El Dividendo de la Paz en Educación

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Motivation

- Civil war is an enormous obstacle to development as it entails large economic and social costs (Goldin and Lewis, 1975; Collier, 1999; Abadie and Gardeazabal, 2003)
- Massive evidence that individuals in conflict-affected areas reduce investment in education (Justino, 2016)...
  - ↓ years of educational attainment (Akresh and de Walque, 2011; Chamarbagwala and Moran, 2011; Fergusson et al., 2019; Ichino and Winter-Ebmer, 2004; Leon, 2012; Merrouche, 2006)
  - ↓ school completion (Shemyakina, 2011; Rodriguez and Sanchez, 2009; Swee, 2009)
- ... with negative long term consequences e.g. lower labor market and health outcomes in adulthood (Akbulut-Yuksel, 2009; Alderman et al., 2006)

Motivation

- Can conflict-affected areas recover from such negative effects when conflict stops?

- Existing evidence on behavioral responses to the end-of-conflict focuses on ex-combatants and veterans (Justino and Stojetz, 2018; Blattman and Annan, 2010; Angrist, 1990)

- What about civilians?

  → **The recent peace agreement in Colombia provides unique opportunity to fill this gap**

This paper

- The effect of Colombia's (pre-agreement) *permanent ceasefire* on school dropout
- Context:
  - Peace process with FARC started in October 2012, after 5 decades of civil war
  - Permanent ceasefire since December 2014 (offensive activities dropped by 98%)
  - Agreement and disarmament 2 years later
- Empirical strategy:
  - Panel of municipalities from 2011-16. Sample: 1092 municipalities $\leq$ 200.000 inhabitants (drops major cities and capital cities)
  - Temporal variation: start of the permanent ceasefire
  - Cross-sectional variation: municipalities affected by FARC violence during 2011-14

Preview of findings

- Significant reduction of 0.8 - 1 pp in school dropout rates in municipalities previously affected by FARC's violence (19% less dropouts)
- Robust to several measures of violence exposure and different specifications
- Recruitment of children decreased in formerly FARC-affected areas (explain up to 9% of the main effect)
- Results are larger in areas more exposed to violence and smaller in areas more exposed to coca cultivation

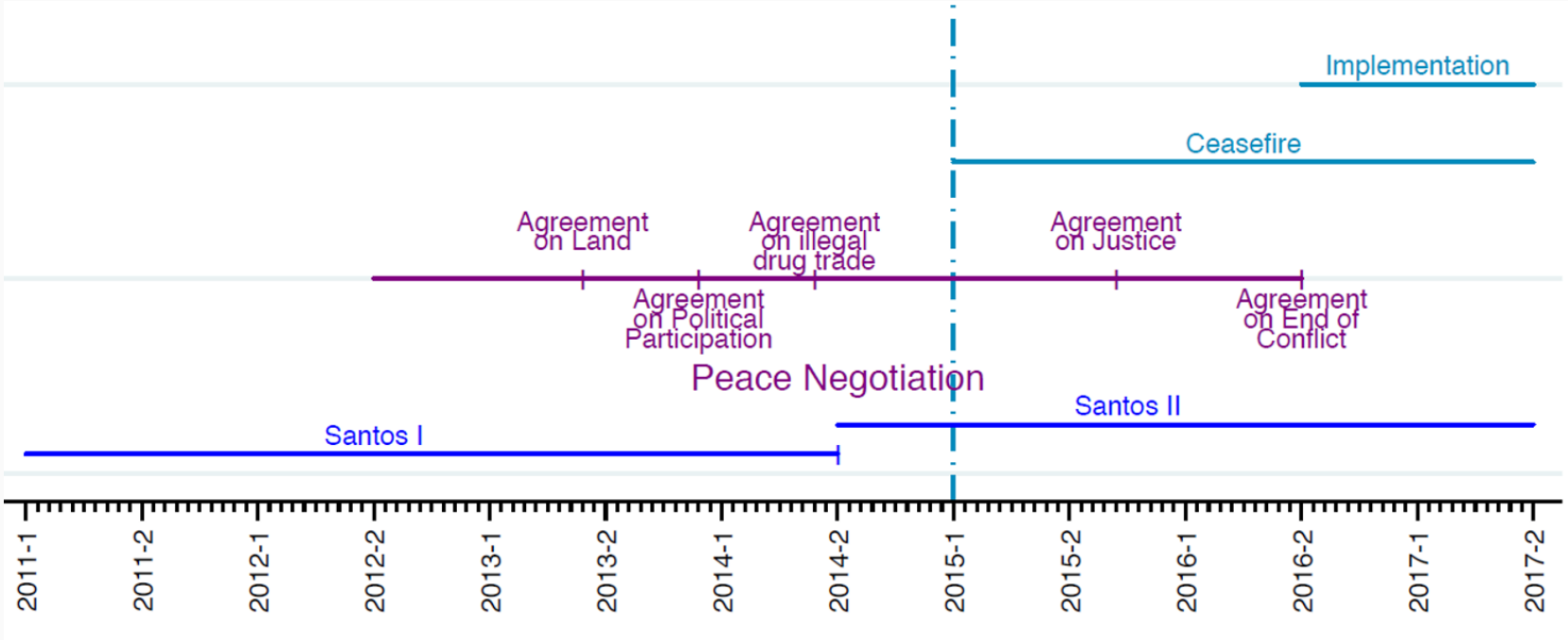
Contribution

- Growing empirical research on micro-level effects of violence mostly focus on long-term educational outcomes (Bruck et al., 2017)
  - Outcomes should not necessarily respond symmetrically to the existence and to the absence of conflict
  - Little research on short-term effects of peace
  - Little research on post-conflict human capital accumulation by civilians

- Growing research on the consequences of Colombia's peace agreement
  - Assassination of local leaders for territorial control (Prem et al., 2019a)
  - Massive deforestation in former FARC-controlled areas (Prem et al., 2019b)
  - Rise and persistence of coca cultivation (Mejia et al., 2019c)

→ This paper provides some silver lining

Context: recent peace process in Colombia



Source: Prem et al. (2018)

Exposure to FARC violence

- Continuous measure: attacks perpetrated by FARC during 2011-2014 per 10.000 inhabitants

- Discrete measure: if number of attacks above the 25th percentile of the empirical distribution among those with at least one attack

Source: violent events recorded in Noche y Niebla reports from the NGO Centro de Investigacion y Educacion Popular CINEP (Restrepo et al. 2004)

Measuring school dropout

- Dropout rate in municipality m in year t

$$Y_{mt} = \frac{\sum_{s=1}^{S_{mt}} d_{smt}}{\sum_{s=1}^{S_{mt}} e_{smt}}$$

d_{smt} : dropouts in school s in municipality m in year t
e_{smt} : enrollment in school s in municipality m in year t
S_{mt} : number of schools in municipality m in year t.

- Weighted average of the school-specific dropout rates using as weights the share of the school-level enrollment over the entire school population of the municipality

Source: yearly administrative school records (Census C600 DANE/MinEdu)

Summary statistics

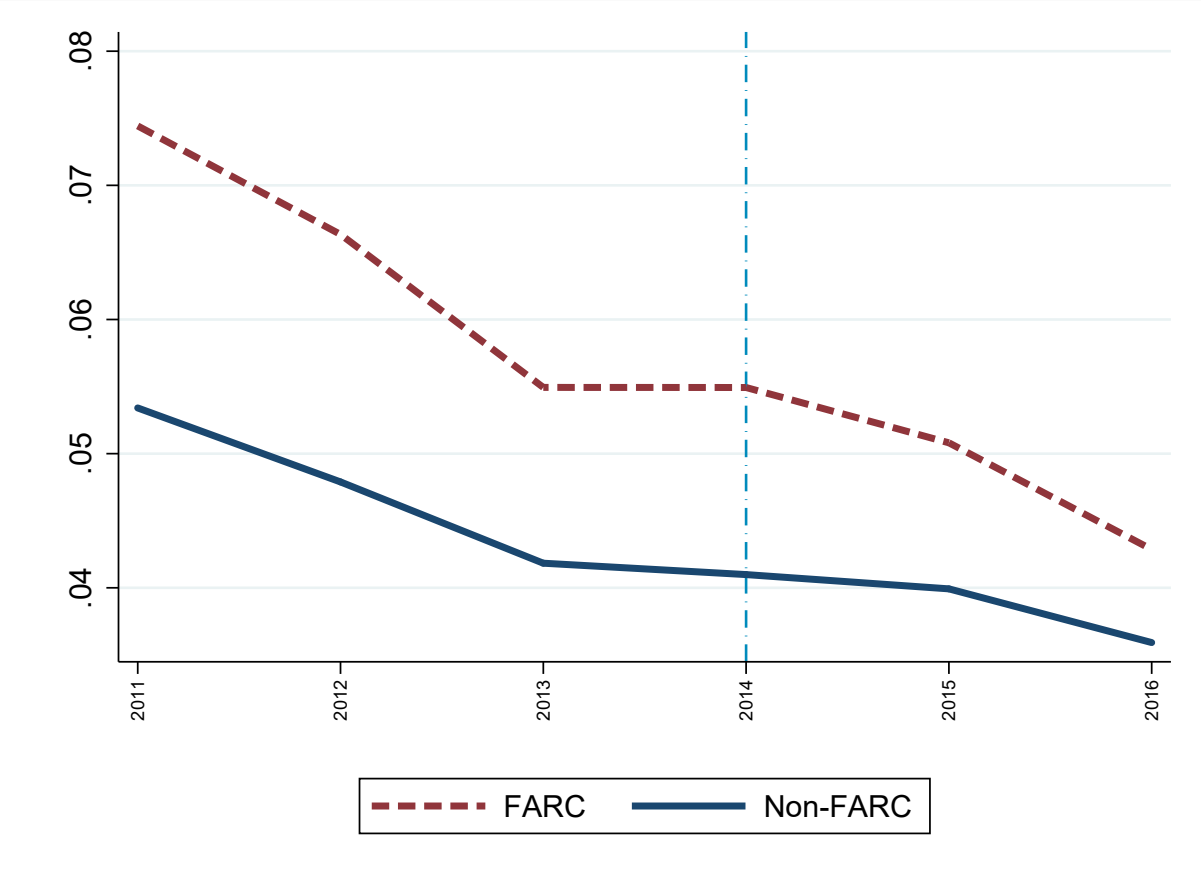
	(1) Mean	(2) Mean (unweighted)	(3) Standard deviation	(4) Median	(5) Min	(6) Max
Dropout rate	4.72	4.72	2.47	4.48	0.00	38.67
Dropout rate (Rural)	5.19	5.10	3.46	4.72	0.00	66.67
Dropout rate (Urban)	4.47	4.35	2.72	4.20	0.00	25.57
Dropout rate (Public)	4.92	4.77	2.48	4.69	0.00	38.67
Dropout rate (Private)	2.06	2.95	4.45	1.04	0.00	73.91
Dropout rate (Primary)	3.92	3.74	2.55	3.57	0.00	38.67
Dropout rate (Secondary)	5.56	5.63	3.03	5.22	0.00	48.15
Dropout rate (Girls)	4.06	4.02	2.26	3.84	0.00	42.31
Dropout rate (Boys)	5.36	5.39	2.77	5.09	0.00	36.73
FARC attacks per 10,000 inhab	0.11	0.12	0.46	0.00	0.00	9.80
FARC presence	0.13	0.09	0.34	0.00	0.00	1.00
Highly exposed to FARC	0.07	0.07	0.12	0.26	0.00	1.00
Rural population	0.45	0.59	0.26	0.45	0.02	1.00
Poverty index	65.24	70.30	19.75	68.77	14.27	100.00
Distance to capital	80.40	82.87	61.11	64.57	0.00	493.08
Population	20,929.17	20,929.17	48,648.88	33,214.00	284.00	199,264.00
Municipalities			1092			

Dropout by exposure to FARC violence before the ceasefire

	(1)	(2)	(3)
		Exposure to FARC violence	
	Avg without FARC	Continuous	Discrete
Dropout rate	4.57	0.34***	1.65***
	(2.45)	(0.06)	(0.18)
Dropout rate (Rural)	4.94	0.58***	2.36***
	(3.38)	(0.10)	(0.28)
Dropout rate (Urban)	4.36	0.21***	1.30***
	(2.70)	(0.07)	(0.22)
Dropout rate (Public)	4.78	0.30***	1.52***
	(2.47)	(0.06)	(0.18)
Dropout rate (Private)	2.03	0.17	0.28
	(4.51)	(0.11)	(0.34)
Dropout rate (Primary)	3.76	0.33***	1.78***
	(2.47)	(0.07)	(0.21)
Dropout rate (Secondary)	5.40	0.35***	1.47***
	(3.02)	(0.07)	(0.21)
Dropout rate (Boys)	3.92	0.31***	1.50***
	(2.23)	(0.06)	(0.17)
Dropout rate (Girls)	5.20	0.37***	1.80***
	(2.75)	(0.07)	(0.20)
Share of rural pop	0.43	0.04***	0.12***
	(0.26)	(0.00)	(0.02)
Distance to capital	77.70	5.58***	23.43***
	(60.16)	(1.63)	(7.50)
Poverty index	63.87	3.64***	12.81***
	(20.12)	(0.46)	(1.31)
Ln population	10.41	-0.04	-0.02
	(0.99)	(0.02)	(0.11)
Municipalities		1092	

Evolution of school dropout rate

Dropout rate by pre-ceasefire exposure to FARC violence



Empirical strategy

- Two sources of variation:
  - Timing of the permanent ceasefire: $Cease_t = year > 2014$
  - FARC-affected municipalities during 2011-2014: $FARC_m$

$$Y_{mdt} = \delta(Cease_t \times FARC_m) + \alpha_m + \gamma_{dt} + \sum_{c \in \mathbf{X_m}} \gamma'(c \times Cease_t) + \epsilon_{mdt}$$

Y_{mdt} : dropout rate in municipality m, department d, and year t.
α_m : municipality fixed-effects.
γ_{dt} : year $\times$ department fixed-effects.
$\sum_{c \in \mathbf{X_m}} \gamma'(c \times Cease_t)$: controls $\times$ post cease dummy.
ϵ_{mdt} : error term clustered at the municipality level.

- Regressions weighted by municipality-level school enrollment in 2014

Main results

Main results

	(1)	(2)	(3)	(4)	(5)	(6)
	FARC attacks per 10,000 inhab			Exposed to FARC attacks		
Cease × FARC	-0.19***	-0.18**	-0.13**	-0.84***	-1.02***	-0.80***
	(0.07)	(0.07)	(0.06)	(0.24)	(0.27)	(0.23)
	[0.01]	[0.01]	[0.01]	[0.00]	[0.00]	[0.00]
Observations	6,523	6,523	6,523	6,523	6,523	6,523
Municipalities	1092	1092	1092	1092	1092	1092
R-squared	0.704	0.735	0.740	0.705	0.737	0.741
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	No	No	Yes	No	No
Dept-Year FE	No	Yes	Yes	No	Yes	Yes
Controls	No	No	Yes	No	No	Yes
Mean DV	4.425	4.425	4.425	4.425	4.425	4.425
SD DV	3.003	3.003	3.003	3.003	3.003	3.003

Dropout or enrollment?

	(1)	(2)	(3)	(4)	(5)	(6)
	Municipality level regressions		School level regressions			
	Enrollment	Dropouts	Dropout rate		Enrollment	Dropouts
Cease × FARC	-0.04	-0.19***	-1.24***	-1.04**	0.00	-0.18**
	(0.03)	(0.07)	(0.43)	(0.49)	(0.03)	(0.09)
Observations	6,523	6,523	140,933	140,933	140,933	140,933
R-squared	0.981	0.903	0.119	0.539	0.971	0.739
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	No	No	No	No	No
Dept-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	No	No	No	No	No
Municipalities	1092	1092	1092	1092	1092	1092
Mean DV	7.589	4.293	4.619	4.619	4.619	4.619
SD DV	1.151	1.420	7.515	7.515	7.515	7.515
School FE			No	Yes	Yes	Yes
Schools			39178	39178	39178	39178

Identification assumption

In the absence of the ceasefire, dropout rates in municipalities formerly exposed to FARC violence would have been evolved similarly to dropout rates in municipalities not exposed to FARC violence

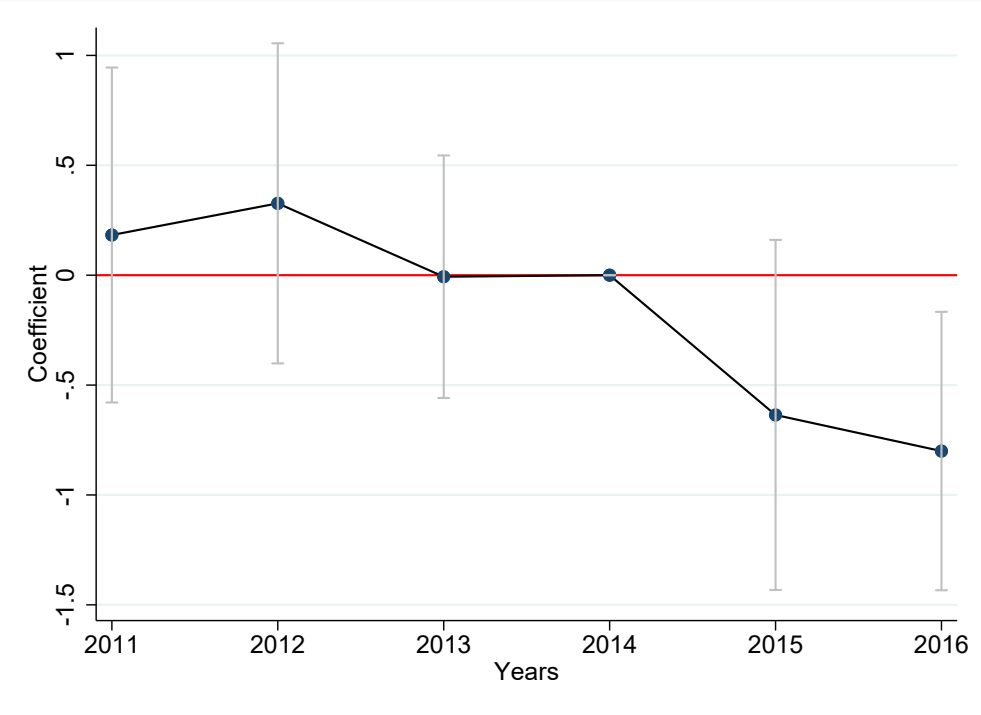
- Parallel pre-trends and dynamics
- Parametric parallel pre-trends ▸ Figure
- Placebo treatment period ▸ Results

Parallel pre-trends and dynamics

Estimate:

$$y_{mdt} = \alpha_m + \lambda_{dt} + \sum_{j \in T} \beta_j (FARC_m \times \delta_j) + \epsilon_{mdt} \quad (1)$$

Point estimates (discrete)



▸ Continuous

Robustness

Robustness

- Alternative measures of FARC violence
  - *FARC presence:* having at least one attack by FARC (extensive margin)
  - Highly exposed defined as attacks above the median
  - Other source for FARC exposure: selective civilian killings by FARC (Centro Nacional de Memoria Histórica - CNMH)
- Control variables and matching
  - Lasso procedure to pick controls
  - Pscore matching strategies
- Alternative comparison group: municipalities exposed to conflict
- Winsorization procedure to account for outliers ▸ Results
- Floor effects: share over pre-ceasefire dropout rate ▸ Results

Robustness

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		FARC measures					Truncate sample based on pscore	
	Extensive margin	Attacks above median	FARC measured by selective killings	Machine learning controls	Pscore × Cease	Municipalities with conflict	10%	3.8%
Cease × FARC	-0.56***	-0.95***	-0.55***	-0.71***	-0.74***	-0.98***	-1.23***	-0.81***
	(0.21)	(0.33)	(0.17)	(0.27)	(0.24)	(0.27)	(0.40)	(0.28)
Observations	6,523	6,523	6,523	6,523	6,523	3,302	1,802	4,366
R-squared	0.736	0.736	0.736	0.739	0.739	0.739	0.749	0.741
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dept-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Municipalities	1092	1092	1092	1092	1092	552	301	730
Mean DV	4.43	4.43	4.43	4.43	4.43	4.73	5.48	4.81
SD DV	3.00	3.00	3.00	3.00	3.00	2.84	3.10	2.98

Mechanisms

Mechanisms

1. Recruitment
2. School supply
3. Victimization
4. Opportunity costs

Mechanisms: recruitment?

- Forced -or otherwise- recruitment by military or armed groups affects negatively the long-term economic performance of child soldiers in terms of skills, productivity and earnings (Blattman and Annan, 2009; Swee, 2015)

- Children are recruited as soldiers, porters, messengers, cooks, helpers and as providers of sexual services (Justino, 2016)

- In Colombia: 16.879 children. FARC accounts for 54% of children recruitment. 68% boys, 76% between 12-16 years old (CNMH, 2017)

- The average recruitment in municipalities affected by FARC before the ceasefire is 3 children. This accounts for 8.5% of our average effect on dropouts (19%$\times$ 187)

Mechanisms: recruitment?

	Victims of recruitment	Recruitment cases
Cease × FARC	-1.27**	-1.17**
	(0.50)	(0.50)
Observations	6,523	6,523
R-squared	0.552	0.608
Municipality FE	Yes	Yes
Year FE	No	No
Dept-Year FE	Yes	Yes
Municipalities	1092	1092
Mean DV	20.29	20.29
SD DV	5.256	5.256

Mechanisms: recruitment?

	(1)	(2)	(3)	(4)
	Student characteristics		School characteristics	
	Primary	Girls	Rural	Public
Cease × FARC × Z	-0.25	0.10	-0.71	-0.52
	(0.25)	(0.12)	(0.68)	(0.61)
Cease × FARC	-0.84***	-1.06***	-0.54*	-0.38
	(0.28)	(0.30)	(0.31)	(0.46)
Cease × Z	-0.10	0.28***	-0.28**	-0.31***
	(0.07)	(0.03)	(0.11)	(0.10)
Observations	12,937	13,046	12,138	8,804
R-squared	0.716	0.736	0.646	0.758
Municipality FE	Yes	Yes	Yes	Yes
Dept-Year FE	Yes	Yes	Yes	Yes
Municipalities	1092	1092	1092	1092
Mean DV	4.354	4.419	4.453	3.934
SD DV	3.530	3.190	3.579	4.027

Mechanisms: school conditions?

	(1)	(2)	(3)	(4)
	School resources		School openings	
	Student-teacher ratio	Teachers	Intensive margin	Extensive margin
Cease × FARC	-0.05	-4.74	0.42	-0.03
	(0.48)	(33.31)	(0.59)	(0.05)
Observations	6,519	6,523	6,523	6,523
R-squared	0.656	0.981	0.368	0.500
Municipality FE	Yes	Yes	Yes	Yes
Dept-Year FE	Yes	Yes	Yes	Yes
Municipalities	1092	1092	1092	1092
Mean DV	20.29	180	0.26	0.12
SD DV	5.26	246.2	2.75	0.32

Mechanisms: victimization?

- Perceptions of insecurity, fear of physical attacks and sexual violence incentivize households to keep children at home

- In Colombia:
  - School facilities were used at different stages of the conflict as supply centers and camping areas by both illegal armed groups and state security forces (CNMH, 2017).

  - Students and teachers faced threats and indoctrination attempts and were exposed to various forms of attacks, being often caught in crossfire (CNMH, 2017).

  - During 2009-2014: 22 homicides of teachers per year. After 2014: 8 homicides (Fecode, 2016).

▸ Mines

Mechanisms: victimization and economic opportunities

	(1)	(2)	(3)	(4)	(5)	(6)
	Municipality characteristics					
			Coca suitability		Coca eradication	
	OAG	Mines victims	Continuous	Discrete	Continuous	Discrete
Cease × FARC × Z	-0.30*	-0.10*	0.65***	1.69***	-0.38***	-2.35***
	(0.17)	(0.06)	(0.24)	(0.40)	(0.09)	(0.47)
Cease × FARC	-0.66***	-0.77***	-1.25***	-2.16***	-0.67***	-0.33
	(0.24)	(0.28)	(0.30)	(0.35)	(0.25)	(0.23)
Cease × Z	-0.13***	0.03	-0.16**	-0.15**	0.12***	0.07
	(0.05)	(0.05)	(0.06)	(0.06)	(0.04)	(0.05)
Observations	6,523	6,523	6,523	6,523	6,523	6,523
R-squared	0.738	0.737	0.738	0.739	0.738	0.739
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes
Dept-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Municipalities	1092	1092	1092	1092	1092	1092
Mean DV	4.428	4.428	4.428	4.428	4.428	4.428
SD DV	3.003	3.003	3.003	3.003	3.003	3.003

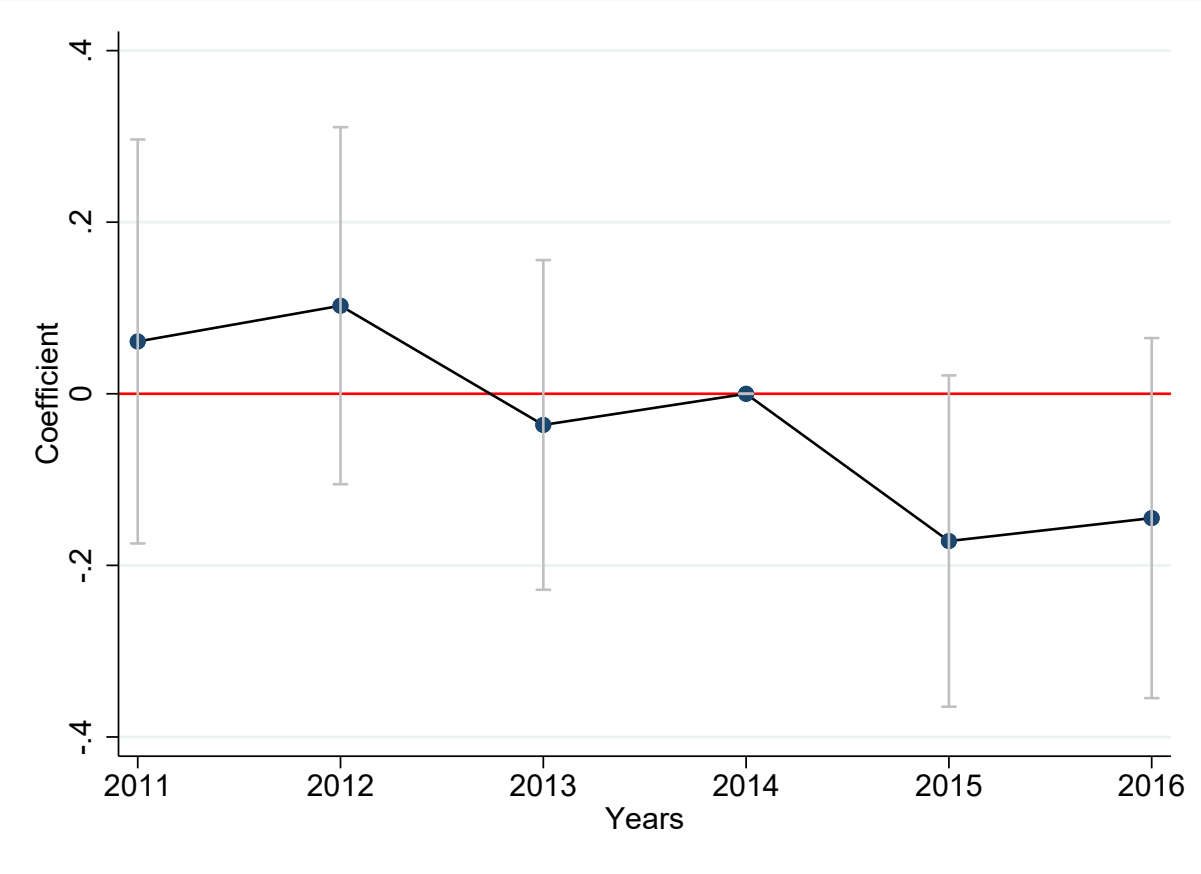
Conclusions

- School dropout rates significantly decreased in municipalities formerly affected by FARC after the ceasefire
- Suggestive evidence this might be mainly explained by a decrease in victimization and less by a reduction in recruitment
- We hope that this highlighted benefits point to the importance of the peace agreement

Thank you!

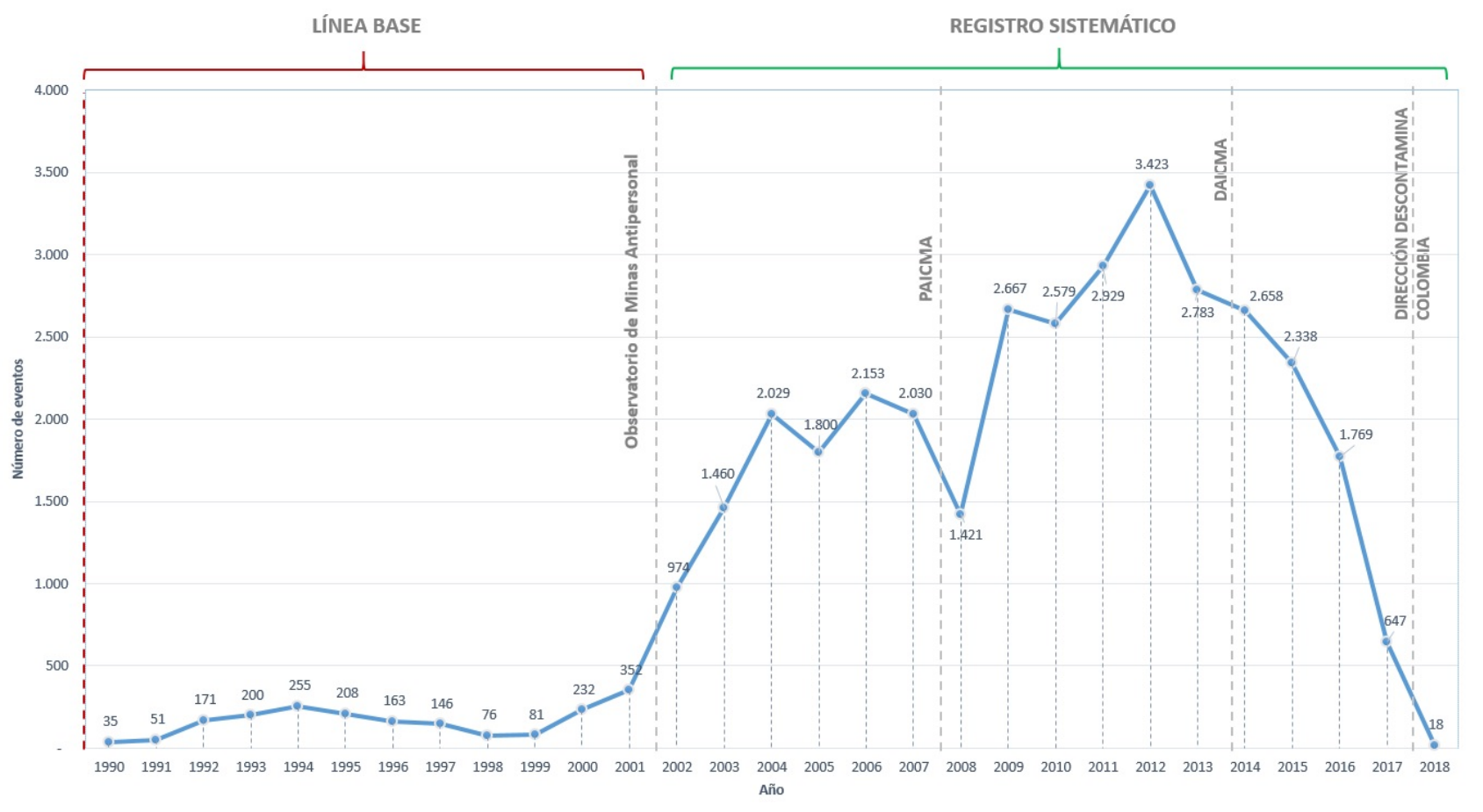
Event study (continuous measure)

Figure 1: Point estimates (continuous)



Back

Evolution of events related to anti-personnel mines



Source: Oficina del Alto Comisionado para la Paz - Descontamina Colombia

Back

Floor effects

	(1)	(2)	(3)
	Relative to:		
	2011	2014	Avg 2011-14
Cease × FARC	-0.12**	-0.18*	-0.12**
	(0.05)	(0.10)	(0.05)
Observations	6,475	6,342	6,523
R-squared	0.565	0.601	0.289
Municipality FE	Yes	Yes	Yes
Year FE	No	No	No
Dept-Year FE	Yes	Yes	Yes
Municipalities	1084	1059	1092
Mean DV	0.915	1.473	0.970
SD DV	0.753	3.120	0.798

Back

Outliers

	(1)	(2)	(3)	(4)	(5)	(6)
	Exposure to FARC attacks			Highly exposed		
Winsorization level:	1%	2.5%	5%	1%	2.5%	5%
Cease × FARC	-0.17**	-0.15**	-0.13**	-0.96***	-0.86***	-0.75***
	(0.07)	(0.07)	(0.07)	(0.26)	(0.26)	(0.25)
Observations	6,523	6,523	6,523	6,523	6,523	6,523
R-squared	0.740	0.745	0.749	0.742	0.746	0.750
Municipalities	1092	1092	1092	1092	1092	1092
Municipiality FE	Yes	Yes	Yes	Yes	Yes	Yes
Dept-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Mean DV	4.425	4.425	4.425	4.425	4.425	4.425
SD DV	3.003	3.003	3.003	3.003	3.003	3.003

▸ Back

Parametric parallel pre-trends

Estimate:

$$y_{mdt} = \alpha_m + \lambda_{dt} + \beta(FARC_m \times Trend_t) + \epsilon_{mdt} \quad (2)$$

	(1) Exposure to FARC attacks	(2) Highly exposed
Linear trend × FARC	-0.03	-0.09
	(0.04)	(0.13)
Observations	4,354	4,354
R-squared	0.755	0.755
Municipality FE	Yes	Yes
Dept-Year FE	Yes	Yes
Municipalities	1092	1092
Mean DV	4.719	4.719
SD DV	3.058	3.058

▸ Back

Placebo Cease

	(1)	(2)	(3)	(4)	(5)	(6)
	Exposure to FARC attacks			Highly exposed		
Placebo Cease × FARC	-0.10	-0.09	-0.09	-0.26	-0.27	-0.27
	(0.08)	(0.07)	(0.07)	(0.31)	(0.26)	(0.26)
Observations	4,354	4,354	4,354	4,354	4,354	4,354
R-squared	0.756	0.786	0.786	0.755	0.786	0.786
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	No	No	Yes	No	No
Dept-Year FE	No	Yes	Yes	No	Yes	Yes
Controls	No	No	Yes	No	No	Yes
Municipalities	1091	1091	1091	1091	1091	1091
Mean DV	4.719	4.719	4.719	4.719	4.719	4.719
SD DV	3.058	3.058	3.058	3.058	3.058	3.058

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