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SOCIOLOGY | RESEARCH ARTICLE

“The Trayvon Martin Effect”: Estimating the effect of the Trayvon Martin shooting on reading performance scores using the synthetic control method

James E. Wright II^{1*}

Abstract: This study analyzes how the fatal shooting of Trayvon Martin affects schools and specifically students in Florida. The research examines students’ reading scores, employing a Synthetic Control Method (SCM) to construct a synthetic comprised of 29 schools in the Miami Dade School District as the comparison group. The findings suggest that the shooting of Trayvon Martin lowered reading scores by 1% point in 2013 while the synthetic obtained a 7% point increase in reading scores in 2013. Finally, this paper proposes steps to take in the event of a traumatic event occurring at schools.

Subjects: Education; Education Studies; Sociology of Education

Keywords: shootings; student performance; synthetic control method; education; violence

1. Introduction

Within the past five years, one of the nation’s most contentious events surrounded the incident that led to the death of Trayvon Martin. On February 26, 2012, 17-year-old Trayvon Martin was shot and killed by George Zimmerman, who was a neighborhood watch captain. This event sparked national outrage over whether or not the shooting was justified or racially motivated. Subsequent riots, protests, and rallies broke out across the country as a result of Mr. Martin’s death. Much of the discourse (rightfully so) revolved around race-related issues and the legality of Florida’s stand-your-ground laws. While this discourse is important, the topic surrounding the effects of shootings on students is understudied.

There is a growing body of literature within the psychology and education discipline that discuss the impact of school shootings on students (Abouk & Adams, 2013; Beland & Kim, 2015; Borum, Cornell, Modzeleski, & Jimerson, 2010; Campbell & Schwarz, 1996; Poutvaara & Ropponen, 2010).



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PUBLIC INTEREST STATEMENT

The tragic shooting and killing of Trayvon Martin sparked national outrage across the country. While many sought out to address the racial implications as well as the gun policies in place in Florida, minimal research and conversation was used to address how the shooting impacted other students, specifically students of color. Using a new economic technique, this article finds that students performed worse off in the school that Mr. Martin attended as a result of his death. Clearly, tragic national events such as this shooting has effects not only for the individuals affected, but also the students that attend the same school. Understanding these effects can help educators and policymakers alike when addressing tragic events that transpire to school aged children.

Previous literature has examined the effect of school shootings on a whole set of outputs such as enrollment rates and test scores. While previous papers have examined school shootings that took place on a campus this paper deviates and adds to the growing body of literature by examining a non-traditional school shooting.

In particular, this paper measures the impact of a non-traditional school shooting, focusing on reading performance scores on a standardized test. The paper studies the effects of the Trayvon Martin shooting on high school students in the Miami Dade School District, explicitly analyzing reading scores. I posit that one of the populations most affected by school shootings are students who attend or live near the school where a shooting occurred. I utilize a Synthetic Control Method (SCM) to create a synthetic Dr Michael M. Krop High School that did not experience the Trayvon Martin shooting. Additionally, I construct a data-set, using information from the Florida Department of Education and the Common Core website.

This study demonstrates that the Trayvon Martin shooting resulted in a stark decrease in reading scores in 2013. The synthetic control yields a 7% point gap between the Dr Michael M. Krop High School reading scores and the synthetic Dr Michael M. Krop High School reading scores. To validate my study, I utilize a series of inference and robustness tests, as shown in Abadie, Diamond, and Hainmueller (2012).

The paper will revisit the Trayvon Martin case, review the literature that documents the effects of school shootings on students, and examine the methodology and the importance of using a synthetic control. Furthermore, I discuss my data and explain the Florida Comprehensive Assessment Test (FCAT) and FCAT 2.0. In addition, the paper will present the results and the limitations of the study. Finally, it will address future work and policy implications.

2. Background of the Trayvon Martin case

On February 26, 2012, about 7 pm George Zimmerman, a 28-year-old neighborhood watch captain, calls 911 to report “a suspicious person” in the gated community retreat at Twin Lakes. Zimmerman says he is following Martin after the teen started to run, prompting the dispatcher to tell him, “We don’t need you to do that.” Zimmerman pursues Martin anyway, but then says he lost sight of him. Later it is confirmed that at 7:25 pm that Martin is shot and killed.

About 7:10 pm phone records show Martin was on the phone with his girlfriend around the time he saw Zimmerman while returning on foot from a convenience store to the home of his father’s fiancée.

At a March 20 news conference, Martin family attorney Benjamin Crump says the girl heard someone ask Martin what he was doing and Martin asking why the person was following him. The girl gets the impression that there is an altercation, during which the earpiece falls from Martin’s ear and the connection goes dead, according to Crump.

According to an Orlando Sentinel story later confirmed by Sanford police, Zimmerman tells authorities that after Zimmerman briefly lost track of Martin, the teen approached him. After the two exchange words, Zimmerman says, he reaches for his cell phone, and then Martin punches him in the nose. Zimmerman says Martin pins him to the ground and begins slamming his head into the sidewalk.¹

3. Literature review

Existing literature documents the effects of violence on students’ learning abilities and aptitude test scores. My paper contributes to the literature by identifying the impact of a non-traditional school shooting on students’ performance scores. It has been noted that children can be vulnerable to the effects of violence, because its exposure can alter the timing of typical developmental trajectories (Boney-McCoy & Finkelhor, 1995).

There are four main avenues in which student development is affected by violence (Margolin & Gordis, 2000). First, violence can result in post-traumatic stress disorder, specifically: visualized or otherwise repeatedly perceived memories of the traumatic event; repetitive behaviors; trauma-specific fears; and changed attitudes about people, life, and the future (Terr, 2003). Also, school violence can cause peer problems, as a result of increased community violence hindering a student's ability to form relationships (Osofsky, 1995). Furthermore, psychobiological effects may result because of experiences during childhood and adolescence that affect the human brain (Akiba, LeTendre, Baker, & Goesling, 2002; Perry, 1997; Weiss & Wagner, 1998). Finally, school violence can have cognitive implications. In Sapolsky, Uno, Rebert, and Finch (1990), the researchers found that exposure to trauma can result in damage to the hippocampus.

A recent proliferation of articles study the impact of shooting on students academic performance. One of the seminal articles found that there is evidence of over 157 school shootings in high schools that have resulted in one or more deaths (Beland & Kim, 2015). One of the first pieces to examine school violence came from outside the United States context. In Finland, Poutvaara and Ropponen (2010) found that the average performance of young men declined as the result of a school shooting, but did not see a similar pattern for young women. As an attempt to measure the impact of school shootings on enrollment, Abouk and Adams (2013) discovered that school shootings led to a 10%–12% increase in private high school enrollment. The effects of school shootings are most pronounced in nonurban areas.

More recently, Beland and Kim (2015) completed the most comprehensive econometric analysis of the impact of school shootings on several outputs. The authors identified several key findings, utilizing the documents provided by the National School Safety Center for school shooting records and the National Center for Educational Statistics for school characteristics. Beland and Kim (2015) determined that homicidal shootings significantly decreased the enrollment of 9th grade students as well as their test scores in Math and English standardized tests. Using student level data from California, the authors found that shootings lowered test results for students who remain enrolled. Building upon this growing literature, I posit the first econometric analysis of the impact of a non-traditional shooting on reading performance scores.

4. Synthetic control method

The synthetic control method (SCM) is a data-driven approach to select comparison units for a single treated unit. More specifically, SCM allows researchers to select controls that closely resemble the treated unit before it received the treatment. As identified by Abadie et al. (2012), one of the main barriers for comparative case studies with a small sample size is the absence of an explicit mechanism that determines how comparison units are selected. The central idea behind SCM is that a weighted combination of control units is selected by data-driven methods, which provides a better comparison for a treated unit than any single control unit alone (Abadie et al., 2012). SCM creates the synthetic or counterfactual of the treated unit by selecting treatments from a “donor” pool on values that range from 0 to 1. Furthermore, the method is used to select a weighted combination of control units that most closely approximate values of an outcome, and a series of predictor variables of the treated unit in the pretreatment period.

SCM produces output that explicitly states the contribution of each “donor” to the synthetic as well as how closely the synthetic matches the treated unit. This method produces a graphic that represents the outcome of the variable of interest for the synthetic and treated unit pre- and post-treatment. To measure the effect of the treatment, the graph displays the counterfactual of the treated group absent of the treatment happening.

In addition, SCM offers several key advantages to showing true causal interpretations. SCM avoids extrapolation biases and provides more focused descriptions and analyses of similarities and differences between the treatment and comparison group (Abadie et al., 2012). Another key advantage

addresses endogeneity from omitted variable bias due to the presence of unobserved time-invariant and time-varying factors that may affect the outcome of interest (Abadie et al., 2012; Abadie, Diamond, & Hainmueller, 2015; Billmeier & Nannicini, 2013; Birdsall, 2016).

Some estimation techniques, such as Fixed Effect and Difference-in-Difference estimators, account for unobserved time-invariant or generally stable over time factors (e.g. school composition); however, they cannot account for unobserved time-varying factors, such as changes in the quality of a teacher. SCM controls for both observed and unobserved time-varying and time-invariant factors affecting the outcome of interest by matching on pre-treatment outcomes (Abadie et al., 2015). More importantly, only units alike in both observed and unobserved outcome determinants should exhibit similar values of that outcome over an extended period of time (Abadie et al., 2015).

5. Data and sample

The data from the study comes from two sources: The National Center for Education Statistics and the Florida Department of Education. The NCES has data related to CBSA (Core based statistical area), county, district, private school, public school and state data related to education characteristics. The data goes back to the year 1986 and ends in 2014. The Florida Department of Education provides data related to exam scores by school as well as graduation rates which are applicable to this research. The main dependent variable of interest is a measure of the percent of students that pass the reading portion of the Florida standards assessment. This information is obtained from the Florida Department of Education.

To explain how the shooting of Trayvon martin impacted reading scores I use a wide range of explanatory variables. They include percent Black, Hispanic and White, pupil-teacher ratio, full time equivalency teachers and the total students. Utilizing these variables,² I construct annual school level panel data for the period of 2006–2013. The Trayvon Martin shooting occurred in 2012, which gives a pre-treatment period of 6 years. The sample period ends in 2013 because there is a high percentage of missing data in 2014 (close to 70% of school had missing data). The synthetic Dr Michael M. Krop High School is constructed as a weighted average of potential control schools, so that the chosen weights represent the best predictors of reading scores at Dr Michael M. Krop High School before the shooting. The donor pool comes from 29 other schools in the same school district as Dr Michael M. Krop High School. These schools are listed in Table 1.

In my analysis, I measure the effect of the Trayvon Martin shooting, identifying the differences in reading scores between Dr Michael M. Krop High School and its synthetic control after 2012. Following the comparison, I perform a series of placebo tests and robustness checks to confirm that my estimated effect for Dr M. Krop High School reading scores displays a 1% point decrease while the synthetic Dr M. Krop High School shows a 7% point increase.

Table 1. List of schools in donor pool

	Academy of AR	Hialeah Senior High School	Miami Carol C	Miami Norland	Miami Sunset Senior High
Miami SHRS BA	G Holmes Brad	John A Fergus	Miami Central	Miami Lakes C	North Miami B
American SENI	Coral GBLS SH	Hialeah-Miami Lakes Senior High	Miami Edison Senior High School	Miami North-western Senior High	North Miami Senior High School
Mater perform	Design & Architecture Senior High	Homestead SEN	Miami Killian	Miami PLMT SR	Barbara Golem
Doral ACAD HS	Coral Reef Senior High School	Mast Academy	Robert Morgan Educational Center	Miami Springs Senior High School	Booker T Wash

6. What is the FCAT and why does it matter?

The Florida Comprehensive Assessment Test (FCAT) was established in 1998 as part of Florida’s over-all plan to increase student achievement by implementing higher standards. The FCAT was administered to students in Grades 3–11 and consisted of criterion-referenced assessments in mathematics, reading, science, and writing, which measured student progress toward meeting the Sunshine State Standards (SSS) benchmarks. During the 2010–2011 school year, Florida began the transition from the FCAT to the FCAT 2.0 and Florida End-of-Course (EOC) Assessments. The FCAT measured student achievement of the Sunshine State Standards, while the FCAT 2.0 measures student achievement of the Next Generation Sunshine State Standards, which are more rigorous grade-level expectations.³

As previously mentioned, the areas of reading and mathematics are tested each year for Grades 3–10, specifically in Grades 4, 8, and 10. The FCAT is administered to students in February for writing and in March for reading, mathematics, and science. If a student fails or falls below the passing score, he/she will be retested until he/she passes (June, October and March of 11th and 12th were the testing dates). FCAT and FCAT 2.0 scores affect students in Grade 3 Reading for promotion and retention purposes and Grade 10 Reading and Mathematics for high school graduation.

Related to this paper, Grade 10 students must earn a scale score of 300 to pass the FCAT and FCAT 2.0 reading and mathematics to graduate. The equivalent developmental scale scores are 1926 on FCAT and FCAT 2.0 Reading and 1889 on FCAT and FCAT 2.0 Mathematics. Tables 2 and 3 demonstrates the breakdown of the scores for all grade levels.

Table 2. FCAT developmental scores

FCAT reading developmental scale scores					
Grade	Level 1	Level 2	Level 3	Level 4	Level 5
3	86–1,045	1,046–1,197	1,198–1,488	1,489–1,865	1,866–2,514
4	295–1,314	1,315–1,455	1,456–1,689	1,690–1,964	1,965–2,638
5	474–1,341	1,342–1,509	1,510–1,761	1,762–2,058	2,059–2,713
6	539–1,449	1,450–1,621	1,622–1,859	1,860–2,125	2,126–2,758
7	671–1,541	1,542–1,714	1,715–1,944	1,945–2,180	2,181–2,767
8	886–1,695	1,696–1,881	1,882–2,072	2,073–2,281	2,282–2,790
9	772–1,771	1,772–1,971	1,972–2,145	2,146–2,297	2,298–2,943
10	844–1,851	1,852–2,067	2,068–2,218	2,219–2,310	2,311–3,008

Table 3. FCAT reading scores equivalency

FCAT reading scale scores					
Grade	Level 1	Level 2	Level 3	Level 4	Level 5
3	100–258	259–283	284–331	332–393	394–500
4	100–274	275–298	299–338	339–385	386–500
5	100–255	256–285	286–330	331–383	384–500
6	100–264	265–295	296–338	339–386	387–500
7	100–266	267–299	300–343	344–388	389–500
8	100–270	271–309	310–349	350–393	394–500
9	100–284	285–321	322–353	354–381	382–500
10	100–286	287–326	327–354	355–371	372–500

For Grade 10, the FCAT and FCAT 2.0 are “high stakes” assessments, provided that a certain score (1926) is required to graduate. Given the magnitude associated with the FCAT and FCAT 2.0 reading scores, the main independent variable for my study measures the impact of the Trayvon Martin shooting on students’ FCAT and FCAT 2.0 reading scores. While looking concurrently at math scores would be ideal for the study, the changes made to the mathematics tests in 2011 eliminated all math scores for Grade 10, requiring the math component only to be taken up to Grade 8.

Most recently, Florida has transitioned away from the use of the FCAT 2.0 and now uses the Florida Standards Assessment as a measure of student ability. While the standards have changed, this study still resonates as in 2012 the FCAT and FCAT 2.0 were the standards employed by Florida.

7. The effect of the Trayvon Martin shooting

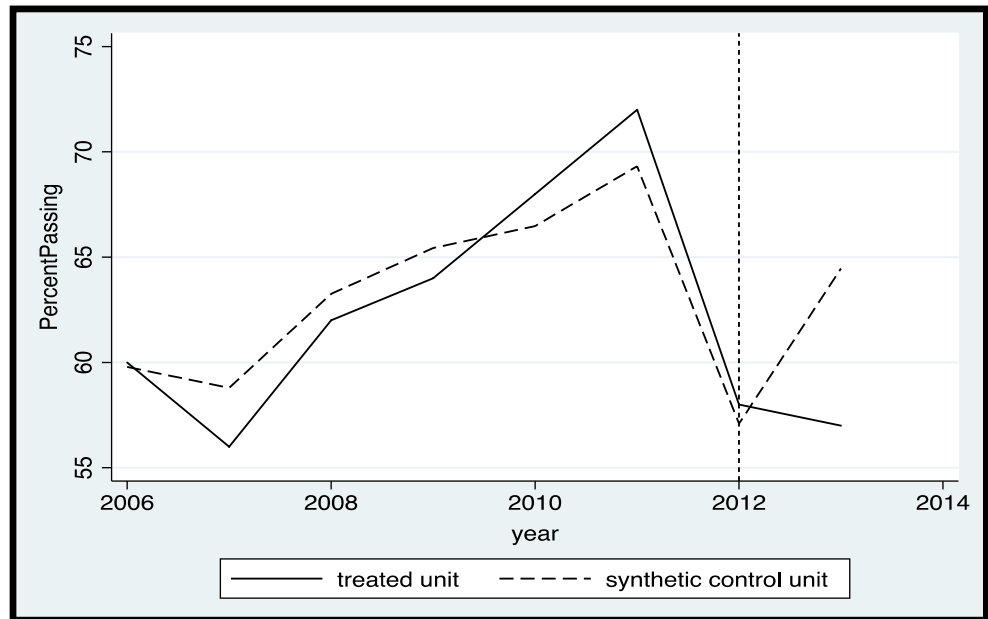
To analyze the effect of the Trayvon Martin shooting, I construct a synthetic Dr Michael M. Krop High School. The synthetic control closely matches the demographics of the real Dr Michael M. Krop High School. Table 4 shows the synthetic Dr Michael M. Krop High School and the means of the controlled schools used in the district. As provided by the table, 11 of the 16 predictor variables in the synthetic control are better measures for Dr Michael M. Krop High School, given the smaller variance in the numbers compared to the means. The majority of the predictors in the synthetic control match the real high school, I continue to visually construct the test results for Dr Michael M. Krop High School and the synthetic Dr M. Krop High School.

Figure 1 displays the reading performance scores of Grade 10 students in Dr Michael M. Krop High School and its synthetic counterpart for the years 2006–2013. The scores at the synthetic Dr Michael M. Krop High School resemble the actual scores at Dr Michael M. Krop High School from 2006–2012. From the figure, it is clear that the synthetic has slightly higher test scores, ranging between 2 and 3% points in 2006–2010, and has lower test scores than the real Dr Michael M. Krop High School in 2011 and 2012. These results reveal that the Trayvon Martin shooting had a negative effect on student test scores following the shooting in 2013. The synthetic school shows that there should have been an approximate 7% point increase in scores after the shooting, while the real Dr M. Krop High School experienced a 1% point decrease in scores from 2012–2013. Figure 1 represents a weighted average of the best predictors that come from 6 schools in the district.⁴

Table 4. Predictor variables comparison treated vs. synthetic vs. regular means

	Treated	Synthetic	Means of 29 controls
FTETeachers	151.8714	99.2744	120.9399
PupilTeacherRatio	22.70857	21.95994	19.22321
pctBlk9th	36.07144	27.08384	33.05731
pctHisp9th	37.18303	41.99517	54.40936
pctWhite9th	16.23024	17.62481	5.751204
pctBlk10th	33.90958	26.75434	33.48556
pctHisp10th	37.90337	43.28369	54.48771
pctWhite10th	25.61935	24.9656	9.424737
pctBlk11th	31.4545	26.20012	33.75164
pctHisp11th	38.19385	38.23313	52.54805
pctWhite11th	27.65745	25.87607	9.762029
pctBlk12th	29.77805	25.8469	34.28027
pctHisp12th	39.06167	39.8834	53.40966
pctWhite12th	28.2642	30.63802	52.94796
pctfreeandreducedlunchstu	34.76422	34.79584	21.22576
Totalstudents	3440.286	2073.858	2341.225

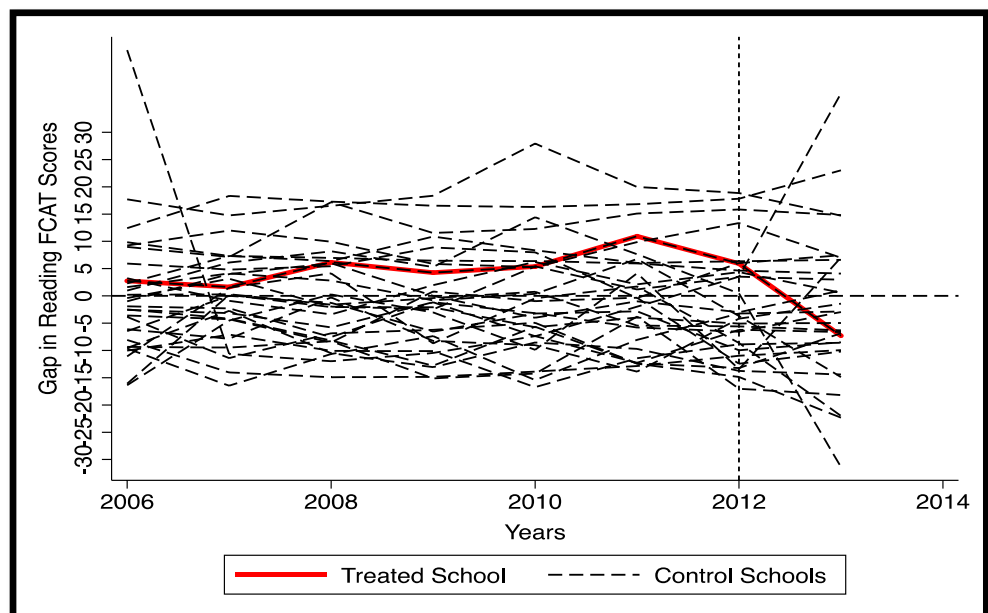
Figure 1. Percent passing scores in reading Dr M. Krop High School vs. synthetic.



Given the analysis, the shooting had a bigger effect on students who took the test and passed from 2012 to 2013. In 2012, 693 students took the FCAT 2.0; 58% of the students passed, which amounts to approximately 402 students passing. For the following year, only 637 students took the FCAT 2.0; 57% of the students passed, which amounts to 363 students passing. There was not only a reduction in the number of students who took the test in 2012–2013 (i.e. 56 students), but also 39 students who did not pass from 2012 to 2013.

To evaluate the validity of my study, I perform a battery of placebo tests, where the event of interest is reassigned to all of my comparison units. Using a placebo, I obtain a synthetic control estimate for a school that did not experience the event of interest. Applying this idea to each school in the

Figure 2. Gap in reading performance scores at synthetic Dr M. Krop High School and placebo gaps from applying it every other school in the treatment.



donor pool allows me to judge whether the shooting of Trayvon Martin estimated for Dr M. Krop High School is unusually large, compared to the placebo effects obtained for other schools that did not experience the shooting.

Figure 2 exhibits the placebo effects of all the schools in the donor pool, or all the schools in the Miami Dade School District. The synthetic control estimate for Dr Michael M. Krop High School appears consistent with other schools on reading performance scores until 2012, which is when the shooting occurred, after 2012 the negative gap in the reading scores appears. Some schools appear to share the same trajectory as Dr M. Krop High School; however, many of these schools already had negative gaps in reading performance scores, as shown in my pre-treatment scores.

From the figure, it is difficult to decipher what happens when the placebo test is run. As a result, I ascertain the Root Mean Squared Prediction Error (RMSPE) for each placebo test and compare it to the RMSPE for the treated unit, Dr Michael M. Krop High School. The RMSPE for my treated unit is 5.94, so I discard any placebo test that has double my RMSPE. These results are shown in Figure 3, which displays a set of placebos to use for my synthetic control comparison.

Still, there are mixed results as to the consistency of the results. In Figure 3, there are three or four placebos that show the same trajectory as the synthetic school of interest. More specifically, one of the schools that appears in the top left quadrant of Figure 3 experiences a similar decrease in reading scores as a result of the shooting. This particular school experienced substantial decreases in scores prior to the shooting, which implies that the drops in scores may not be attributed to the shooting. Additionally, the other schools that show a decrease in scores post-2012 may be a result of these students belonging to the same school district and experiencing similar circumstances as the students at Dr Michael M. Krop High School.

An alternative way to conduct placebo analyses is to assign my event of interest to a year other than 2012. I compare the year of the Trayvon Martin shooting to a period before the shooting actually took place (I assign 2011 as the treatment year instead of the actual treatment year 2012). If I see large effects with a placebo year 2011, it would undermine my confidence that the results displayed in Figure 1 are driven by the fact that the Trayvon Martin shooting disrupted school children to the extent that the reading scores were lowered.

Figure 3. Gap in reading performance scores at synthetic Dr M. Krop High School and placebo gaps from applying it to best-matched schools in treatment.

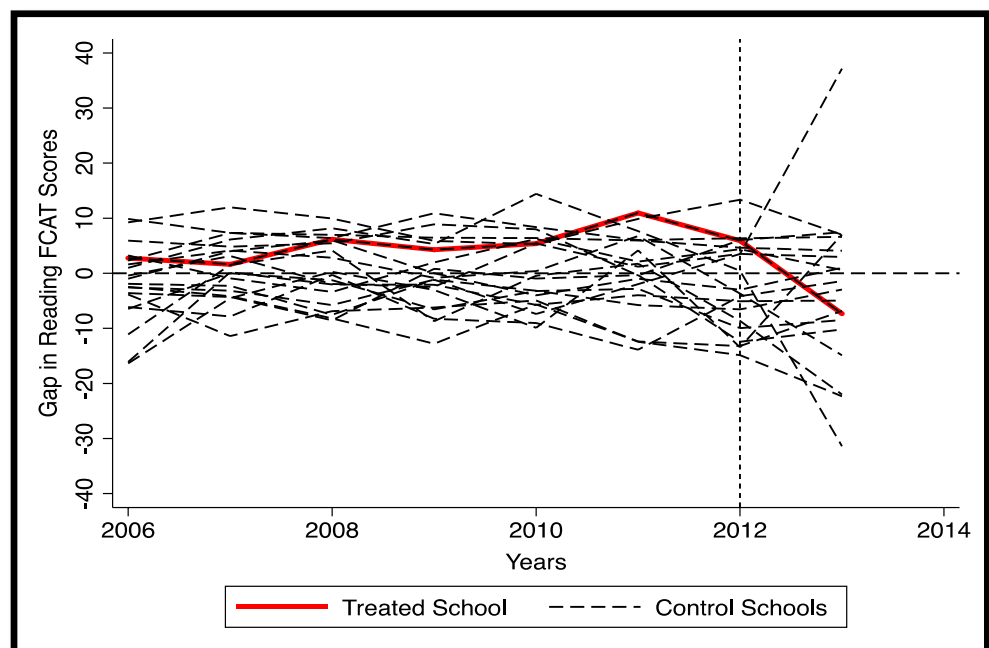


Figure 4. Placebo shooting in 2011: Dr M. Krop High School vs. synthetic.

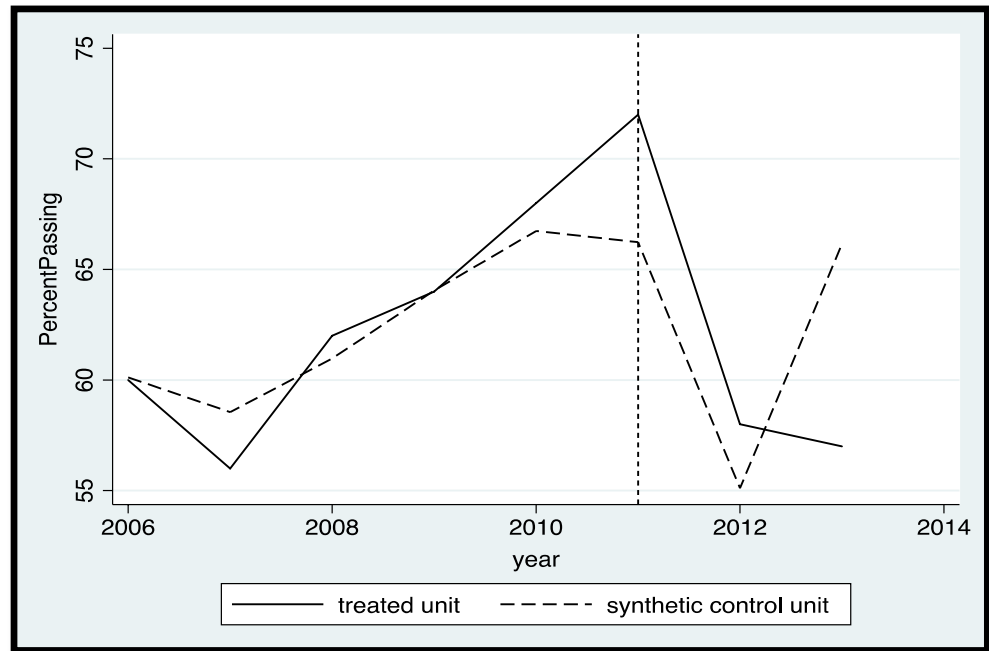


Figure 4 presents the results for the case when reassigning the Trayvon Martin shooting to the year 2011. In this placebo study, the pre-treatment period is from 2006–2010. The synthetic Dr Michael M. Krop High School produces an almost identical percentage of students passing to the actual percentage of students passing at Dr Michael M. Krop High School. For 2010, the synthetic high school appears to have a steep decline in reading scores. From the figure, the shooting has no effect on the actual Dr Michael M. Krop High School when assigned the treatment year 2011. Still, there is a decrease in scores for the synthetic school. In the year following the placebo shooting date 2011 we see the same pattern of reading performance scores for both the synthetic and real school. This suggests that the gap estimated in Figure 1 reflects the impact of the Trayvon Martin shooting and not a potential lack of predictive power of the synthetic control.

As a means to measure the sensitivity of the results, I run two separate robustness tests. In Table 5, six high schools were used for the synthetic control, which was Miami Palmetto Senior High School, Academy of Arts and Minds Charter High School, North Miami Senior High School, North Miami Beach Senior High, Mater Performance Arts & Entertainment Academy, and Miami Killian Senior High School. I re-estimate my baseline model to construct a synthetic Dr M. Krop High School, omitting in each iteration the first school with the highest weight (Miami Palmetto Senior High School) and the second school with the highest weight (Academy of Arts and Minds Charter High School) in Table 5. It is important to see if the estimates in Figure 1 are sensitive to the exclusion of any other school in my sample. Moreover, I evaluate to what extent my results are driven by any particular school.

Table 5. Synthetic weights for Dr M. Krop High School

Control weights and school names	Unit weight
7014 (Mater Performance Arts & Entertainment Academy)	.064
7022 (Academy of Arts and Minds Charter High School)	.306
7361 (Miami Killian Senior High School)	.001
7431 (Miami Palmetto Senior High School)	.413
7541 (North Miami Beach Senior High)	.089
7591 (North Miami Senior High School)	.128

Figure 5. Robustness check: leaving out highest predictor school.

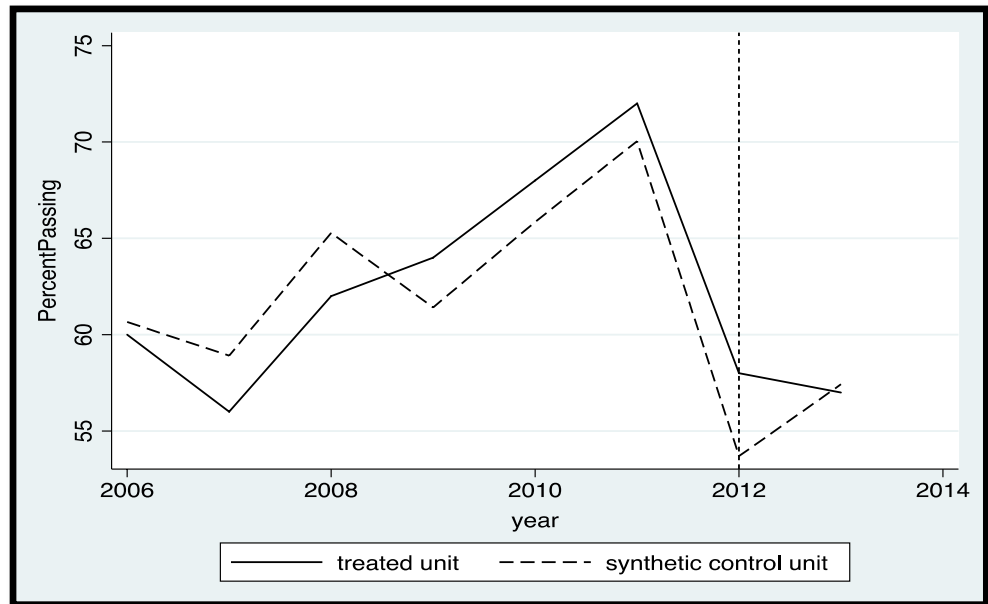
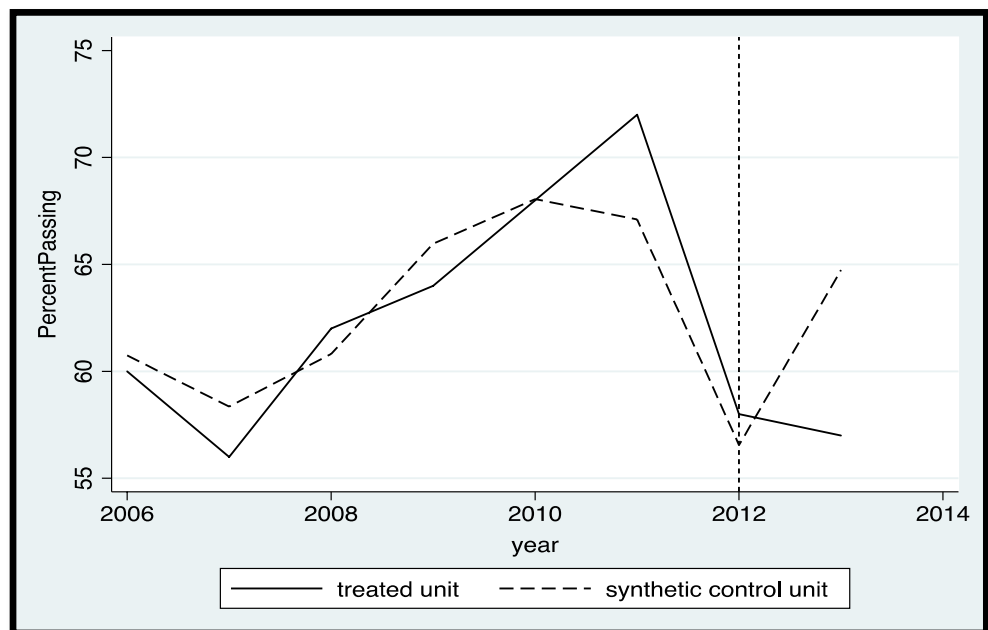


Figure 5 displays the results, leaving the highest weighted school out of the estimate. The dashed line represents the synthetic scores at Dr Michael M. Krop High School and the solid line represents the actual scores at Dr Michael M. Krop High School. As shown in the figure, there is no robust difference between the synthetic and real high school; however, there is a positive increase in the synthetic reading scores and a negative decrease in the real reading scores. In addition, Figure 6 shows the reading score results of the synthetic and real high school, leaving out the second highest predictor school. Figure 6 represents even more robust results as one may see the same increase in the synthetic as Figure 1 and the same decrease in the real high school in Figure 1 as well.

Figure 6. Robustness check: leaving out second highest predictor school.



8. Limitations

Despite the number of placebo tests, inference tests and robustness checks there are a few limitations to my results. One of the limitations is that my data-set only contains 30 of the 52 schools predictor variables for the year 2006. While I reached out to the remaining schools not included in the data-set, the major concern is Non Missing At Random (NMAR). I acknowledge that obtaining the information for the other schools may have slightly altered my results.

Within the literature, many studies focus on the impact of school shootings on math scores. At the outset of this project, I hoped to measure the effects of the Trayvon Martin shooting for both reading and math scores. Unfortunately, the math scores could not be analyzed given that the FCAT was changed to the FCAT 2.0 in 2011, which required students to take the math portion until Grade 8. As a result, I focused on students' performance using their reading scores.

Finally, some researchers may not recognize the causal linkage between the shooting and the reading scores. One may argue that since the shooting took place in Sanford, Florida, Trayvon Martin's school should not serve as the treatment group. While that argument has value this article is the first to shed light on the impact of non-traditional school shootings impact on students.

9. Future work and policy implications

Overall, this study presents a unique case, highlighting the effect of the Trayvon Martin shooting on students' reading scores. Using all of the demographic information for every school in the Miami Dade County may help create a more robust synthetic. While this analysis includes 30 of the 52 schools, future work will obtain the demographic data from the missing 22 to eliminate the problems associated with NMAR. Furthermore, the district can be used as the treated unit, and a neighboring district or all of the districts in Florida can be used as comparison units. Since Dr Michael M. Krop High School was in the Miami Dade School District, students in the district may have been affected by the shooting (which may account for why Figures 2 and 3 have schools with similar effects). By assigning different schools as treated or control units, the reassignments may help confirm the validity of the study.

For the SCM, my predictor variables focused on Grades 9–12 racial demographics. Similar models can be run that predict variables directly related to the grade in which students take the FCAT. Grade 10 is the highest grade that students take the reading component of the FCAT. However, Trayvon Martin was a junior when he was shot and killed. Future models can make predictions on Grade 10 variables or Grade 11 variables. Also, models can predict Grade 10 and Grade 11 variables on the highest demographics, leaving out the demographics that hold little weight in the schools. Many variations of the predictor variables can be used to measure the effects of the Trayvon Martin shooting.

As previously mentioned, there are a number of variations worth considering when running additional models. It is important to note that the Trayvon Martin shooting took place in Sanford, Florida. A future model can combine the Sanford School District and Miami Dade School District as a treated unit or solely use the Sanford School District as a treated unit. However, running the model with the Sanford School District would address a different research question. Finally, it may be interesting to run the model with either a Difference-in-Difference or a Triple Difference. Both models would provide baseline scores between the treated group and the control group, improving the validity of this study.

Policy salient questions and implications arise when one looks at the results of the study. It is clear that there was a decrease in the reading scores after the shooting. Policymakers, educators, school board members, and other agencies should provide additional services for students who experience post-traumatic events. By creating an environment geared towards helping students cope and deal with tragedy, will not only support students psychologically, but will also assist them with test-taking. It may be beneficial for each state's Board of Education to push back test dates in the event of an extremely traumatic event. Specific guidelines can be used if such an event takes place.

Moreover, there needs to be educational opportunities available to parents after a tragic event. A school district can hold meetings at the school, where a school shooting occurred, or its main campus. Parents can address their concerns, comments, or questions regarding the event and obtain information about the school's next step. At these meetings, pamphlets should be provided to parents, in which trained professionals brief parents on ways of telling their children what happened. It will be important for the meetings to be held more than once in hopes to reach all of the parents affected. A parent who does not attend these meetings should be contacted or mailed the information.

Finally, it is worth noting that the killing of Trayvon Martin had a ripple effect throughout the nation specifically involving the state of race relations. As this paper doesn't directly touch upon race relations, it is clear that the shooting had a negative impact on students of color with the decreased test scores. As events continue to transpire throughout our country, the American school system needs to make a concerted effort to address racial inequalities that exist across the country within the schools, by providing more resources to schools of color.

10. Conclusion

The paper measured the impact of the Trayvon Martin shooting on reading scores, demonstrating that the shooting produced less than optimal results for the students who attended Trayvon's high school (approximately 1% point decrease as opposed to the synthetic of a 7% point increase). While it not explicitly shown in this paper, there was a pronounced reduction in the number of students that attended Dr Michael M. Krop High School after the shooting. The reduction may highlight another problem as a result of school shootings.

Social science research will play an important role in identifying clear and objective policy solutions for policymakers. The research must identify ways to counteract the effects of school shootings. If research falters in assessing the impact of school shootings, then students will continue to suffer, resulting in lower grades and tests scores as well as long-term psychological effects. There should be a bilateral effort by policymakers and social scientists if one hopes to create a better environment for students, who already experience traumatic events in their lifetime. School shootings may never cease, but this paper informs policymakers and scientists about the ways to help students cope and move forward in their academic and personal endeavors.

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Notes

1. This timeline of the story comes from CNN.
2. These variables have appeared in earlier works by Beland and Kim (2015) as robust variables to use to explain school shootings.

3. This information comes directly from the Florida Department of Education titled "FCAT 2.0 Historical".

4. Mater Performance Arts & Entertainment Academy, Academy of Arts and Minds Charter High School, Miami Killian Senior High School, Miami Palmetto Senior High School, North Miami Beach Senior High, North Miami Senior High School. The weights for the schools appears in the Table Appendix, Table 5.

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Appendix

The variable list for the real and synthetic control includes:

- Percent passing reading scores—The total of students in 10th grade that pass the reading score component of the FCAT and FCAT 2.0
- Full time equivalency teachers—The amount of time required to perform an assignment stated as a proportion of a full-time position and computed by dividing the amount of time employed by the time normally required for a full-time position.
- Pupil teacher ratio: The ratio of pupils to teachers within an entity (i.e. state, school district, or school). The district-level pupil/teacher ratio uses the total of pupils and the total FTE number of teachers reported in the schools associated with the school district. The pupil/teacher ratio does not represent class size, but rather is a district-level measure of pupils and teachers
- Percent Black 9th grade—The percent of Black students in grade 9 in each school
- Percent Hispanic 9th grade—The percent of Hispanic students in grade 9 in each school
- Percent White 9th grade—The percent of White students in grade 9 in each school
- Percent Black 10th grade—The percent of Black students in grade 10 in each school
- Percent Hispanic 10th grade—The percent of Hispanic students in grade 10 in each school
- Percent White 10th grade—The percent of White students in grade 10 in each school
- Percent Black 11th grade—The percent of Black students in grade 11 in each school
- Percent Hispanic 11th grade—The percent of Hispanic students in grade 11 in each school
- Percent White 11th grade—The percent of White students in grade 11 in each school
- Percent Black 12th grade—The percent of Black students in grade 12 in each school
- Percent Hispanic 12th grade—The percent of Hispanic students in grade 12 in each school
- Percent White 12th grade—The percent of White students in grade 12 in each school
- Percent free and reduced lunch students—The percent of students eligible for free and reduced lunch
- Total students—The total students in each school



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