section 4 shows the results and perform a robustness check that point to the important role of the international media in shaping the risk perceptions of international investors. In section 5 I turn to a robustness analysis that checks the relevance of the international media coverage of a certain event on the foreign perception of sovereign risk. The last section concludes.

2 Background

2.1 The Colombian conflict

Colombia has had political violence since its independence in 1819, and there is not a definite date when the current civil war began. Most scholars agree that the murder of politician Jorge Eliécer Gaitán in 1948 was the trigger of a popular violent struggle between the Liberal and the Conservative Parties. During the military dictatorship of Rojas (1953-1957), some of the leaders of several guerrillas were murdered. This contributed to the formation of "independent republics" within Colombia that occasionally carried out assaults, retentions and armed actions in peripheral areas. In 1958 an agreement named "Frente Nacional" (National Front) was crafted by the Liberal and Conservative parties with the purpose of bringing the rivalry to an end and alternating the presidency every four years. This agreement excluded other political actors as the Communist Party, creating dissatisfaction in the "independent republics" especially when the second government of the National Front ordered the army to bring down such republics and take back the sovereign authority in those territories (Bushnell, 1996).

Rebels in one of those republics leaded by Pedro Marín, a.k.a. Manuel Marulanda or *Tirofijo* (Sure-shot) and in association with a section of the Communist Party, responded to the army oppression by creating the FARC. Although there are other guerrilla organizations in Colombia, FARC has traditionally been the strongest rebel organization in Colombia. This study focuses on events involving FARC.

After peace negotiations with the government of Belisario Betancourt (1982-1986) FARC launched the political party "Unión Patriótica" (UP). Based on socialist ideals, UP was supported by other organizations besides FARC. Starting from the second half of the 1980s thousands of members of the UP were murdered by paramilitary forces allegedly supported by the Colombian army. This alienated FARC who grew bigger and stronger, expanding its portfolio of actions from regular rebel-like felonies to terrorizing civilians and looting public and private establishments, kidnapping-for-ransom, extortions and thousands of brutal events like disruption of economic infrastructure including oil pipelines, attacks to government military positions, and bombings and road blocks (Vargas, 2009).

The Colombian conflict is still ongoing despite several efforts of the Government to bring the war to an end. This insurgent group has grown almost exponentially: While in 1978 FARC had

about 850 men, by 1987 there were 6,000 soldiers in its ranks and in 2000 the number of members was around 16,000 (The World Bank, 2003).

Maintaining a rebel group and feeding its members and their families, plus the provision of clothing, shelter and equipment, entails costs and requires access to sources of funding. Insurgent groups like FARC get their financing from extortion rackets and any kind of activity related to the military control on a certain territory (The World Bank, 2003). Indeed FARC has extorted hundreds of politicians, foreigners and civilians. But the group's main source of funding is the management of illegal crops from taxing coca crops and controlling production to processing and export of cocaine and heroine (Mejia and Restrepo, 2010).

2.2 Costs of the war

Armed conflicts entail a number of costs not only for the hosting country but also some times internationally. These costs are theoretically divided in two: direct and indirect costs. Direct costs involve the destruction of physical and human capital as well as the labor force. Indirect costs refer mainly to consequences of second order like wrong allocation of resources, decrease of investment rates, and increase in transaction costs among others (Trujillo and Badel, 1998). This paper analyzes costs involving the wrong allocation of resources.

Direct costs of the Colombian conflict have been estimated using different techniques. Rubio (1995) finds that the internal violence slows the economic growth 2.5% per year. Rubio aggregates the public and private expenditures in defense, justice, security and insurance against illegal activities and estimates the annual cost of these in 15% of GDP. In contrast, Trujillo and Badel (1998) separate the costs of illegal activities into criminal activities and armed conflict. The authors aggregate as costs directly linked with the armed comflict the costs of infrastructure reparation due to damages caused by terrorist attacks, the cost of medical assistance to army soldiers, the present value of future income that the killed in combat will not perceive, and the excess military expenditure. They estimate a gross cost of conflict of around 3% of GDP per year which differs in 12 percentage points to that computed by Rubio (1995). Vargas (2010) explains that the discrepancy between Rubio and Trujillo and Badel is not only due to the different disaggregation of the direct costs of conflict; the discrepancy is also due to the difficulty of classifying several conflict phenomena, the lack of a clear distinction of whether on not some activities are transfers between groups and the complexity of distinguishing the effect of events with different intensities.

The challenge of measuring the costs of the armed conflict is to identify how the economic growth of the country would have been if the conflict had never happened. This calls for a "counterfactual" or comparison group representing the Colombian economic performance in the absence of conflict, as Abadie and Gardeazabal (2003) have for the Basque Country. In this paper I apply the methodology of Abadie and Gardeazabal (2003) to the case of Colombia thereby finding a counterfactual of the foreign perception of sovereign risk to measure the causal effect of conflict events on the financial markets.

2.3 Milestone events

In this paper I consider three of the most relevant political events of the armed conflict in Colombia during the last two years: The release of the hostage Clara Rojas, the rescue of Ingrid Betancourt, and the killing of Raúl Reyes, who was one of the most important leaders of FARC. The choice of these events is based on two criteria: Widespread international media coverage and heterogeneity across events[3]. Following these criteria the selected events are of three different kinds of occurrences: one hostage release, one hostage rescue and the death of one of an important rebel leader. In addition, while the FARC has committed numerous misdeeds over the years, just a handful of them have had wide coverage by the international media and financial institutions, and hence have affected the perception of foreign investors and their decision making. Using the Google news finder I base my choice of events on the amount of news published on the web the day of the event and one and two days later. Table 1 shows the international media spread of the events that this paper considers, which in turn are the top three events in terms of media hits in the last few years.

Event	**t**	**t+1**	**t+2**
Clara Rojas	810	136	67
Raul Reyes	1100	1130	214
Ingrid Betancourt	1040	2310	1550

Table 1: Amount of releted news throughout the word

Clara Rojas is the former campaign director of Ingrid Betancourt's presidential campaign. She and Ingrid were kidnapped by the FARC in February 23^{th} 2002 while they were running their

[3]Heterogeneity of events is important for two reasons: First, foreign investors might perceive different intensities of sovereign risk if the responsible of the event was the insurgent group or the incumbent Government. Second, different kind of events enable the researcher to, on the one hand, quantify and qualify whether or not certain kind of events have any impact on the analyzed series, and on the other hand, measure the disparity of the effects among the events.

political campaign in an are that the army was currently disputing with FARC on the southern part of the country. In 2006, while in custody, Clara Rojas gave birth to her son Emmanuel, who was taken away from her [4]. On December 2007 FARC announced the unilateral release of Rojas and her son using as mediator Venezuela's president Hugo Chavez and the Red Cross. On December 31 FARC accused the Colombian Government of carrying out military operations around the agreed release territory and hence the release was temporally suspended. The Colombian Government claimed that FARC's announcement was not sincere and president Alvaro Uribe accused the FARC of not having the child in custody any longer. On January 2 2008 the Colombian Government verified that the child was being looked after by the Colombian Institute for Family Wellfare. After six years of captivity, on January 10 2008, Clara Rojas was finally freed[5].

Ingrid Betancourt is a Colombian politician and former senator with French citizenship who ran for president in 2002 and was kidnapped by FARC. Betancourt entered politics in 1990, and in 1994 was elected to the House of Representatives. During her captivity, several videos released by FARC revealed her poor health condition. In 2008 there was even a rumor that Ingrid was probably dead[6]. On July 2 2008, the Colombian Government announced in press conference that Ingrid Betancourt, together with 14 other hostages (including three American citizens) had just been rescued from the FARC. The news quickly spread through the whole world because of the role France had played during her captivity.

Finally, Luis Edgar Devia, a.k.a. Raúl Reyes, was the spokesperson and one of the leaders of FARC. He was accused by the Colombian and United States Governments of production, manufacture, and distribution of hundreds of tons of cocaine to the world, mainly to the United States. He was also credited for expanding FARC's drugs trafficking and raising funds for the organization, in addition to be involved in several murders of civilians[7]. On March 1 2008, Reyes was killed during a military operation in Ecuadorian territory near the border with Colombia. The Colombian Government reported that the operation was carried 1.1 miles inside Ecuador on a guerrilla camp and that Reyes and 16 other guerrillas were killed in the operation[8]. But the Ecuadorian Government

[4] The New York Times (January 10, 2008), *2 hostages are released by the Colombian Guerrillas.* Available in http://www.nytimes.com/2008/01/10/world/americas/10iht-colom.5.9140992.html?_r=1

[5] El Universal (January 10 of 2008), *Confirma análisis de AND que Juan David es Emmanuel* Avialable in http://www.eluniversal.com.mx/notas/473214.html.

[6] ADN (September 11, 2007), *Ingrid Betancourt, una vida truncada*, Avialable in http://www.adn.es/mundo/20071130/NWS-0991-Colombia-Betancourt.html

[7] BBC News (march 1, 2008), *FARC aura of invincibility shattered*, Available in http://news.bbc.co.uk/2/hi/americas/7273320.stm

[8] Telam (March 17, 2008), *El Colombiano muerto en el ataque a las FARC no fue abatido por la organización*, Available in http://www.telam.com.ar/vernota.php?tipo=N&dis=26&sec=5&idPub=97483&id=216742

claimed that the military attack was actually carried 1.9 miles from the border and that it resulted in 20 casualties. The president of Ecuador went on and said that the Colombian aircraft entered 6.2 miles inside his country, followed by troops and helicopters. President Correa claimed that the sovereignty of Ecuador had beed violated. Venezuela's president Chavez also criticized Colombia's military operation and broke diplomatic relations recalling the diplomatic personnel from the embassy in Bogotá[9].

3 Data and Methodology

The data used for the estimation was obtained from the Bloomberg Platform and all the variables have daily frequency from January 2 2006 to September 23 2009. Besides the required Colombia data, in order to construct the synthetic control group that served as counterfactual, I used information on six additional countries: Argentina, Brazil, Chile, Ecuador, Peru and Mexico. While I decided to limit the universe of potential controls to Latin America, the actual choice of countries was constrained by the availability of comparable information.

The dependent variable in my analysis is the *Credit Default Swap* (CDS). The CDS series features end-of-week seasonality, which was corrected by making the relevant differentiation (Δ_7) to make the time series stationary. Other variables included in the CAR analysis to compute the *abnormal* CDS were the exchange rate of each currency against the dollar and the EMBI. These, which I will discuss further in subsection 3.1, are also not stationary and this was corrected by taking first differences (Δ_1).

One potential way to assess the effect of violent conflict on the foreign perception of sovereign risk is by looking at the evolution of sovereign bonds issued in the domestic market in either local or foreign currency (the latter, called Brandy Bonds, avoid the exchange rate risk and the concentration inherent to the former). By doing so one can presumably compare the bond's price before and after the conflict event and assign any significant difference to the event itself. One problem of this approach, however is that political turmoil is likely to affect the entire domestic market and hence its specific impact on debt instruments traded by international investors cannot be isolated.

[9] El Mundo Internacional (March 3, 2008), *Correa: "No permitiremos que este hecho quede en la impunidad"*, Available in http://www.elmundo.es/elmundo/2008/03/03/internacional/1204515279.html

The confounding effect of the systemic risk of the domestic market can be avoided by analyzing a market that incorporates the sovereign risk perception while trading local debt-related instruments in international markets. One such financial figure is the CDS, a two-sided insurance that allows the contracting agents to trade or hedge the default risk of a specific entity or country. In it, the seller assumes the risk and the buyer pays the insurance (Weistroffer, 2009)[10]. Since the CDS embeds the sovereign risk perception of a country it follows that the occurrence of political turmoil in such country will affect the CDS-transaction price. If the event is interpreted as *good news* by foreign investors the perceived risk will be lower and the price of the CDS will drop. On the contrary, if the event is perceived as *bad news* foreign investment the price of the CDS will rise. There is empirical evidence that the CDS price is closely correlated with the sovereign risk perception: Blanco et al. (2004) find a significant statistical association between the investment-grade bonds and the CDS and suggest that the latter helps explaining around 80% of the credit risk.

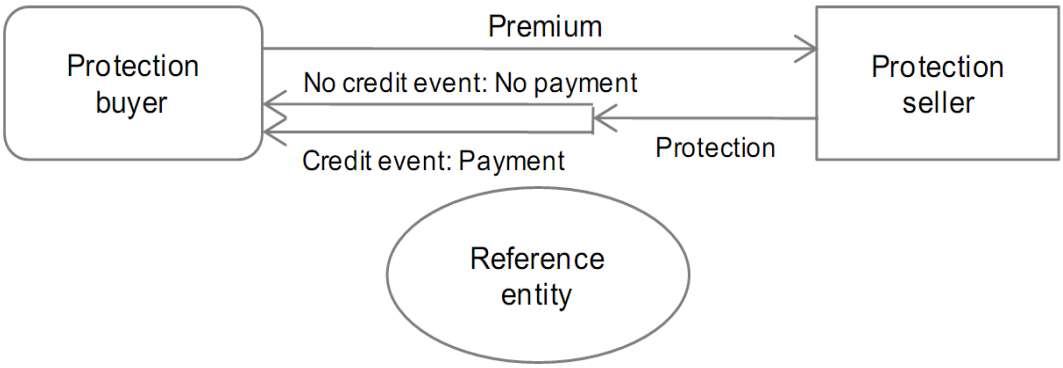


Figure 1. source: Deutsche Bank (2009)

In this paper I use both SCG and CAR methodologies. Using the information of several other Latin American countries I first construct a synthetic Colombian CDS that, while replicating the actual CDS, will not be affected by the political events in consideration. This serves as control group and provides a counterfactual against which to compare the actual post-event CDS behavior in order to determinate whether the conflict had a significant impact on financial markets. This is formally done with the CAR methodology that checks the *cumulative* post-event deviations of the *abnormal* CDS. The latter is obtained by computing the residuals resulting from a regression

[10] Formally, the CDS is a swap-type credit derivative in which the buyer agrees to pay fixed premium on a notional principal (e.g. a government bond) to the seller for a period of time until a pre-defined event occurs or until the contract matures. In exchange the buyer receives from the seller a payoff that is contingent on the occurrence of such event (e.g. a default, a bankruptcy, a falling credit rating, a political event, etc.) (Hull, 2003). See figure 1 for a graphical summary

of the CDS on the structural variables that effect its behavior: an auto-regressive structure; the exchange rate; the EMBI, an index of the performance of emerging markets world-wide; and a set of dummies that capture idiosyncratic non-conflict political events that are likely to affect the foreign perception of sovereign credit risk. The resulting residuals are then the *abnormal* CDS and, provided the structural model is well specified, these are expected to be *white noise* so that their cumulative value over a few days should not be significantly different than zero. Any cumulative deviation around a specific event-date is then consequence of the event. Lack of comparable cumulative deviations in the synthetic control group should confirm this is the case.

3.1 Synthetic Control Group

Researchers are often interested in the effect of a policy or intervention on a specific population. Examples include the intake of a new medicine and the supply of certain learning tools to school-children in poor villages. The challenge is to find (*unaffected*) control units with the same observable characteristics as the treated ones. When only one unit is treated, Abadie et al. (2007) identify two challenges to find a control group: On the one hand there is uncertainty in how to choose the comparison group; on the other, most of the available data are samples of disaggregated units and the inferential techniques measure only uncertainty around aggregated data. The common methods for causal inference try to solve the latter problem but it is still difficult to find a population unaffected by the treatment that approximates satisfactorily the most relevant characteristics of the affected population. The SCG method is one that instead of looking for the single closest comparison group constructs a weighted average characteristics featured by several groups, thereby creating an artificial group which closely matches the performance of the treated group. That is, by allowing several plausible control groups to contribute to the counterfactual, SCG does not limit its search for a comparison to a single unit, but it does end up with a unique control, one that matches the treated group better than any single non-treated unit. Once this is done, one is able to verify how close does the SCG matches the treated in terms of pre-treatment outcomes (Abadie et al, 2007).

Abadie and Gardeazabal (2003) were the first in implementing SCG and they did so to assess the impact of ETA terrorism on the Basque Country's economic performance. They replicate the region's pre-terror performance with economic characteristics of the other provinces of Spain and show that both outcomes differ in a statistically significant way after the onset of terrorism activity

in the real Basque Country.

The aim of this paper is to evaluate whether there is an effect of conflict events in the foreign perception of sovereign credit risk as measured by the Colombian CDS. For this purpose I construct a synthetic *abnormal* CDS thereby replicating the pre-event Colombian abnormal CDS behavior using characteristics of the CDS of other Latin American countries[11].

The residuals estimated from regressing the model specified in (1) are the portion of the CDS of the Colombian sovereign bonds not explained by its traditional structural determinants, called the *abnormal* CDS[12].

$$\begin{aligned}\Delta_7 CDS_{i,t} &= \alpha_i + \beta_{i,j}\sum_{j=1}^{J}\Delta_7 CDS_{i,t-j} \\ &\quad + \gamma_{i,k}\sum_{k=1}^{K}\Delta_1 ER_{i,t-k} + \phi_{i,z}\sum_{z=1}^{Z}\Delta_1 EMBI_{i,t-z} \\ &\quad + \tau_{\text{col}}\mathbf{POL}_{\text{col},t} + e_{i,t}^{CDS} \qquad (1)\end{aligned}$$

This autoregressive model of order j includes two structural determinants of the CDS[13]: $ER_{i,t}$ is the exchange rate of the currency of country i against the US dollar at time t and it is used to take away the exchange rate risk of the emerging market. For example if foreign investors perceive a higher risk of their money in an emerging market, they will take their capital out from that country, hence depreciating the exchange rate. $EMBI_{i,t}$ is the JP Morgan-risk measure for each emerging country, issued daily. This index is used by the investors to assess risk following JP Morgan's own perception which takes into account among other things the total returns of external debt instruments like the Brady Bonds. Note that all the regressors of equation (1) are lagged j periods to reduce endogeneity issues[14]. The matrix **POL** represents a set of dummies that take into account non-conflict political events which might have affected the behavior of the CDS. These dummies guarantee that the abnormal CDS are "cleaner" than what it would be achieved just by including the structural variables in their computation. Finally, $e_{i,t}^{CDS}$ is the difference between the

[11] I specifically use the pre-shock CDS mean and variance. I don't use neither the EMBI nor the exchange rate because these characteristics were already used to estimate the abnormal CDS from equation (1).

[12] The results of the estimation of equation (1) for the Colombian CDS are presented in the appendix (see table 2).

[13] The notation Δ_7 means that the CDS series was corrected for weakly seasonality (recall that the frequency is daily).

[14] However this and other potential sources of bias present in equation (1) are not big concerns as the causal inference does not take place at this stage yet.

predicted and the actual value of the CDS. This is the abnormal CDS, which I will examine to check whether the CDS of the Colombian sovereign bonds (and hence the way risk is perceived by foreign investors in financial instruments) is affected by the Colombian conflict[15].

Using as the main input the abnormal CDS estimated for each country (Colombia and the Latin American control candidates) I go on to build the SCG. Formally, and using the same notation as Abadie and Gardeazabal (2003) and Abadie et al. (2007), Let J be the number of countries used to construct the SGC: in this case $J = 6$ (Argentina, Brazil, Chile, Mexico, Peru and Venezuela). Let $W = (w_1, ..., w_j)$ be a vector of nonnegative weights which add up to one. The scalar w_j is the weight of country j in the SCG. Each vector W returns a different synthetic control and therefore the election of one particular W is the most important task of this step. The finally chosen W must be one that helps replicating as close as possible the actual Colombian CDS, using a weighted average of the other countries' CDS.

Further, let $\mathbf{Y}_{\text{col}}$ be a $(T \times 1)$ vector of abnormal CDS for Colombia from period 1 to period T, and let $\mathbf{Y}_J$ be a matrix of $(T \times J)$ containing the abnormal CDS for all countries in J. The objective is to find the vector W^* which minimizes the difference $\mathbf{Y}_{\text{col}} - \mathbf{Y}_J W^*$. In practice this can be achieved by making the SCG is as similar as possible to the treated one, so W^* must actually minimize the difference $\mathbf{X}_{\text{col}} - \mathbf{X}_J W^*$, where $\mathbf{X}_{\text{col}}$ and $\mathbf{X}_J$ are vectors of covariates for Colombian an the countries in J respectively. That is W^* is the:

$$\arg\min_{w} \left(\mathbf{X}_{\text{col}} - \mathbf{X}_J W\right)' v \left(\mathbf{X}_{\text{col}} - \mathbf{X}_J W\right) \tag{2}$$

$$s.t. \quad \sum_{j=1}^{J} w_j = 1 \quad and \quad w_j \geq 0 \quad \forall\, j$$

where v is a semidefinite diagonal squared matrix that reflects the potential different importance of each characteristic of the abnormal CDS (Guidolin and La Ferrara, 2006; technical appendix).

3.2 Cumulative Abnormal Returns

As in Guidolin and La Ferrara (2007), the estimation of (1) uses two "windows": The *event window* is the period in which the analysis is carried out. Let w_0 be the day of the event, and w the number of periods before and after the event date. Then, the length of the *event window* goes from $w_0 - w$

[15] Empirical comparisons like Zhu (2004) have shown that sovereign bond spreads and CDS spreads move together in the long run.

to $w_0 + w$. This is an interval of time where given the expectations about the event, the impact of the latter on the market is likely to be observed. On the other hand, the *estimation window* is the interval of time in which the regression model in (1) is performed and hence the structural parameters are estimated to compute the abnormal CDS.

Consider the sequence $\{CDS_{i,t}\}_{t=1}^{T}$ of daily CDS prices for country i and let η be the length of the estimation window and ρ the amount of days between the last day of this window and the first day of the event window. Then, the estimation of (**??**) uses data from period $w_0 - w - \eta - \rho$ to period $w_0 - w - \rho$. As mentioned the estimated parameters are used to compute the residuals and hence obtain the abnormal CDS:

$$\begin{aligned} \hat{e}_{i,l}^{CDS} &= CDS_{i,l} - \hat{\alpha}_i - \hat{\beta}_{i,l} \sum_{j=1}^{J} CDS_{i,t-l} \\ &\quad - \hat{\gamma}_{i,k} \sum_{k=1}^{K} ER_{i,l-k} - \hat{\phi}_{i,z} \sum_{z=1}^{Z} EMBI_{i,l-z} \\ &\quad - \tau_{\text{col}} \mathbf{POL}_{\text{col},t} \end{aligned} \tag{3}$$

where $l = \{w_0 - w, w_0 + w\}$ one-period steps. Once the abnormal CDS for Colombia are obtained from (3) and those obtained from the other countries are used to construct the SCG, the abnormal CDS are forecasted into event window using the structural parameters and the realized values of the variables in (1) during the window period. The abnormal CDS both for Colombia and the SCG are in addition added up period by period within the event window to generate the cumulative abnormal CDS. That is:

$$CAC = \sum_{l=w_0-w}^{w_0+w} \hat{e}_l^{CDS} \tag{4}$$

Recall that CAC is predicted to be equal to zero if the event of interest has no effect on the CDS behavior.

4 Results

This section is divided in two subsections. First, I compare the behavior of the Colombian abnormal CDS with that of the SCG before and after the event date. By visually inspecting the outcome of

the treated unit together with that of the obtained SCG one can assess the extent to which the latter is a good counterfactual and also check if there are any divergences between the two after the event takes place. Using the SCG, the second subsection shows the results of the CAR analysis for the Colombian sovereign bonds CDS. As in Guidolin and La Ferrara (2007) I compare the 4-day post-event evolution of the actual Colombian abnormal CDS and the cumulative abnormal CDS against that of their synthetic counterparts.

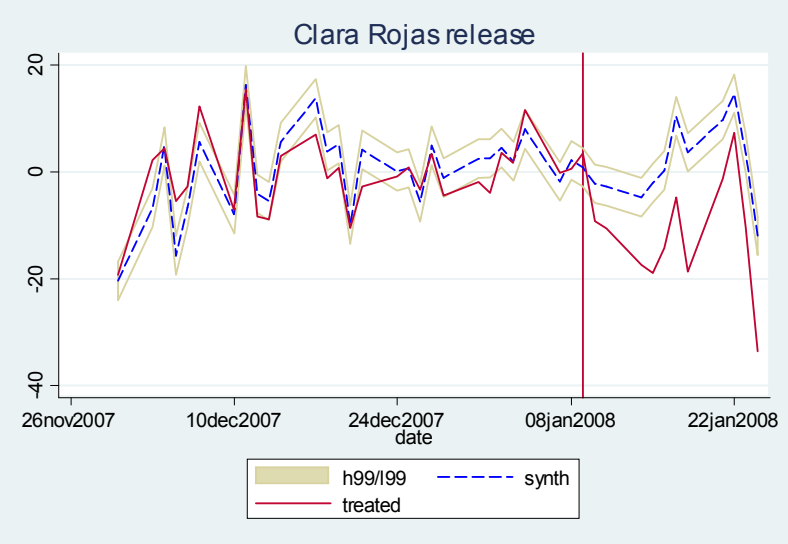
4.1 Synthetic Control Group

Causal inference requires the existence of a comparable control group to assess the effect of a program or shock on a treated group in terms of an outcome of interest. When the treated group is a single unit finding a control unit that looks sufficiently alike is challenging and artificially constructing that unit by combining characteristics of existing non-treated units may be a good way forward. If the synthetic control can map the pre-treatment behavior of the treated unit sufficiently well then any differences arising between the two series after the treatment takes place can be interpreted as the impact on the treated unit.

In this section, for each of the conflict events in consideration I present a picture of the evolution of both the Colombian abnormal CDS and that of the SCG. A vertical line is drawn on the day of the event across the horizontal axis (representing time). Note that the date of the event is different in each picture, which means that the three events of the main analysis are not overlapping, which otherwise would be a confounder of the effect of any single conflict event. The solid line in each figure shows the evolution of the Colombian abnormal CDS and the dotted line its SCG counterpart. The latter features a 99% confidence interval.

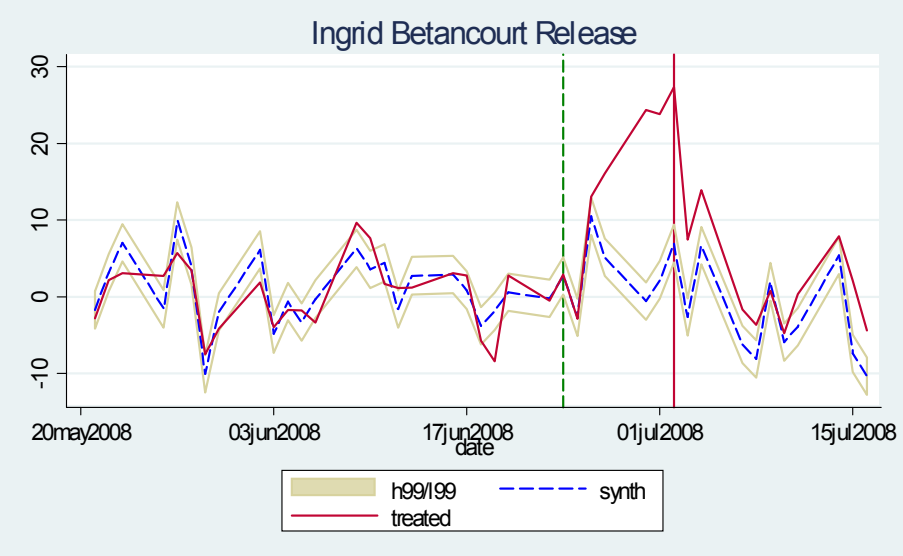
I now tun to the analysis of each event.

4.1.1 Release of Clara Rojas



Clara Rojas was released on January 10 2008. As suggested by the picture the synthetic abnormal CDS matches quite closely the pre-release evolution of the actual Colombian one (the solid line, representing the latter, consistently lies within the confidence interval of the former). However, starting from the event date there is a gap that widens between the synthetic abnormal CDS (which continues to fluctuate around zero) and the actual one, which drops significantly. The lower price of the Colombian CDS in the international markets suggests that Rojas' release was well received by foreign investors who momentarily perceived a lower country-risk. The next section zooms-in over the few days surrounding the event to complete the analysis by looking at the cumulative impact on the abnormal CDS.

4.1.2 Rescue of Ingrid Betancourt



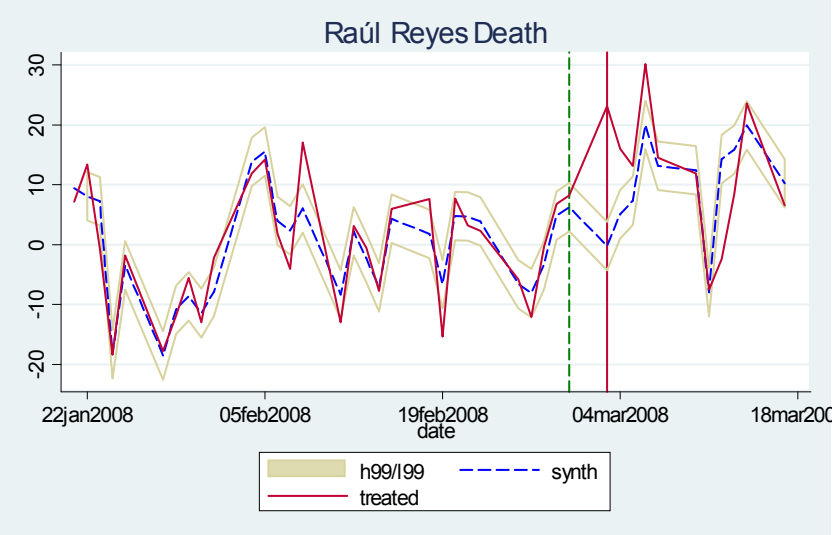
Rojas was kidnapped together with Ingrid Betancourt who was running for president at the time of the abduction. Betancourt was rescued on July 2 2008 (see the solid vertical line), during the now famous *Operación Jaque* carried out by the Colombian army. However, the analysis of this event is more nuance than the previous case: A few days before the rescue, on June 24 2008 (see dashed vertical line) Colombian and Ecuador froze diplomatic relations and threat to halt bilateral trade[16].

The diplomatic impasse shocked the market shortly before the rescue of Betancourt and hence the Colombian abnormal CDS had recently risen, suggesting a higher-than-average sovereign risk perception on the eve of the rescue. In this respect the picture shows that the rescue of Betancourt did have the substantive effect of bringing the CDS price back down, offsetting the risk upward-shift felt by the markets during the previous week, and bringing the abnormal CDS back to the track of the events-absent counterfactual.

These patterns and their cumulative effect around the event day will also be more closely analyzed in the next section.

[16] Canada.com (June 25^{th}, 2008) *Rift grows between Ecuador, Colombia*, available in http://www.canada.com/ottawacitizen/news/story.html?id=33672749-651a-47b7-8f08-1744ea2b2a03

4.1.3 Killing of Raúl Reyes



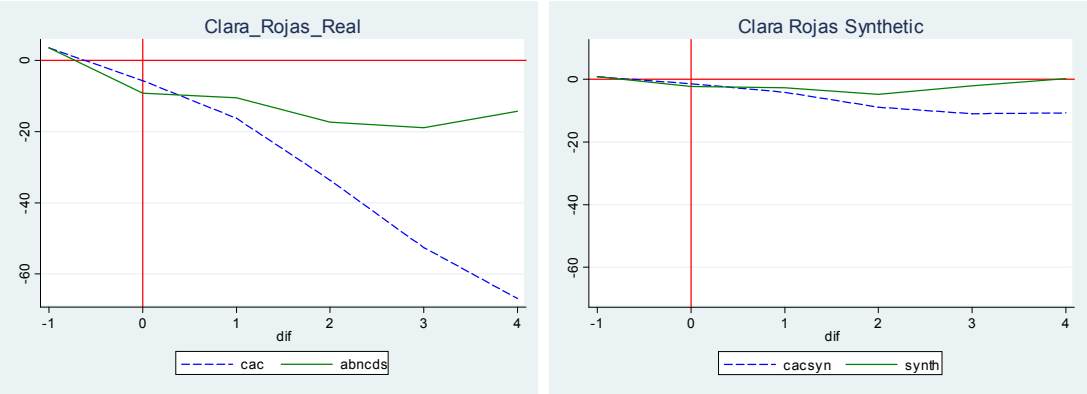
Reyes was bombed to death on March 1 2008. This was a Saturday, a day in which the derivatives' market does not trade. The picture therefore plots vertical lines both on the last transaction day before the event (dashed line) and on the first transaction day afterwards (solid line). The picture shows how the abnormal CDS rises sharply from one transaction day to the next. While this pattern may seem counterintuitive because it conveys a higher risk perception, it suggests that the "good news" to the market of an important military achievement was offset by a set of "bad news": On the one hand, the event constituted hard evidence of previous speculations regarding the presence of illegal Colombian armed groups in foreign territory. On the other hand, during the event itself Colombia violated Ecuador sovereignty by entering its territory and throwing aerial bombs. The picture suggest that the net long-term effect of the event on the foreign perception of risk was negligible, as the Colombian abnormal CDS quickly converges back to the SCG and stays within the confidence bounds.

4.2 Cumulative Abnormal CDS

This section digs deeper into the analysis of the cumulative impact of the conflict events on the CDS market during the days following such event. Recall that the cumulative abnormal CDS are the recursive sum of abnormal CDS over an interval of time. For each of the conflict events in consideration I present a picture of the evolution of both the Colombian abnormal CDS (as well

as its cumulative value) and the two SCG series[17]. Again, the x-axis (representing time) draws a vertical line across the event day and spans from one day prior to the event to four days afterwards (this is the *event window*. The solid line in each figure shows the evolution of the abnormal CDS and the dotted line its cumulative counterpart. I show the results obtained from regressions carried out over an estimation window from 45 days to 5 days before event[18].

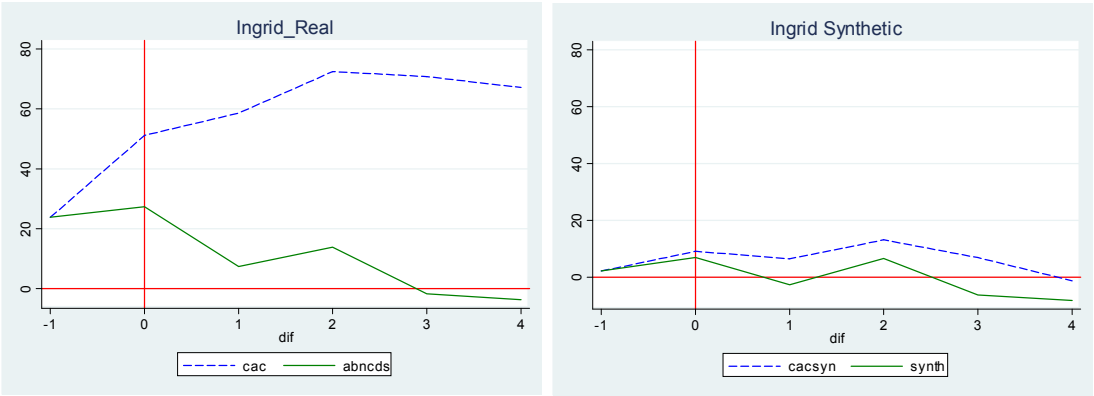
4.2.1 Release of Clara Rojas



Starting around zero, while the actual cumulative abnormal CDS has negative values consistently after the event (solid line, left-hand side), the synthetic one stays around and very close to its expected zero value (solid line, right-hand side). Indeed, at the end of the four-day period the Colombian cumulative abnormal CDS are significantly negative and its value is about seven times larger than the cumulative abnormal CDS of the SCG, which remains close to zero. This is strong evidence that Rojas' release had a positive impact on the markets, reducing the risk perception of Colombia in the credit markets and lowering the price of the country's sovereign bonds CDS.

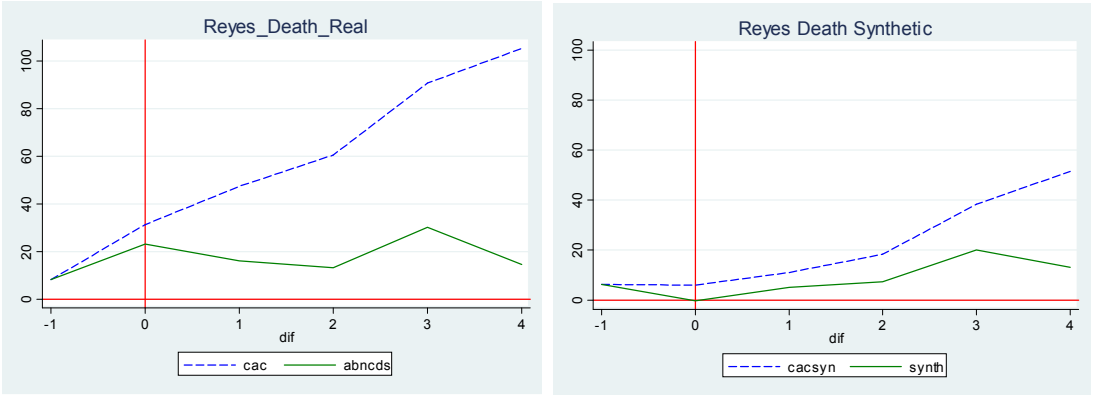
[17] The Colombia (actual) series are on left-hand-side panel and the SCG series are on the right-hand side.
[18] In the appendix I present the results obtained with other lengths of the window.

4.2.2 Rescue of Ingrid Betancourt



As explained in the previous section, the analysis of the effect of the rescue of Ingrid Betancourt is not straightforward. It is confounded by the fact that, just a week before this event, Colombia and Ecuador entered a diplomatic impasse, affecting negatively the credit risk perception of international investors. This is confirmed in the current analysis of the cumulative impact. In contrast to the case of Clara Rojas, the left hand side picture shows that the abnormal CDS starts *above* its expected value of zero before the rescue took place. It, however, bounces back after the vent so that the line of the cumulative abnormal CDS of the Colombian bonds decreases its slope and it turns negative after the second post-event day, when it starts to offset the previous pattern. again the evolution of the SCG on the right hand side suggest that none of this happened to the control group that complies with the expected fluctuation around zero and no significant cumulative effect.

4.2.3 Killing of Raúl Reyes



In the case of the Reyes' killing a consistently positive abnormal CDS results in a large and poistive cumulative abnormal CDS at the end of the forth day. While one would be tempted to

interpret this as evidence that this event had a negative impact on foreign risk perception, the analysis of the SCG on the right hand side limits this interpretation. Indeed, while half as large in terms of magnitude, the synthetic series do follow the same pattern as the actual (treated) Colombia ones. This suggest that there were probably other simultaneous forces affecting the risk rankings of the whole region during those days, and hence that part of the increasing risk found for Colombia was actually a regional Latin American phenomenon. This is confirmed by looking back at the Reyes-relevant figure of the previous section, in which the days around the even coincide with an upward shift of both the actual and the synthetic series.

5 Robustness

The appendix reports results figures obtained from using different length estimation windows. This exercise corroborates that the main results are robust to using different time-spans to estimate the structural parameters of CDS determinants used to compute the abnormal CDS. In particular the appendix reports results coming from estimation windows 50 to 10 days before the event and 55 to 15. There are not substantial changes in the main results. I now turn to a more engaging robustness analysis, one that checks the assumption that conflict events that matter are those widely covered by the international media.

The role of the international media

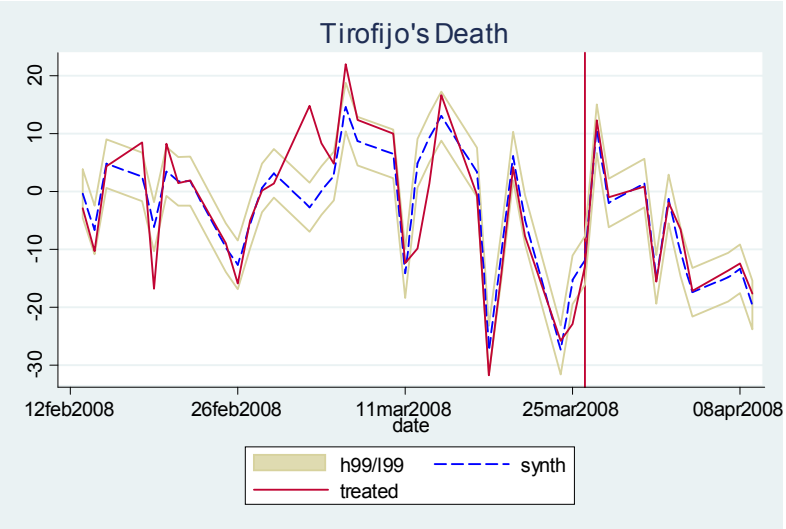
The analysis presented on this paper lies on the assumption that only domestic events presenting widespread coverage by the international media influence the perception of investors in international financial markets. This is regardless of the media coverage that the events receive in the local news. Indeed, international investors' preferences should be shaped by the global news, not by local papers. To corroborate this assumption, and hence give validity to the results discussed, in this las section I perform a falsification test.

As it turns out the death (for natural reasons) of Manuel Marulanda (a.k.a. *Tirofijo* or "Sure-shot"), the main leader of FARC and the group's founder, had very little coverage in the international media, although it was a major event locally.

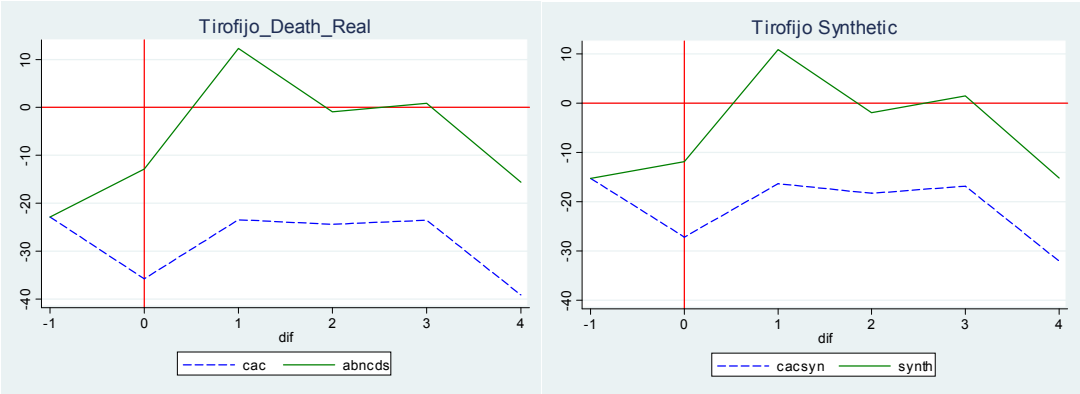
Tirofijo was reported dead on March 26 2008. In contrast to the events studies before (see Table 1) the number of hits reported by Google news on the day of and the days following the

announcement of the event is extremely low. The source reports 16 hits on the same day, and only 2 and 6 on the next day and two days afterwards respectively. Surprisingly, this represents only 2.4% of the news covering Clara Rojas' release and 0.5% of the news on Ingrid Betancourt!

The historical importance of the death of the all-time FARC leader, combined with the lack of information about it in the international press constitutes a rare 'experiment' that can be used to test the assumption that conflict events shape the perception of international markets through the international mass media. This has potentially interesting policy consequences.



The above picture shows a remarkably similar pattern of the actual and the synthetic abnormal CDS both before and after the death of the leader. For the whole period, the Colombian abnormal CDS rarely moves outside the confidence bounds of the SCG. There is absolutely no wedge forming after the event between the two series, indicating that the market did not react whatsoever to the death of the founder of FARC. The figure of the cumulative abnormal CDS below confirms the findings (or the lack thereof), showing no difference between the evolution of the cumulative abnormal CDS and the synthetic counterpart.



6 Conclusion

This papers uses recent techniques in the financial and impact evaluation literature to study the *causal* effect of different types of conflict events on the foreign perception of risk of investment. Risk perception is proxied by the behavior of the *Credit Default Swap* for the Colombian government bonds traded in foreign markets. I find that, depending on the specifics of the event, the market may react positively, negatively, or not react at all. I also show that whether the market reacts at all, in turn depends on whether events have sufficiently widespread international media coverage.

While the inference shown in this paper is mainly visual, it heavily depends on the control group used as counterfactual. This paper uses the SCG methodology developed by Abadie and Gardeazabal (2003) and Abadie et al. (2007) to construct such control group and I show that it does match the pre-shock series quite well.

In terms of specific findings, the release of Clara Rojas seems to have had a positive impact on credit markets, lowering the risk perception and hence the price of the country's CDS. A military intelligence operation resulting in the rescue of Ingrid Betancourt also had a positive effect, offsetting a previous upward trend of the CDS prices, driven by diplomatic and trade issues with Ecuador. However, while similar to Betancourt rescue in terms of military skills and results achieved, the killing of Raul Reyes is shown not to have such positive results. This is arguably because of the offsetting fact that the military initiative actually took place on a foreign country, with no previous official clearance of Ecuador.

This paper is part of the recent academic literature on the economic impact of armed conflict from a sub-national perspective. This approach is promising and the research agenda ahead is vibrant, since it facilitates the use of methodologies for causal inference as the ones used here,

which in turns helps shaping evidence-based policy advice, for which the ultimate goal should be to reduce the incidence of conflict and minimize the negative consequences.

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Appendix

Tables

These are the results of the estimation of equation (1) for the Colombian CDS:

Variable	**Clara**	**Ingrid**	**Reyes**
	CDS_t	CDS_t	CDS_t
CDS_{t-1}	0.998***	0.656***	0.769***
	(0.079)	(0.107)	(0.089)
Exchange $rate_{t-1}$	-0.172**	-0.062*	0.061
	(0.059)	(0.024)	(0.042)
$Embi_{t-1}$	-0.130	0.039	0.127
	(0.163)	(0.099)	(0.156)
Cons	351.102**	105.854*	-117.605
	(120.732)	(42.364)	(82.377)
R-squared	0.85	0.76	0.79

*Notes: Robust standard errors are shown in parentheses. Regressions include dummies to control for non-conflict political events. *** is significance at the 1% level, ** is significant at the 5% level, * is significant at the 10% level.*

Table 2: Model Estimates for Colombia

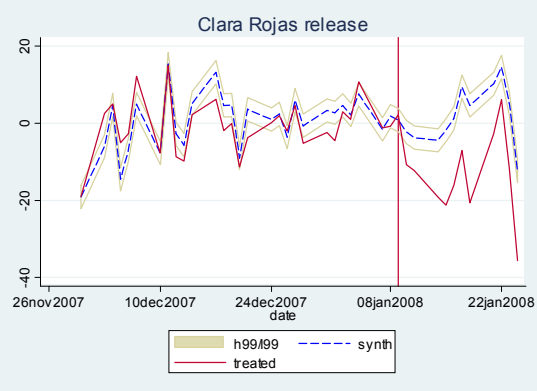
Additional figures

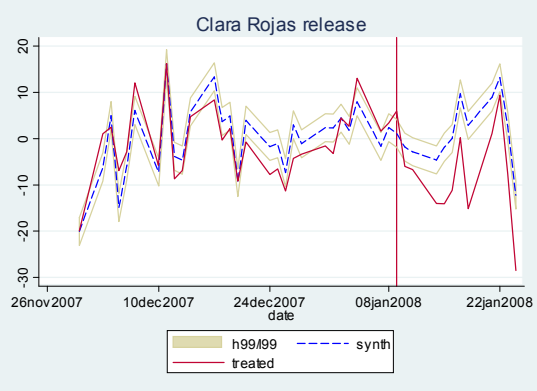
The robustness checks below use different lengths of the estimation windows to estimate the structural CDS parameters from regression model (1), used in turn to compute the abnormal CDS required by the analysis.

Abnormal CDS

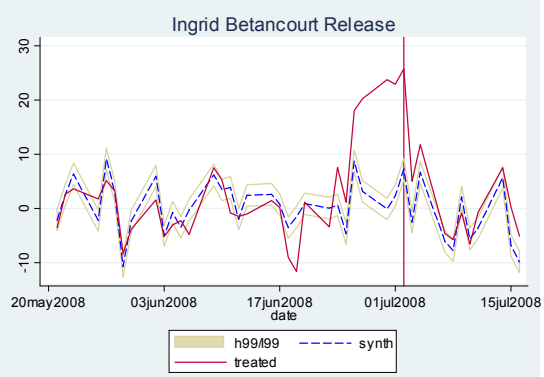
For each event the graph on the left hand side corresponds to the results obtained using an estimation window 50 to 10 days before the event date. The one on the right hand side corresponds to the results using an estimation window 55 to 15 days before the event date. The substantive results explained in the main paper remain largely unchanged.

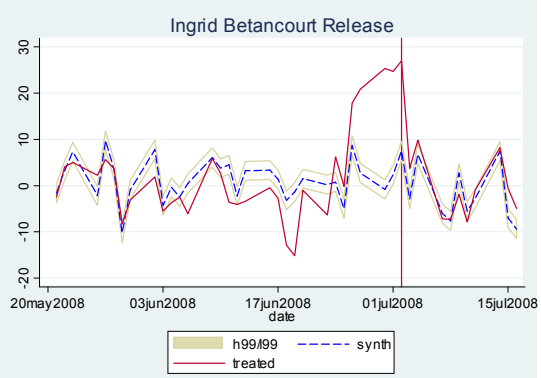
Clara Rojas



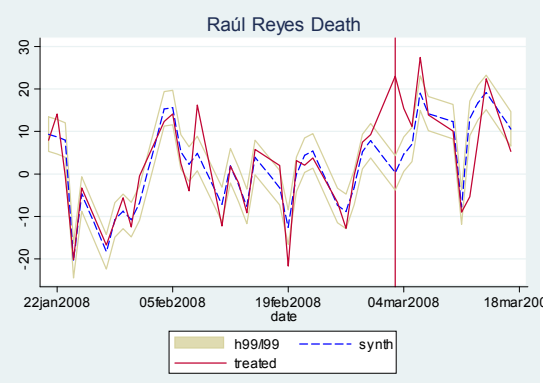


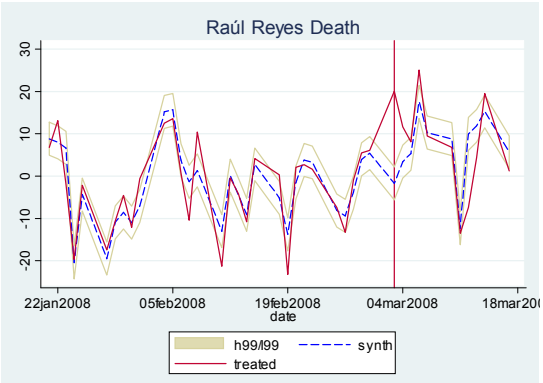
Ingrid Betancourt



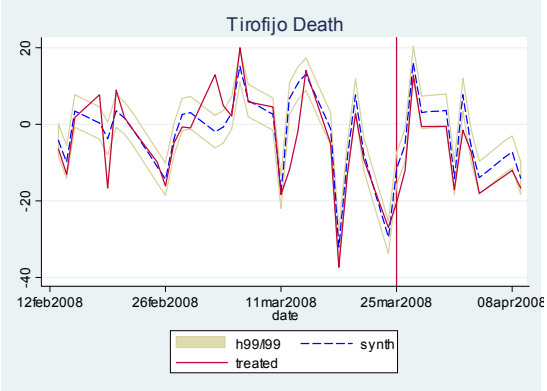


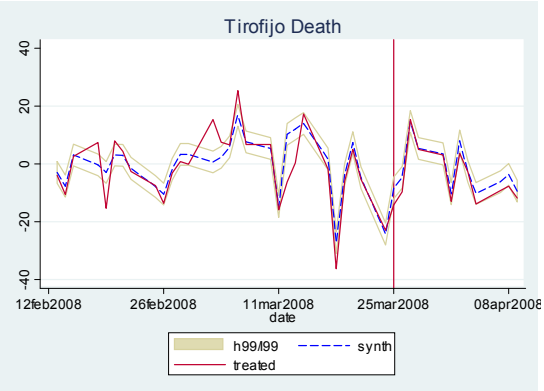
Raúl Reyes





Tirofijo



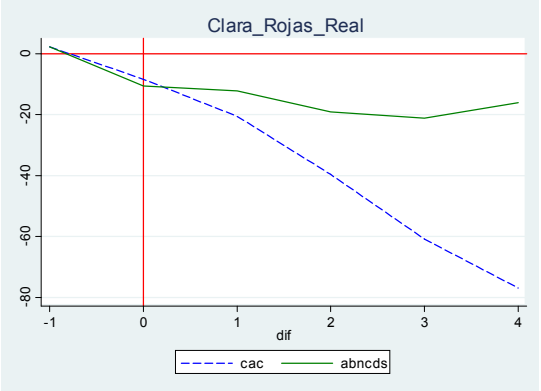


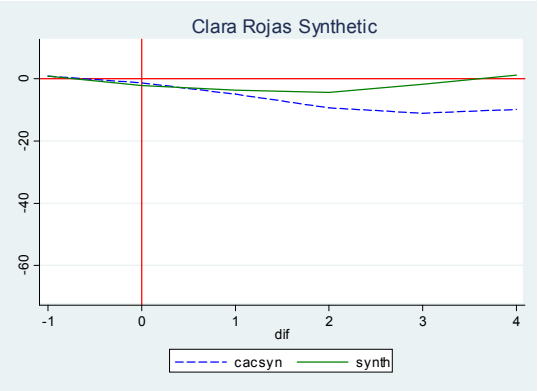
Cumulative Abnormal CDS

As in section 4.2, the picture on the left hand side shows the behavior of the actual abnormal CDS and cumulative abnormal CDS. The one on the right hand side shows the behavior of the synthetic abnormal CDS and the synthetic cumulative abnormal CDS. Again, for each event the first set of pictures correspond to the results based on an estimation window covering 50 to 10 days before the event date, and the second set corresponds to the results based on a window covering 55 to 15 days before the event date. As in the previous case, results are largely unchanged.

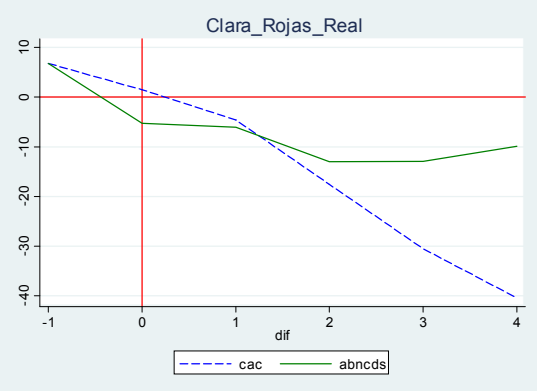
Clara Rojas

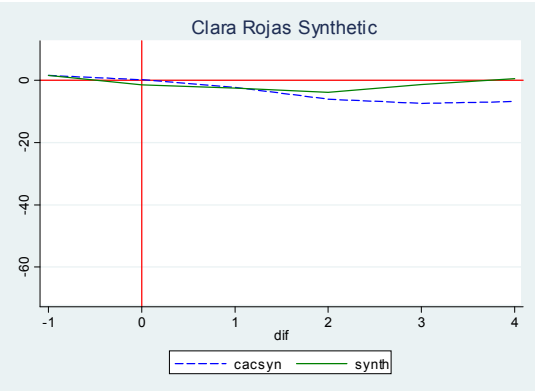
- **50 to 10 day before the event**





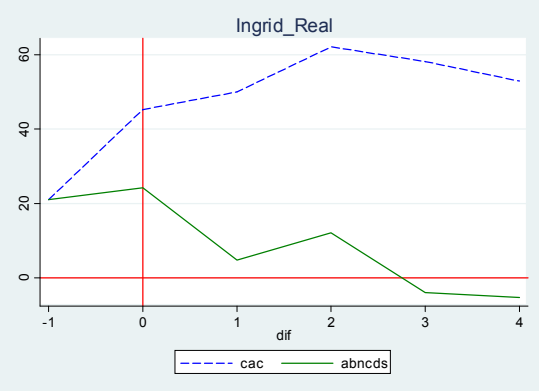
- **55 to 15 day before the event**

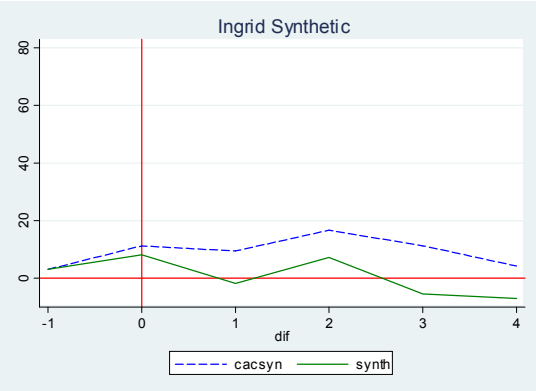




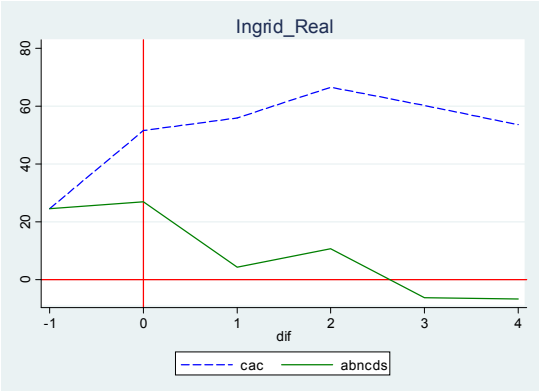
Ingrid Betancourt

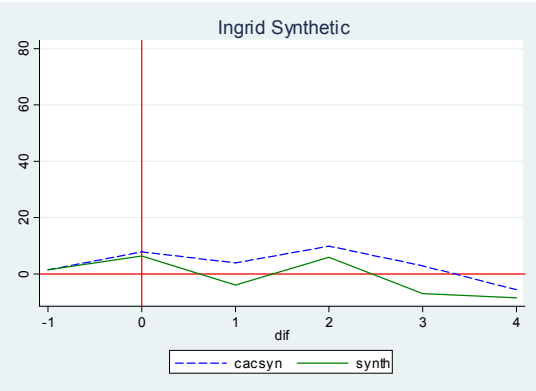
- **50 to 10 day before the event**





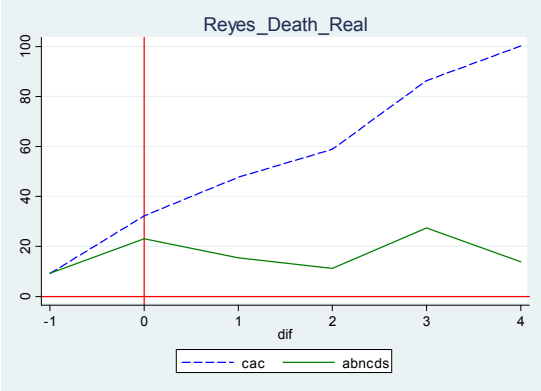
- **55 to 15 day before the event**

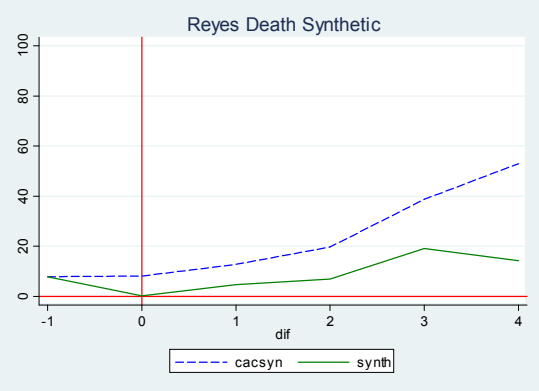




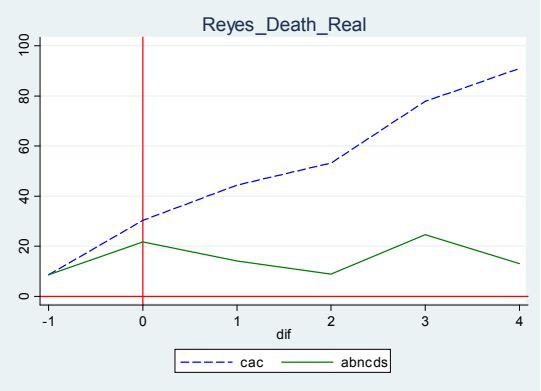
Raúl Reyes

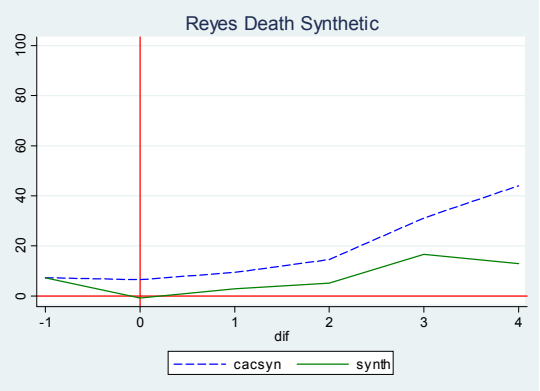
- **50 to 10 day before the event**





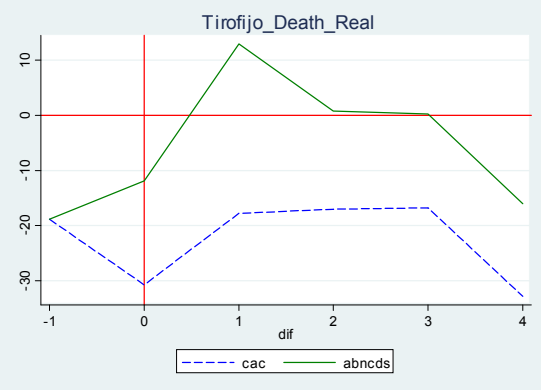
- **55 to 15 day before the event**

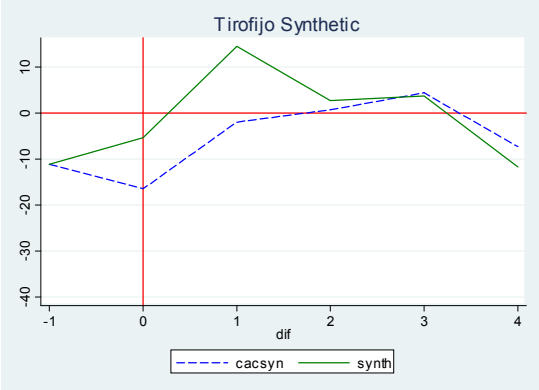




Tirofijo

- **50 to 10 day before the event**





- **55 to 15 day before the event**