

When a Strike Strikes Twice:
Massive Student Mobilizations, School Incapacitation Effects and Teenage
Pregnancy

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PRELIMINARY DRAFT - DO NOT CITE OR CIRCULATE WITHOUT THE CONSENT OF THE AUTHOR

Outline

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- 2 Data and Measurement
- 3 Context and Descriptive Statistics
- 4 Empirical Strategy
- 5 Results
 - Main Results
 - Robustness Check
 - Heterogeneity/Mechanisms
- 6 Discussion

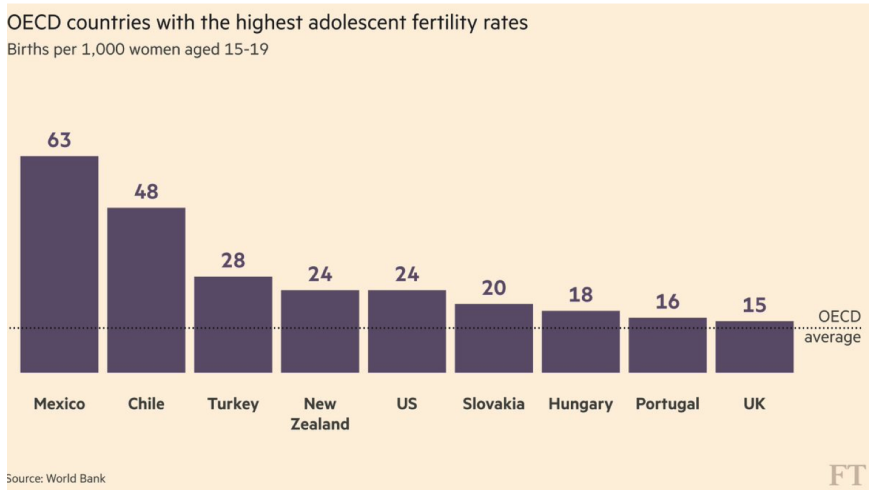
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Introduction

- In this paper, we empirically study the impact of massive school absenteeism on **teenage pregnancy** and explore school incapacitation effects as a possible mechanisms and its consequences on school dropout rates
- Exploiting variation in the timing of nationwide student strikes and variation in adherence to the student movement across schools in 2011, we identify:
 - 1 An economically significant short-run impact of schools closure on teenage pregnancy. A municipality with average-strike exposure experienced an increase of 3% in teenage pregnancies;
 - 2 This might be an important reason behind the large high-school dropout increase observed during that year.

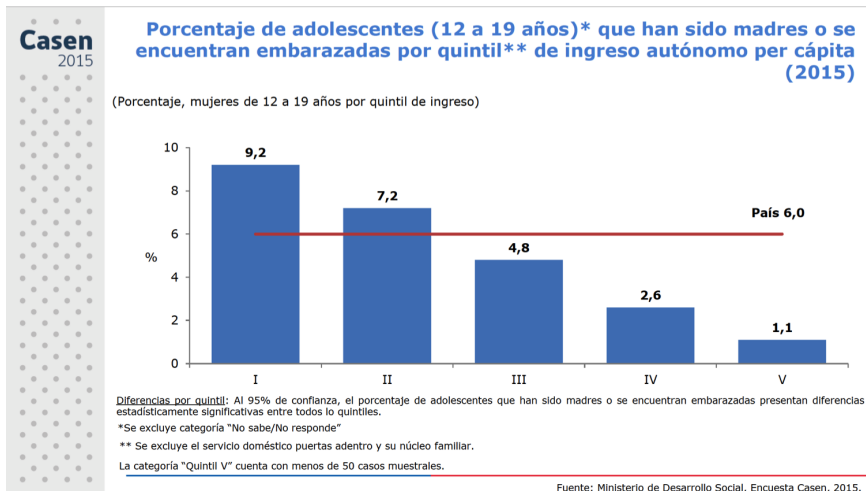
Motivation: Teen pregnancy in Chile vs OECD

Figure: Teen pregnancy rate in some OECD countries



Motivation: Teen pregnancy in Chile

Figure: Teen pregnancy rate by income quintile in Chile



Lit. Review and Contribution

- Risky choices may be the result of making mistakes, excessive myopia, or time inconsistent preferences, among other reasons (Kahneman, 1994)
- Of particular interest when understanding, crime, pregnancy and drug abuse among the youth (Gruber, 2001)

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- Schools can have a crucial role in controlling and educating teens about such risks:
 - (1) Schools may incapacitate students to take risky actions by imposing time constraints and adult supervision
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 - (2) School time also helps educating the young about the costs of taking such risks
- (1) and (2) may explain the empirical findings of schooling effects on crime rates (Jacob and Lefgren, 2003), drug abuse (Griffin et al., 2004), teenage pregnancy (Black et al., 2008) and STDs (Alsan and Cutler, 2013)

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 - We study school closures, and test if they can mitigate the effects of expanding schooling
 - 3 Finally, school effects on risky behavior can exist because of higher human capital but also incapacitation (Anderson, 2014)
 - We look at sudden and momentary (six months) school closures which likely rules out effects of human capital

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Data and Measurement

- Teenage Pregnancy

- ▶ Administrative data on the universe of births and fetal deaths in Chile provided by the Ministry of Health through the Department of Health Statistics (DEIS)
- ▶ We construct high frequency data on conception: the number of teenage pregnancies in a month within a municipality for years 2007 to 2011
 - ★ Date of Conception \approx Birth date - weeks of gestation at birth

- Schooling Data

- ▶ Administrative registries containing enrolment and grade data maintained by the Ministry of Education
- ▶ Dropout variable for student i : $Pr(Enrolled_{i,t+1} = 0 | Enrolled_{it} == 1)$
- ▶ Administrative registries of daily assistance for each student in Chile in year 2011 maintained by the Ministry of Education

Data and Measurement

- Main independent variable: Strike Intensity
- We use alternative measures to classify a school as “being on strike”
 - M1 Extensive review of press releases using Wayback Machine Software
 - ★ Binary variable, =1 if mentioned as being on strike during 2011
 - ★ 14.3% of schools
 - M2 Use daily attendance data from Ministry of Education for year 2011
 - ★ Binary variable, =1 if five or more days lost during August 2011
 - ★ 25% of schools
 - ★ Data does not contain all public schools of the country

$$\text{Average Municipality Adherence}_m = \frac{\sum_{i=1}^{N_m} 1_{i(s)} \text{Strike}_s}{N_m}$$

$$\text{Strike Intensity}_{mt} = I[\text{Strike Period}_t] \times \text{Av. Municipality Adherence}_m$$

- Where i , s , and m denote a female student, school, and municipality, respectively. N_m is the total number of female students residing in municipality m whereas Strike_s is a binary indicator for whether school s was on strike.

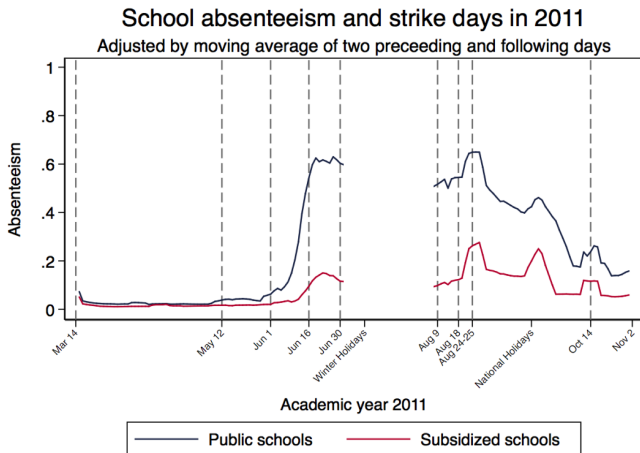
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Context and Descriptive Statistics

- With the hope of influencing policy (and they did) to reform the educational system in Chile, high school and university students - mainly from non-private institutions - first protested on May 12th of 2011
- According to press releases by June 25th more than 600 (out of 10,000 approx) schools adhered to some form of strike
- Strikes in some schools consisted in students taking over school infrastructure and spending day and night inside, impeding any school activities
- The strikes continued during and beyond the winter school break with protests reaching a peak of adherence in late August of 2011, after which the strike started to fade out

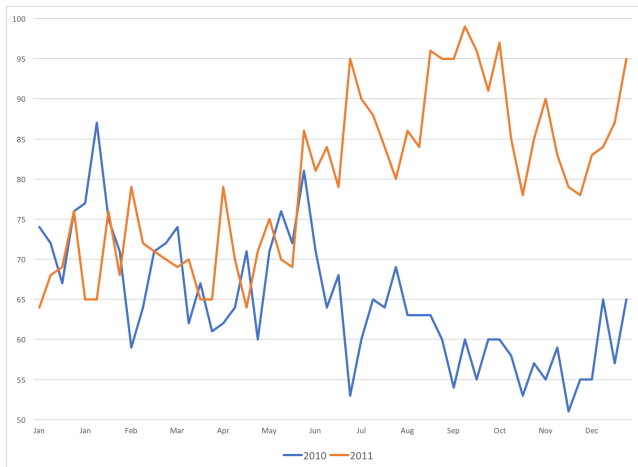
Context and Descriptive Statistics

Figure: Daily Assistance in Moving Average of 2 days during 2011 by Type of School



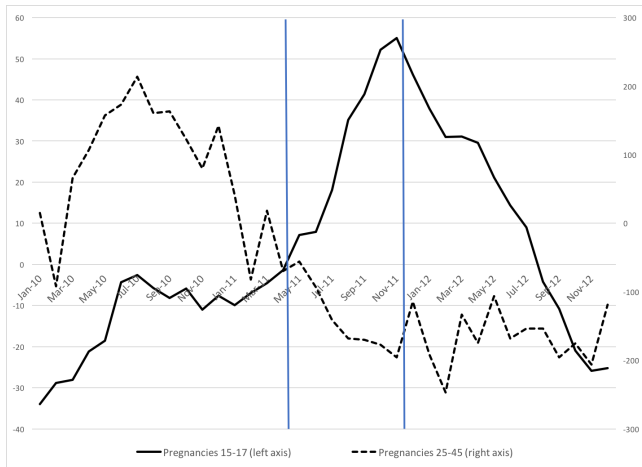
Context and Descriptive Statistics

Figure: Google Search Trends for Term "Pregnant" (Chile, 2010-2011)



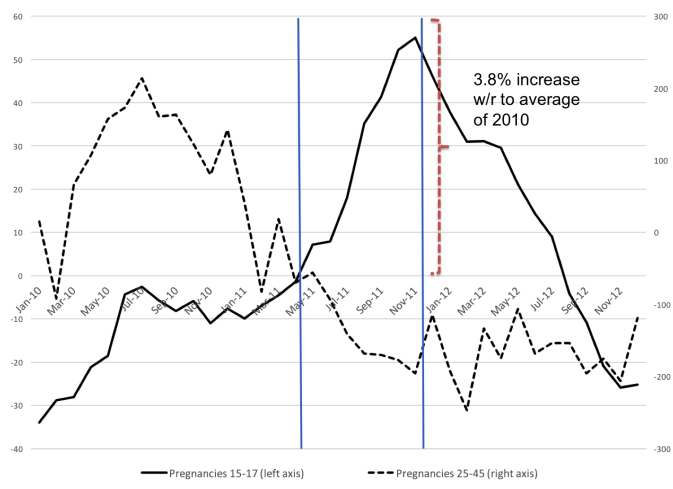
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Figure: Pregnancies by Age Group (detrended 2010-2013)



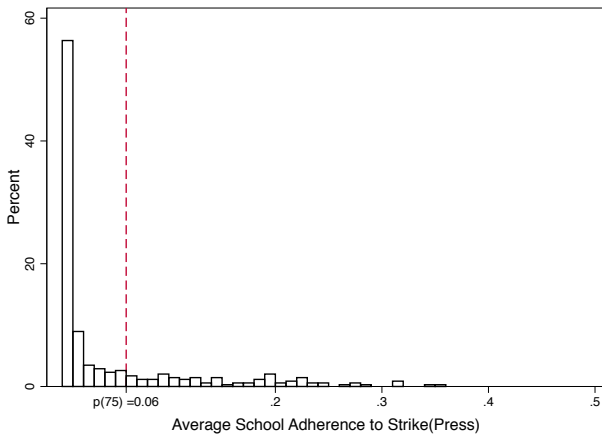
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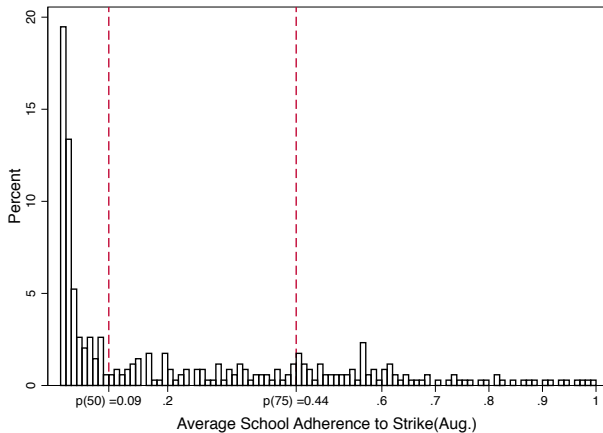
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Figure: Distribution of municipalities according to Average School Strike Adherence (Press.)



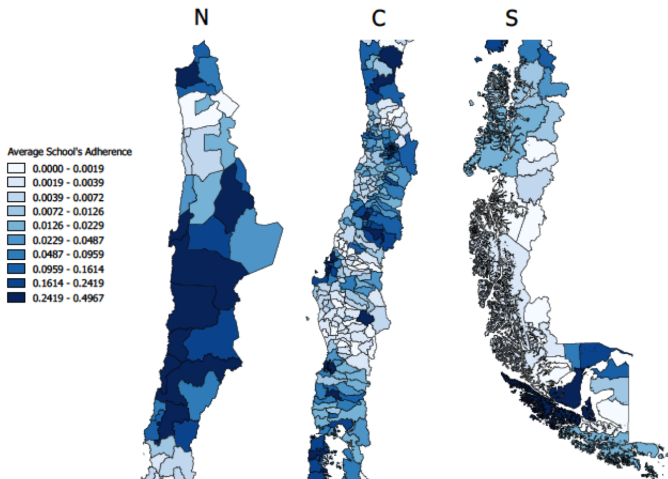
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Figure: Distribution of municipalities according to Average School Strike Adherence(Aug.)



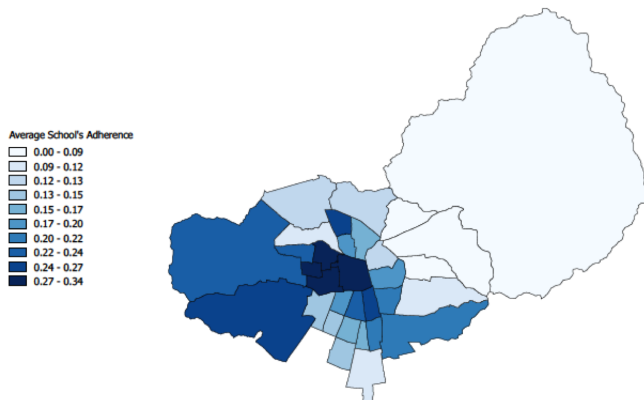
Context and Descriptive Statistics

Figure: Geographic Distribution of Average School Strike Adherence in Chile



Context and Descriptive Statistics

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Context and Descriptive Statistics

Variable	Strike Adherence (Assist.)			Strike Adherence (Press)		
	Low	High	p-value	Low	High	p-value
Teenage pregnancies per 1,000 teens	0.035	0.031	0.340	0.034	0.034	0.946
Monthly school attendance	0.831	0.762	0.000	0.837	0.745	0.000
=1 if Day After Pill available on comuna	0.535	0.581	0.462	0.574	0.465	0.207
Population (1000)	36.402	88.535	0.020	33.950	95.806	0.003
% of female population	0.482	0.479	0.753	0.478	0.492	0.045
Income per capita	222.669	291.661	0.405	244.585	226.669	0.738
% of poor households in municipality	17.422	13.954	0.093	17.233	14.517	0.212
Municipality expenditure per capita	160.412	153.014	0.709	168.990	127.674	0.054
% of pop above 18 years old	0.717	0.713	0.717	0.716	0.716	0.931
% of population Age 14 to 17	0.066	0.065	0.642	0.066	0.066	0.706
% of female population Age 14 to 17	0.490	0.495	0.528	0.488	0.498	0.107
% of population working	0.370	0.391	0.048	0.370	0.391	0.122
% of population with primary education	0.400	0.347	0.057	0.405	0.335	0.002
% of population with high school	0.342	0.356	0.139	0.334	0.378	0.000
% of population with higher education	0.103	0.140	0.131	0.102	0.145	0.002
% of rural students	0.254	0.173	0.059	0.272	0.118	0.000
% of students in public school	0.614	0.572	0.400	0.630	0.524	0.081
% of students in voucher school	0.361	0.374	0.722	0.342	0.429	0.121
% of students in private school	0.025	0.054	0.144	0.028	0.046	0.012
% of students in FDS Schools	0.683	0.635	0.058	0.690	0.614	0.001

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Empirical Strategy

$$\ln(\text{Teenage Pregnancies}_{mt}) = \alpha + \beta \text{Strike Intensity}_{mt} + \gamma X_{mt} + \lambda_m + \tau_t + \varepsilon_{mt}$$

- We interpret β as a standard semi-elasticity, i.e. a variation in a unit of strike intensity has an effect of $\beta\%$ on teenage pregnancies
- X_{mt} is a vector of controls including municipality-specific linear trends, total pregnancies (in logs), poverty rate, per capita government expenditure (in logs), student population in public schools (in logs), population (in logs), and female population (in logs)
- λ_m and τ_t denote municipality and month of conception fixed effects, respectively

Empirical Strategy: Multiple Proxies

- We have two measures (with error) of *Strike Intensity*_{mt}:

$$S_{mt1} = \gamma_1 \text{Strike Intensity}_{mt} + \mu_{mt1}$$

$$S_{mt2} = \gamma_2 \text{Strike Intensity}_{mt} + \mu_{mt2}$$

- The variable that forms both, true and observed, strike intensity is a binary indicator for whether student i who resides in municipality m attended a school on strike in year 2011. We observe z_{im} as a proxy for x_{im} . So that we have:

$$z_{im}^a = x_{im} + \mu_{im}^a$$

- Where $\text{cov}(x_{im}, \mu_{im}^k) < 0$ when x_{im} is binary, for $k = a, b$. Measurement error is necessarily non-classical.
- The caveat here is that after aggregating at the municipality (m) level we also get that $\text{cov}(x_{.m}, \mu_{.m}^k) < 0$.

Empirical Strategy: Multiple Proxies

- Suppose we want to estimate:

$$y_m = \beta_0 + \beta_1 x_m + \varepsilon_m$$

- But we observe, z_m^a Following Black et al. (2001), under this structure (and other assumptions) we have that:

$$\begin{aligned} \text{plim} \hat{\beta}_1 &= \frac{\text{Cov}(y_m, x_m + u_m^k)}{\text{Var}(x_m + u_m^k)} \\ &= \beta_1 \frac{\text{Var}(x_m) + \text{Cov}(x_m, u_m^k)}{\text{Var}(x_m) + 2\text{Cov}(x_m, u_m^k) + \text{Var}(u_m^k)} \\ &= \beta_1 \frac{\text{Var}(x_m) + \text{Cov}(x_m, u_m^k)}{\underbrace{\text{Var}(x_m) + 2\text{Cov}(x_m, u_m^k) + \text{Var}(u_m^k)}_{\text{If } \text{Var}(u_m^k) + \text{Cov}(x_m, u_m^k) > 0}} \\ &< \beta_1 \end{aligned}$$

- We have a lower bound for β_1 .

Empirical Strategy: Multiple Proxies

- If we have access to an additional measure $z_{im}^b = x_{im} + \mu_{im}^b$ we can get an upper bound for β_1 using z_{im}^b as an instrument for z_{im}^a
- Following Black et al. (2001), we have that:

$$\begin{aligned} \text{plim} \hat{\beta}_1^{IV} &= \frac{\text{Cov}(y_m, z_m^a)}{\text{Cov}(z_m^a, z_m^b)} \\ &= \beta_1 \frac{\text{Var}(x_m) + \text{Cov}(x_m, u_m^a)}{\text{Var}(x_m) + \text{Cov}(x_m, u_m^a) + \text{Cov}(x_m, u_m^b) + \text{Cov}(u_m^a, u_m^b)} \\ &> \beta_1 \end{aligned}$$

- We have an upper bound for β_1 , if in addition (A4) $\text{Cov}(x_m, u_m^b) > \text{Cov}(u_m^a, u_m^b) > 0$ (Black et al. 2000).
 - ▶ Measurement error is not too severe so that z_m^b loses its correlation to x_m and x_m is more correlated to one report than the reports are correlated to each other.

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$$\text{Then } \hat{\beta}_1 < \beta_1 < \hat{\beta}_1^{IV}$$

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Results

Table: Effect of School Closures due to Strikes on Teenage Pregnancy

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Log(Preg)	Log(Preg)	Log(Preg)	Log(Preg)	Strike(Aug.)	IV 1	IV 2
Strike(Aug.) × During Strike	0.107*** (0.030)	0.105*** (0.030)				0.298*** (0.096)	0.291*** (0.097)
Strike(Press) × During Strike			0.272*** (0.087)	0.264*** (0.087)	0.909*** (0.164)		
Observations	28896	28296	29064	28344	28296	28896	28296
Adjusted R ²	0.087	0.087	0.086	0.087	0.483	0.074	0.075
Strike-pregnancy Elasticity	0.025	0.025	0.012	0.012		0.014	0.013
F-test					30.891		
Month FE	Y	Y	Y	Y	Y	Y	Y
Municipality FE	Y	Y	Y	Y	Y	Y	Y
Municipality Linear Trend	Y	Y	Y	Y	Y	Y	Y
Full Controls	N	Y	N	Y	Y	N	Y

Results

Table: Effect of Looser Adult Supervision due to Strikes on Teenage [First Pregnancy](#)

	(1)	(2)	(3)	(4)	(5)	(6)
	Log(Preg)	Log(Preg)	Log(Preg)	Log(Preg)	IV 1	IV 2
Strike(Aug.) × During Strike	0.106*** (0.030)	0.104*** (0.030)			0.315*** (0.102)	0.311*** (0.103)
Strike(Press) × During Strike			0.288*** (0.089)	0.282*** (0.089)		
Observations	28896	28296	29064	28344	28896	28296
Adjusted R ²	0.080	0.080	0.079	0.080	0.067	0.067
Strike-pregnancy Elasticity					0.014	0.014
Month FE	Y	Y	Y	Y	Y	Y
Municipality FE	Y	Y	Y	Y	Y	Y
Municipality Linear Trend	Y	Y	Y	Y	Y	Y
Full Controls	N	Y	N	Y	N	Y

Results

Table: Effect of School Closures due to Strikes on Fetal Deaths

	(1)	(2)	(3)	(4)	(5)	(6)
	Log(Preg)	Log(Preg)	Log(Preg)	Log(Preg)	IV 1	IV 2
Strike(Aug.) x During Strike	-0.001 (0.008)	-0.002 (0.008)			0.002 (0.018)	0.002 (0.018)
Strike(Press) x During Strike			0.014 (0.038)	0.016 (0.039)		
Observations	28896	28296	29064	28344	28896	28896
Adjusted R^2	0.067	0.066	0.067	0.066	-0.012	-0.012
Strike-pregnancy Elasticity					0.000	0.000
Month FE	Y	Y	Y	Y	Y	Y
Municipality FE	Y	Y	Y	Y	Y	Y
Municipality Linear Trend	Y	Y	Y	Y	Y	Y
Full Controls	N	Y	N	Y	N	Y

Results

Table: Effect of Looser Adult Supervision due to Strikes on Teenage Couples

	(1)	(2)	(3)	(4)	(5)	(6)
	Log(Preg)	Log(Preg)	Log(Preg)	Log(Preg)	IV 1	IV 2
Strike(Aug.) × During Strike	0.028 (0.023)	0.028 (0.023)			0.312*** (0.119)	0.319*** (0.121)
Strike(Press) × During Strike			0.286*** (0.098)	0.290*** (0.098)		
Observations	28896	28296	29064	28344	28896	28296
Adjusted R^2	0.013	0.013	0.014	0.014	-0.004	-0.004
Strike-pregnancy Elasticity					0.014	0.015
Month FE	Y	Y	Y	Y	Y	Y
Municipality FE	Y	Y	Y	Y	Y	Y
Municipality Linear Trend	Y	Y	Y	Y	Y	Y
Full Controls	N	Y	N	Y	N	Y

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Results

Table: Effect of School Closures due to Strikes on Pregnancies (Age 18 - 19)

	(1)	(2)	(3)	(4)	(5)	(6)
	Log(Preg)	Log(Preg)	Log(Preg)	Log(Preg)	IV 1	IV 2
Strike(Aug.) x During Strike	0.012 (0.031)	0.010 (0.032)			0.003 (0.105)	-0.009 (0.105)
Strike(Press) x During Strike			0.002 (0.097)	-0.009 (0.096)		
Observations	28896	28296	29064	28344	28896	28296
Adjusted R^2	0.101	0.101	0.101	0.101	0.090	0.090
Month FE	Y	Y	Y	Y	Y	Y
Municipality FE	Y	Y	Y	Y	Y	Y
Municipality Linear Trend	Y	Y	Y	Y	Y	Y
Full Controls	N	Y	N	Y	N	Y

Results

Table: Effect of School Closures due to Strikes on Pregnancies (Age 25 - 45)

	(1)	(2)	(3)	(4)	(5)	(6)
	Log(Preg)	Log(Preg)	Log(Preg)	Log(Preg)	IV 1	IV 2
Strike(Aug.) x During Strike	-0.003 (0.016)	-0.001 (0.016)			0.066 (0.044)	0.070 (0.045)
Strike(Press) x During Strike			0.058 (0.039)	0.064 (0.039)		
Observations	28896	28296	29064	28344	28896	28296
Adjusted R^2	0.564	0.563	0.564	0.564	0.558	0.557
Month FE	Y	Y	Y	Y	Y	Y
Municipality FE	Y	Y	Y	Y	Y	Y
Municipality Linear Trend	Y	Y	Y	Y	Y	Y
Full Controls	N	Y	N	Y	N	Y

Results

Table: Effect of School Closures due to Strikes on Pregnancies (Treatment Lag)

	(1)	(2)	(3)	(4)	(5)	(6)
	Log(Preg)	Log(Preg)	Log(Preg)	Log(Preg)	IV 1	IV 2
Strike(Aug.) x During Strike (Placebo)	0.003 (0.029)	0.004 (0.031)			-0.117 (0.114)	-0.126 (0.117)
Strike Intensity x During Strike (Placebo)			-0.105 (0.106)	-0.115 (0.108)		
Observations	28896	28296	29064	28344	28896	28296
Adjusted R^2	0.086	0.087	0.086	0.087	0.075	0.075
Month FE	Y	Y	Y	Y	Y	Y
Municipality FE	Y	Y	Y	Y	Y	Y
Municipality Linear Trend	Y	Y	Y	Y	Y	Y
Full Controls	N	Y	N	Y	N	Y

Results

Table: Effect of School Closures due to Strikes on Pregnancies (IHS Transformation)

	(1)	(2)	(3)	(4)	(5)	(6)
	Log(Preg)	Log(Preg)	Log(Preg)	Log(Preg)	IV 1	IV 2
Strike(Aug.) × During Strike	0.132*** (0.039)	0.130*** (0.039)			0.326*** (0.118)	0.317*** (0.119)
Strike(Press) × During Strike			0.298*** (0.109)	0.288*** (0.109)		
Observations	28896	28296	29064	28344	28896	28296
Adjusted R^2	0.085	0.085	0.084	0.085	0.073	0.073
Month FE	Y	Y	Y	Y	Y	Y
Municipality FE	Y	Y	Y	Y	Y	Y
Municipality Linear Trend	Y	Y	Y	Y	Y	Y
Full Controls	N	Y	N	Y	N	Y

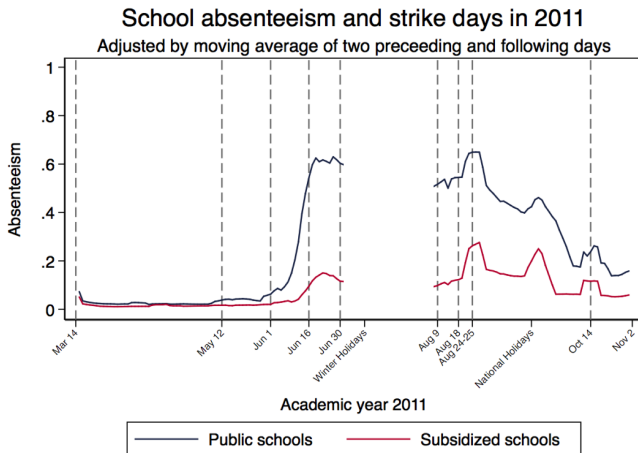
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Heterogeneity/Mechanisms

- An important question behind the results is whether pregnancies increase because:
 - 1 Family planning choices change for female students at the margin of preferences for school drop out (Rational Choice)
 - 2 School closures generate an exogenous change in adult supervision (Risky Behavior)
- We do not rule one or the other but do the following to argue that (2) is more likely:
 - 1 Check if effects peak in times where strikes are also peaking when “heat of the moment” is higher
 - 2 Check if effects are larger in municipalities with a larger proportion of female students going to coed schools
 - ★ Reduce search costs of a partner: Larger effects
 - ★ Have different (more) sexual education: Lower effects
 - 3 Check if effects are lower if we use proportion of schools mobilized but not “taken over”

Peak of Strikes

Figure: Daily Assistance in Moving Average of 2 days during 2011 by Type of School



Empirical Strategy

- We explore if a larger effect is found around periods where strikes where on a peak
- We group school months into bimonthly groups: Apr-May, Jun-Jul, Aug-Sept, Oct-Nov and allow β to vary with these periods:

$$\ln(\text{Teenage Pregnancies}_{mt}) = \alpha + \sum_{\tau=1}^T \beta_{\tau} \text{Strike Intensity}_{m\tau} + \gamma X_{mt} + \lambda_m + \tau_t + \varepsilon_{mt}$$

- ▶ $\tau = 1, 2, 3, 4$ according to each group of bimonthly periods. We leave $\tau = 1$ out of the regression
- ▶ $\tau = 2$ includes winter holidays so our main interest is on $\tau = 3$

Table: Effect of School Closures due to Strikes on Pregnancies: Timing Differences

	(1)	(2)	(3)	(4)	(5)	(6)
	Log(Preg)	Log(Preg)	Log(Preg)	Log(Preg)	IV 1	IV 2
Strike(Aug.) x 2nd period	0.179*** (0.065)	0.177*** (0.065)			0.929*** (0.254)	0.924*** (0.255)
Strike(Aug.) x 3rd period	0.168*** (0.064)	0.167*** (0.064)			0.463** (0.216)	0.454** (0.217)
Strike(Aug.) x 4th period	0.007 (0.062)	0.005 (0.062)			-0.009 (0.233)	-0.018 (0.233)
Strike(Press) x 2nd period			0.845*** (0.189)	0.840*** (0.190)		
Strike(Press) x 3rd period			0.424** (0.198)	0.413** (0.199)		
Strike(Press) x 4th period			-0.006 (0.214)	-0.017 (0.214)		
Observations	28896	28296	29064	28344	28896	28296
Adjusted R ²	0.087	0.087	0.086	0.087	0.070	0.070
Month FE	Y	Y	Y	Y	Y	Y
Municipality FE	Y	Y	Y	Y	Y	Y
Municipality Linear Trend	Y	Y	Y	Y	Y	Y
Full Controls	N	Y	N	Y	N	Y

Table: Effect of School Closures due to Strikes on Pregnancies: % COED Students

	(1)	(2)	(3)	(4)	(5)	(6)
	Log(Preg)	Log(Preg)	Log(Preg)	Log(Preg)	IV 1	IV 2
Strike(Aug.) x During Strike	0.137*** (0.034)	0.131*** (0.034)			0.277* (0.151)	0.280* (0.155)
Strike(Aug.) x COED Sch \geq 50th pct.	-0.053 (0.042)	-0.044 (0.042)			-0.049 (0.190)	-0.026 (0.196)
Strike(Press) x During Strike			0.336*** (0.082)	0.321*** (0.082)		
Strike(Press.) x COED Sch \geq 50th pct.			-0.283 (0.209)	-0.251 (0.210)		
Observations	28896	28296	29064	28344	28896	28296
Adjusted R^2	0.087	0.087	0.086	0.087	0.075	0.075
Month FE	Y	Y	Y	Y	Y	Y
Municipality FE	Y	Y	Y	Y	Y	Y
Municipality Linear Trend	Y	Y	Y	Y	Y	Y
Full Controls	N	Y	N	Y	N	Y

Strikes or School Take-over

- Previous analyses, using Press Release data includes percentage of female students in a school that was taken over.
- We have additional information on press releases on schools that were mobilized or on strike but not taken over.
- Students in schools that were not taken over may have had more adult supervision, hence lower or null effects.

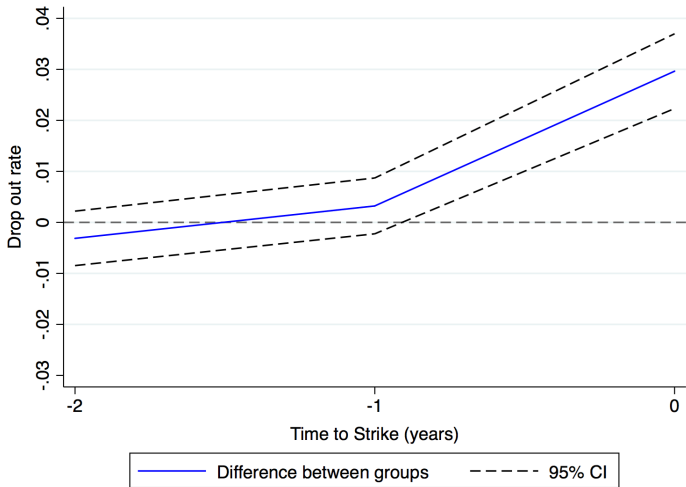
Table: Effect of School Closures due to Strikes on Pregnancies: Using Strike-Only Variation

	(1)	(2)	(3)
	Log(Preg)	Log(Preg)	Log(Preg)
Strike Only(Press) × During Strike	0.016 (0.266)	0.014 (0.263)	
Strike Only (Press) \geq 75th pct. × During Str.			0.008 (0.019)
Observations	29064	28344	28344
Adjusted R^2	0.086	0.087	0.087
Month FE	Y	Y	Y
Municipality FE	Y	Y	Y
Municipality Linear Trend	Y	Y	Y
Full Controls	N	Y	Y

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- 2 Data and Measurement
- 3 Context and Descriptive Statistics
- 4 Empirical Strategy
- 5 Results
 - Main Results
 - Robustness Check
 - Heterogeneity/Mechanisms
- 6 Discussion

Discussion: Dropout rate increased in 40%

Figure: DiD estimates of high-school dropout rates between school on/off strikes



Discussion

- We analyze whether sudden and momentary school closures affect teenage pregnancy
- The Strike provides a unique opportunity to separate incapacitation effects from human capital accumulation of school expansion
- Use different proxies for school adherence and estimate the effect using multiple proxies
- Results show that:
 - ▶ A municipality with average strike exposure experienced an increased of 3% in the number of teen pregnancies (Main Results), during the strikes.
 - ▶ A rough calculation shows that this corresponds to 826 teenage pregnancies in year 2011 approximately.
 - ▶ Heterogeneity analysis is consistent with effects due to loosen adult supervision.
- This could be one reason behind the large increase in high-school drop out during 2011.

Thank you