Abstract Title Page
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Title: **Investigating the Effectiveness of SW-PBIS on School's Accountability at Both Elementary and Middle Schools**

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Abstract Body

Limit 4 pages single spaced.

Background / Context:

Due to the lack of effectiveness of the punitive school approach toward challenging behaviors (Luiselli, Putnam, Handler, & Feinberg, 2005; Reynolds, Skiba, Graham, Sheras, Conoley, & Garcia-Vazquez, 2006), public schools have searched for an innovative approach to better serve students who are at risk for academic failure and dropout/expulsion. A growing number of schools have considered School-Wide Positive Behavior Intervention Support (SW-PBIS) as an innovative approach that sheds light on prevention rather than on disciplinary enforcement. As emphasis on student achievement and social competency grows, SW-PBIS has been introduced as a whole-school approach to develop and enhance student social competency and learning (Sugai, 2007)

SW-PBIS provides schools with effective systemic support for challenging behaviors. It is characterized as a value added model that involves the integration of value-added outcomes; data-based decision making; human ecology and behavior science; scientific evidence-based practices; and school system changes (Anderson & Kincaid, 2005; Carr et al., 1999, 2002; Center on Positive Behavioral Interventions and Supports, 2004; Lewis & Sugai, 1999; Safran & Oswald, 2003; Sugai, Horner, and Gresham, 2001; Sugai et al., 2000; Utley & Sailor, 2002, as cited in Lafrance 2009). Lafrance's study (2009) summarized that SW-PBIS outcomes include decreased numbers of office discipline referrals (ODR); improved prosocial behaviors and peer relationships; and increased instructional time, academic achievement, and satisfaction about school safety.

Schools implementing SW-PBIS desire empirical evidence that indicates a linkage between SW-PBIS and student learning. However, the few studies that have been conducted have yielded mixed results. Sailor and colleagues' (2006) concluded that three middle schools and one K-3 charter school implementing SW-PBIS showed improved school-level academic achievement. New Hampshire's two-year study also reported a positive relationship between SW-PBIS and student achievement in math (Muscott, Mann, and LeBrun, 2008). In contrast, Bradshaw, Mitchell, and Leaf (2009) reported that no relationship between SW-PBIS and academic achievement was identified when examining the effect of SW-PBIS on Maryland's thirty seven elementary schools' academic performance. Taken together, it appears the effectiveness of SW-PBIS on student achievement at the school level is inconclusive; thus, research efforts to examine the longitudinal effect of SW-PBIS on academic achievement growth are needed.

Purpose / Objective / Research Question / Focus of Study:

Although there are some studies investigating the effectiveness of SW-PBIS on students' or schools' accountability, no studies investigate the effect of SW-PBIS over different grade levels with statewide standardized tests. Our study purports to investigate the effect at both elementary and middle schools with 3-year longitudinal statewide test data. In line with the purpose, three research questions guided this research: (1) Is SW-PBIS effective on schools' accountability as represented by statewide standardized tests; (2) What is the pattern of the effect on schools' accountability over time?; and (3) Which school characteristics or factors boost the effect on school's accountability?

Setting:

Minnesota SW-PBIS (MN SW-PBIS) is a large-scale implementation in Minnesota. MN SW-PBIS provides all necessary training and technical support to improve fidelity of implementation of SW-PBIS and has been implemented by a total of 139 out of 2006 public schools (MDE, 2011). This study examined the longitudinal effects of Minnesota SW-PBIS on school-level student achievement.

Population / Participants / Subjects:

Participating schools consist of two groups: one includes elementary schools having 3rd to 5th grades and the other includes middle schools having 6th to 8th grades between the years 2008 and 2010. Since a preliminary study on elementary schools is just completed, we only consider the elementary schools in this abstract. Sample data include schools that start from 3rd grade at 2008 to 5th grade at 2010 and were selected from the state of Minnesota. In Minnesota, the SW-PBIS program started in 2005 and the number of schools implementing SW-PBIS has steadily increased over time. Elementary schools that implemented SW-PBIS program are summarized in Table 1.

(Please insert Table 1 here)

According to the first year of implementation, three cohort groups, cohorts 3 to 5 in Table 1, were selected for this study. Cohorts 3 to 5 consist of schools that started implementing SW-PBIS in 2008, 2009, and 2010, respectively. SW-PBIS intervention schools are considered as a treatment group while matched schools to each treatment group are selected by applying a propensity matching method. The propensity matching method will be discussed in detail in the Statistical Model section. Thus, the sample consists of three cohort groups and their matched schools; the sample size after matching is 144 (=2*(17+11+29)). All schools are public and participated in statewide achievement tests, the Minnesota Comprehensive Assessment – II (MCA II) in math and reading. By applying the propensity matching method, we are able to reduce selection bias and draw results from a quasi-experimental design.

Significance / Novelty of study:

Description of what is missing in previous work and the contribution the study makes.

This study is innovative because we investigated the effectiveness of SW-PBIS on statewide standardized tests in large-scale longitudinal data at the both elementary and middle school levels. Identification of factors listed in the third research question is a very significant study in the field of positive behavior in schools. Furthermore, our results will provide rationales for evaluators and policy makers related to the SW-PBIS program.

This evidence-based research on SW-PBIS provides broad views of current affairs in SW-PBIS. To increase validity of this study, we applied novel methodologies such as propensity score matching methods (PSMM), multivariate linear mixed models (MLMM), and longitudinal structural equation modeling (LSEM). First, we applied a PSMM resulting in a quasi-experimental research design. Based on matched data, we used advanced methodologies, MLMM and LSEM, to draw statistical inferences in this study.

Statistical, Measurement, or Econometric Model:

Propensity Score Matching Method:

We applied a PSMM to select non SW-PBIS schools that reduce sampling bias. Among the matching methods, such as exact, subclassification, nearest neighbor, optimal, full, generic, and coarsened exact matching (Ho, Imai, King, and Stuart, 2011), we applied "optimal" matching that is fairly similar as "nearest neighbor" matching using propensity scores obtained by logistic regression. Optimal matching finds matched samples to minimize a global distance measure that is different from the nearest neighbor matching. The efficiency was shown by Gu and Rosenbaum (1993). To conduct this analysis, we used the `MatchIt` package in R.

Multivariate Linear Mixed Model for Longitudinal Data:

Longitudinal data obtained by PSMM consists of multiple-responses, including mathematics and reading test scores, over 3 years. In analysis, the correlation between mathematics and reading test scores will be considered by applying MLMM. This analysis will provide the effectiveness of SW-PBIS on schools' accountability represented by both mathematics and reading. Using matrix notation, MLMM can be formulated as

$$Y_{ik} \mid b_{ik} \sim N(X_{ik}\beta_k + Z_{ik}b_{ik}, \Sigma_{ik}), \quad k = 1 \text{ and } 2$$

where $N(\cdot,\cdot)$ denotes a multidimensional normal distribution, X_{ik} and Z_{ik} are design matrices for the fixed and subject-specific effects, respectively, and β_k is a vector of unknown regression coefficients (Fitzmaurice, Davidian, Verbeke, and Molenberghs, 2009). To conduct this analysis, we use the `SabreR` package in R.

Longitudinal Structure Equation Modeling (LSEM):

As indicated in the third research question, in this study we identify significant factors (school characteristics) that boost the effect of SW-PBIS. To avoid the redundancy of using covariates at both PSMM and LSEM, we use raw data sets including all covariates used in PSMM, the SW-PBIS variable, and math and reading test scores. By investigating the mediator or moderator effects of school characteristics over SW-PBIS on schools' accountability, we draw school characteristics correlated with SW-PBIS program on school's accountability. To conduct this analysis, we use the `OpenMx` package in R.

Usefulness / Applicability of Method:

In educational and behavioral research, PSMM is very useful to set up a quasi-experimental design. Raw data available to us were observational data consisting of all SW-PBIS schools and non SW-PBIS schools, which may cause a selection bias. This potential problem results in inaccurate statistical inference. As indicated, we selected a matched sample from each cohort group according to the year of implementation of SW-PBIS. Thus, we have three different results from three matching procedures. Tables 2 to 4 show the improvement of balance by comparing statistics before and after matching. For example, "Distance" measuring a global distance was decreased as 62.36%, 98.55%, and 99.32% at cohort groups. In addition to statistics, Figures 1 to 3 indicate comparison of distribution of propensity scores. Points under *Matched Treatment Units* and *Matched Control Units* are

data selected by PSMM. Regardless of distributions of the raw data, each figure shows that the distribution of the matched sample is fairly similar to that of the treatment sample. This procedure removes the threat of selection bias.

Two advanced methodologies, MLMM and LSEM, enable us to answer research questions without correcting due to the unavailability of methodology. Likewise PSMM, MLMM and LSEM have strengths in drawing accurate results. For example, MLMM deals with potential correlation between outcomes while LSEM provides the flexibility to test models under various conditions (e.g., "what if…?" types of questions). All methodologies, PSMM, MLMM, and LSEM, can be applicable in social and behavioral research. We hope through this project to be able to provide advanced methodologies in the analysis of educational and psychology data.

Research Design:

This project is a quasi-experimental design using a matched sample that is obtained by a PSMM. This project is also both a longitudinal study with 3-year longitudinal data and a multi-group study with elementary and middle school data. Since professional development and coaching for SW-PBIS are provided during the summer and MCA II is administered at the end of spring semester, it is expected that degree of awareness of positive behavior in school differs from the length of SW-PBIS program in school. Thus, a longitudinal study is more appropriate than a cross-sectional study to investigate the effectiveness of SW-PBIS. It is beyond the scope to discuss the relations among awareness, length, and accountability, but the potential relationship cannot be avoided.

Data Collection and Analysis:

Based on the matched sample consisting of 57 SW-PBIS and 57 non SW-PBIS schools in elementary school, we investigated the effect of SW-PBIS on MCA II math and reading scores, separately. By fitting LMMs into 3 year longitudinal data, we had base models to test the effect of SW-PBIS. When selecting and testing models, we applied the delta method based on BIC (Kadane and Lazar, 2004).

Findings / Results:

Preliminary data analysis based on elementary schools indicates no statistically significant relationship between SW-PBIS program and schools' accountability. Interestingly, the matched sample still indicates a fairly large gap on schools' accountability between cohort groups and matched groups (Figures 4 to 9).

Conclusions:

Although our preliminary data analysis based on separate linear mixed models indicates no significant effect of SW-PBIS, further analyses are planned in order to investigate this issue more fully.

Appendices

Not included in page count.

Appendix A. References

Anderson, C.M., & Kincaid, D. (2005). Applying behavior analysis to school violence and discipline problems: Schoolwide positive behavior support. *Behavior Analyst, 28*, 49-63.

Bradshaw, C. P., Mitchell, M. M., &Leaf, P. J. (2010). Examining the effects of schoolwide positive behavioral interventions and supports on student outcomes: Results from a randomized controlled effectiveness trial in elementary schools. *Journal of Positive Behavior Interventions, 12*(3), 133-148.

Carr, E. G., Dunlap, G., Horner, R. H., Koegel, R. L., Turnbull, A. P., & Sailor, W. (2002). Positive behavior support: Evolution of an applied science. *Journal of Positive Behavior Interventions, 4*, 4-16.

Carr, E. G., Horner, R. H., Turnbull, A. P., Marquis, J. G., Magito-McLaughlin, D., McAtee, M. L., et al. (1999). *Positive behavior support as an approach for dealing with problem behavior in people with developmental disabilities: A research synthesis* (American Association on Mental Retardation Monograph Series. No. 3). Washington, DC: American Association on Mental Retardation.

Fitzmaurice, G., Davidian, M., Verbeke, G., and Molenberghs, G. (2009), *Longitudinal data analysis*. Chapman & Hall/CRC.

Gu, X. and Rosenbaum, P. R. (1993). Comparison of multivariate matching methods: structures, distances, and algorithms. *Journal of Computational and Graphical Statistics, 2*, 405-420.

Ho, D. E., Imai, K., King, G., and Stuart, E. A. (Forthcoming), ~~"~~MatchIt: Nonparametric Preprocessing for Parametric Causal Inference," Journal of Statistical Software, http://gking.harvard.edu/matchit.

Kadane, J.B. and Lazar, N.A. (2004). Methods and criteria for model selection. *Journal of the American Statistical Association, 99*, 279-290.

Lafrance, J. A. (2010). *Examination of the fidelity of school-wide positive behavior support implementation and its relationship to academic and behavioral outcomes in florida.* Retrieved from http://gateway.proquest.com/openurl%3furl_ver=Z39.88-2004%26res_dat=xri:pqdiss%26rft_val_fmt=info:ofi/fmt:kev:mtx:dissertation%26rft_dat=xri:pqdiss:3383666 (Dissertation Abstract: 2010-99090-466)

Lewis, T. J., Sugai, G. (1999). Effective behavior support: A systems approach to proactive schoolwide management. *Focus on Exceptional Children, 31*(6).

Luiselli, J. K., Putnam, R. F., Handler, M. W., & Feinberg, A. (2005). Whole-school positive behavior support: Effects on student discipline problems and academic performance. *Educational Psychology, 25,* 183–-198.

Minnesota Department of Education (MDE) (2011). *Positive Behavioral Interventions and Supports*. Retrieved April 1, 2011, from http://education.state.mn.us/MDE/Learning_Support/Special_Education/Evaluation_Program_Planning_Supports/Positive_Behavioral_Interventions_Supports/index.html

Muscott, H. S., Mann, E. L., &LeBrun, M. R. (2008). Positive behavioral interventions and supports in new hampshire effects of large-scale implementation of schoolwide positive behavior support on student discipline and academic achievement. *Journal of Positive Behavior Interventions, 10*(3), 190-205.

Reynolds, C. R., Skiba, R. J., Graham, S., Sheras, P., Conoley, J. C., & Garcia-Vazquez, E. (2008). Are zero tolerance policies effective in the schools? An evidentiary review and recommendations. *The American Psychologist, 63(9)*, 852-862.

Safran, S. P. & Oswald, K. (2003). Positive behavior supports: Can schools reshape disciplinary practices? *Exceptional Children, 69*, 361-373.

Sailor, W., Zuna, N., Chol, J. H., Thomas, J., McCart, A., & Roger, B. (2006). Anchoring schoolwide positive behavior support in structural school reform. *Research and Practice for Persons with Severe Disabilities, 31*(1), 18-30.

Sugai, G. (2007). Promoting behavioral success in schools: Commentary on exemplary practices. In McDougal, J., & Miller, D. Special Practitioner"s Edition: Promoting behavioral success. *Psychology in the Schools, 44, 113-118.*

Sugai, G., Horner, R. H., Dunlap, G., Hieneman, M., Nelson, C. M., Scott, T., Liaupsin, C., Sailor, W., Turnbull, A. P., Turnbull, H. R., Wickham, D., Wilcox, B., & Ruef, M. (2000). Applying positive behavior support and functional behavioral assessment in schools. *Journal of Positive Behavior Interventions, 2*(3), 131-143.

Sugai, G., Horner, R. H., & Gresham, F. (2001). Behaviorally effective school environments. (pp. 315-350). In M. R. Shinn, G. Stoner, & H. M. Walker (Eds), *Interventions for academic and behavior problems: Preventive and remedial approaches.* National Association of School Psychologists. Silver Spring, MD.

Utley, C. A., & Sailor, W. (2002). Positive behavior support and urban school improvement: A Special Section of the Journal of Positive Behavior Interventions [Guest editorial]. *Journal of Positive Behavior Interventions, 4,* 195.

Appendix B. Tables and Figures

Table 1
Cumulative List of Elementary Schools

First year of implementation	Number of schools	Selected sample
Cohort 1 (2005~2006)	4	
Cohort 2 (2006~2007)	10	
Cohort 3 (2007~2008)	17	17
Cohort 4 (2008~2009)	11	11
Cohort 5 (2009~2010)	29	29
Total	71	57

Table 2
Result of Propensity Score Matching at Cohort 3

Variables	All data				Matched data				% of Improvement
	Means		SD	Mean Diff	Means		SD	Mean Diff	
	SW-PBIS	Non SW-PBIS	Non SW-PBIS		SW-PBIS	Non SW-PBIS	Non SW-PBIS		
distance	0.26	0.02	0.04	0.25	0.26	0.17	0.18	0.09	62.36
School size	66.41	64.07	39.28	2.34	66.41	55.00	62.21	11.41	-387.61
American Indian	2.47	1.36	4.68	1.11	2.47	0.88	1.50	1.59	-42.47
Asia/Pacific Islander	1.53	2.98	5.61	-1.45	1.53	0.47	0.87	1.06	26.82
Hispanic	2.00	2.98	5.24	-0.98	2.00	1.18	2.01	0.82	15.98
Black	17.88	5.51	8.62	12.37	17.88	11.29	18.22	6.59	46.74
White	42.47	51.23	37.81	-8.76	42.47	41.06	64.35	1.41	83.88
Male	34.12	32.69	20.78	1.43	34.12	27.94	33.99	6.18	-333.18
Special Education Serv.	9.35	8.28	5.78	1.08	9.35	6.53	5.81	2.82	-161.97
Limited Eng. Proficiency	1.35	2.57	7.17	-1.21	1.35	0.53	1.37	0.82	32.12
Free/Reduced Priced Meals	30.76	20.31	14.73	10.46	30.76	24.82	20.01	5.94	43.18
Migrant Service	0.00	0.08	0.52	-0.08	0.00	0.00	0.00	0.00	100.00
Percent of Level 1 (M)	19.74	5.79	6.84	13.94	19.74	15.67	13.57	4.06	70.85
Percent of Level 2 (M)	24.22	16.29	9.47	7.93	24.22	27.63	10.41	-3.41	57.04
Percent of Level 3 (M)	39.66	45.40	10.51	-5.74	39.66	39.94	13.50	-0.28	95.18
Percent of Level 4 (M)	16.39	32.52	15.93	-16.13	16.39	16.79	14.66	-0.39	97.56
MCA II Math (2007)	351.25	358.22	5.00	-6.96	351.25	352.06	5.71	-0.81	88.34
Percent of Level 1 (R)	26.51	11.34	10.17	15.17	26.51	25.14	17.93	1.38	90.93
Percent of Level 2 (R)	10.53	9.52	5.73	1.01	10.53	9.82	6.75	0.71	29.74
Percent of Level 3 (R)	32.93	31.21	8.94	1.72	32.93	33.94	9.98	-1.01	41.35
Percent of Level 4 (R)	30.03	47.93	16.37	-17.90	30.03	31.13	20.72	-1.10	93.86
MCA II Reading (2007)	353.10	362.81	7.37	-9.71	353.10	353.78	11.04	-0.68	92.98

Table 3
Result of Propensity Score Matching at Cohort 4

Variables	All data				Matched data				% of Improvement
	Means		SD	Mean Diff	Means		SD	Mean Diff	
	SW-PBIS	Non SW-PBIS	Non SW-PBIS		SW-PBIS	Non SW-PBIS	Non SW-PBIS		
distance	0.08	0.01	0.04	0.07	0.08	0.08	0.06	0.00	98.55
School size	85.91	64.28	38.64	21.63	85.91	92.27	49.70	-6.36	70.58
American Indian	1.27	1.37	4.73	-0.09	1.27	2.55	2.88	-1.27	-1254.19
Asia/Pacific Islander	3.36	3.03	5.66	0.33	3.36	3.73	4.63	-0.36	-10.26
Hispanic	6.09	3.02	5.29	3.07	6.09	9.36	9.70	-3.27	-6.63
Black	7.18	5.38	8.24	1.80	7.18	13.00	16.35	-5.82	-222.71
White	67.82	51.46	37.01	16.36	67.82	63.64	45.06	4.18	74.44
Male	44.36	32.80	20.40	11.56	44.36	49.55	27.62	-5.18	55.18
Special Education Serv.	14.27	8.32	5.77	5.96	14.27	14.36	9.67	-0.09	98.47
Limited Eng. Proficiency	5.73	2.61	7.24	3.11	5.73	8.27	10.48	-2.55	18.27
Free/Reduced Priced Meals	28.55	20.20	14.59	8.34	28.55	38.27	23.68	-9.73	-16.62
Migrant Service	0.18	0.09	0.52	0.10	0.18	0.64	1.21	-0.45	-370.70
Percent of Level 1 (M)	6.85	5.57	6.45	1.29	6.85	10.55	9.42	-3.70	-186.94
Percent of Level 2 (M)	18.87	16.03	9.29	2.84	18.87	25.36	11.17	-6.49	-128.65
Percent of Level 3 (M)	43.93	45.52	10.41	-1.60	43.93	42.12	8.83	1.81	-13.36
Percent of Level 4 (M)	30.35	32.88	15.78	-2.53	30.35	21.98	12.97	8.37	-231.18
MCA II Math (2007)	357.90	358.36	4.90	-0.46	357.90	354.60	4.98	3.30	-621.08
Percent of Level 1 (R)	12.92	11.03	9.71	1.89	12.92	16.09	8.93	-3.17	-67.64
Percent of Level 2 (R)	9.91	9.51	5.71	0.40	9.91	10.62	4.37	-0.71	-77.44
Percent of Level 3 (R)	32.66	31.15	8.91	1.51	32.66	36.55	9.64	-3.89	-157.37
Percent of Level 4 (R)	44.53	48.32	16.07	-3.79	44.53	36.76	11.40	7.76	-104.87
MCA II Reading (2007)	362.41	363.02	7.14	-0.61	362.41	359.19	5.29	3.22	-425.37

Table 4
Result of Propensity Score Matching at Cohort 5

Variables	All data				Matched data				% of Improvement
	Means		SD	Mean Diff	Means		SD	Mean Diff	
	SW-PBIS	Non SW-PBIS	Non SW-PBIS		SW-PBIS	Non SW-PBIS	Non SW-PBIS		
distance	0.08	0.04	0.04	0.04	0.08	0.08	0.06	0.00	99.32
School size	65.69	63.86	38.33	1.83	65.69	43.21	29.13	22.48	-1126.88
American Indian	1.83	1.35	4.75	0.48	1.83	3.83	15.09	-2.00	-317.81
Asia/Pacific Islander	3.79	3.02	5.68	0.77	3.79	3.17	9.85	0.62	19.37
Hispanic	4.24	2.93	5.14	1.32	4.24	3.48	9.09	0.76	42.33
Black	4.10	5.26	8.03	-1.16	4.10	1.55	4.81	2.55	-119.92
White	51.72	51.28	36.89	0.45	51.72	31.17	25.80	20.55	-4487.04
Male	34.59	32.55	20.19	2.04	34.59	22.97	15.73	11.62	-470.16
Special Education Serv.	9.97	8.22	5.65	1.74	9.97	6.62	5.22	3.34	-92.05
Limited Eng. Proficiency	3.00	2.53	7.16	0.47	3.00	4.48	13.65	-1.48	-213.79
Free/Reduced Priced Meals	23.79	19.93	14.26	3.86	23.79	20.31	20.44	3.48	9.81
Migrant Service	0.07	0.08	0.50	-0.01	0.07	0.28	1.13	-0.21	-2500.00
Percent of Level 1 (M)	5.55	5.49	6.37	0.06	5.55	6.77	6.99	-1.22	-1977.98
Percent of Level 2 (M)	16.59	15.89	9.20	0.70	16.59	20.22	9.85	-3.63	-421.70
Percent of Level 3 (M)	49.25	45.57	10.42	3.67	49.25	50.41	11.41	-1.16	68.37
Percent of Level 4 (M)	28.60	33.05	15.77	-4.45	28.60	22.58	18.42	6.02	-35.19
MCA II Math (2007)	357.48	358.41	4.88	-0.93	357.48	355.82	5.70	1.67	-78.77
Percent of Level 1 (R)	10.44	10.95	9.71	-0.51	10.44	13.37	13.85	-2.93	-474.14
Percent of Level 2 (R)	9.87	9.49	5.73	0.38	9.87	11.08	7.61	-1.21	-220.77
Percent of Level 3 (R)	32.69	31.07	8.88	1.62	32.69	33.02	11.44	-0.33	79.60
Percent of Level 4 (R)	47.01	48.49	16.07	-1.48	47.01	42.51	20.12	4.49	-202.68
MCA II Reading (2007)	362.93	363.08	7.15	-0.15	362.93	360.97	9.79	1.96	-1218.95

Figure 1
Comparison between treatment and control 3 schools via distribution of propensity scores

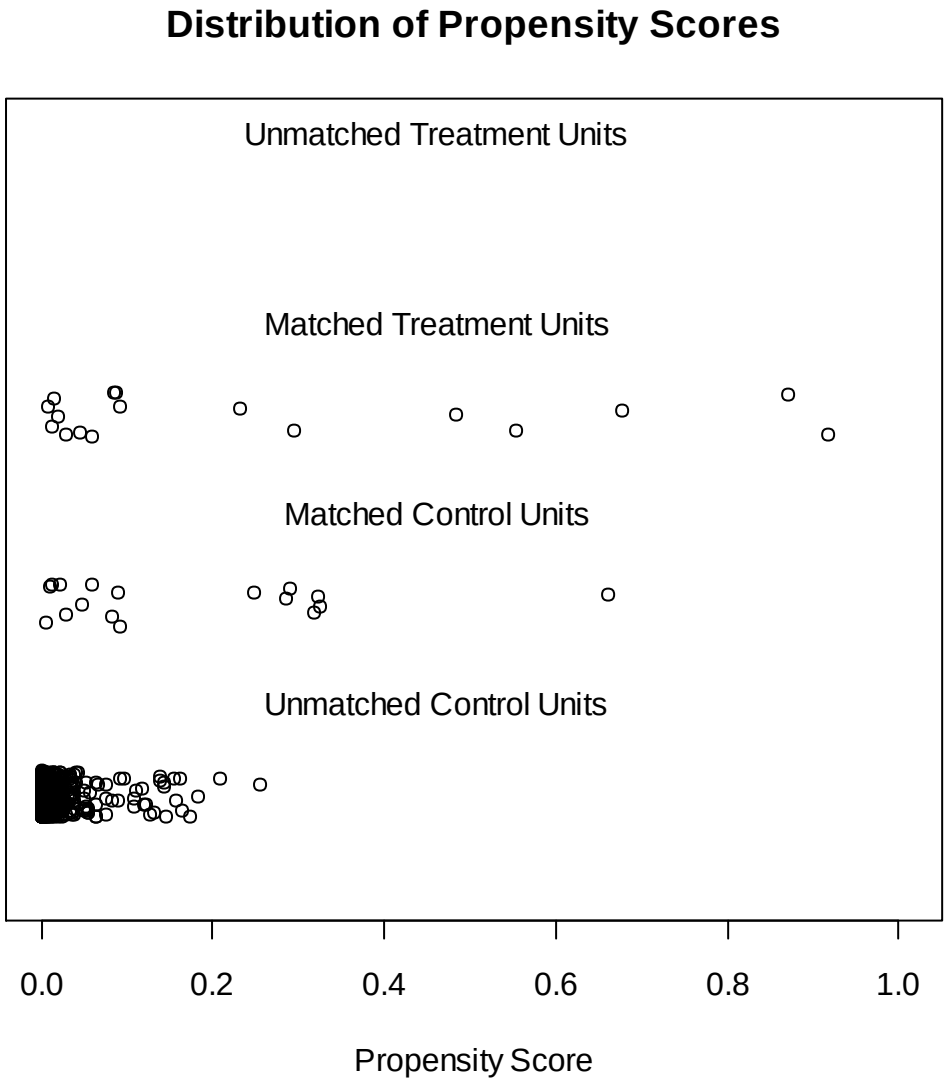

Figure 2
Comparison between treatment and control 4 schools via distribution of propensity scores

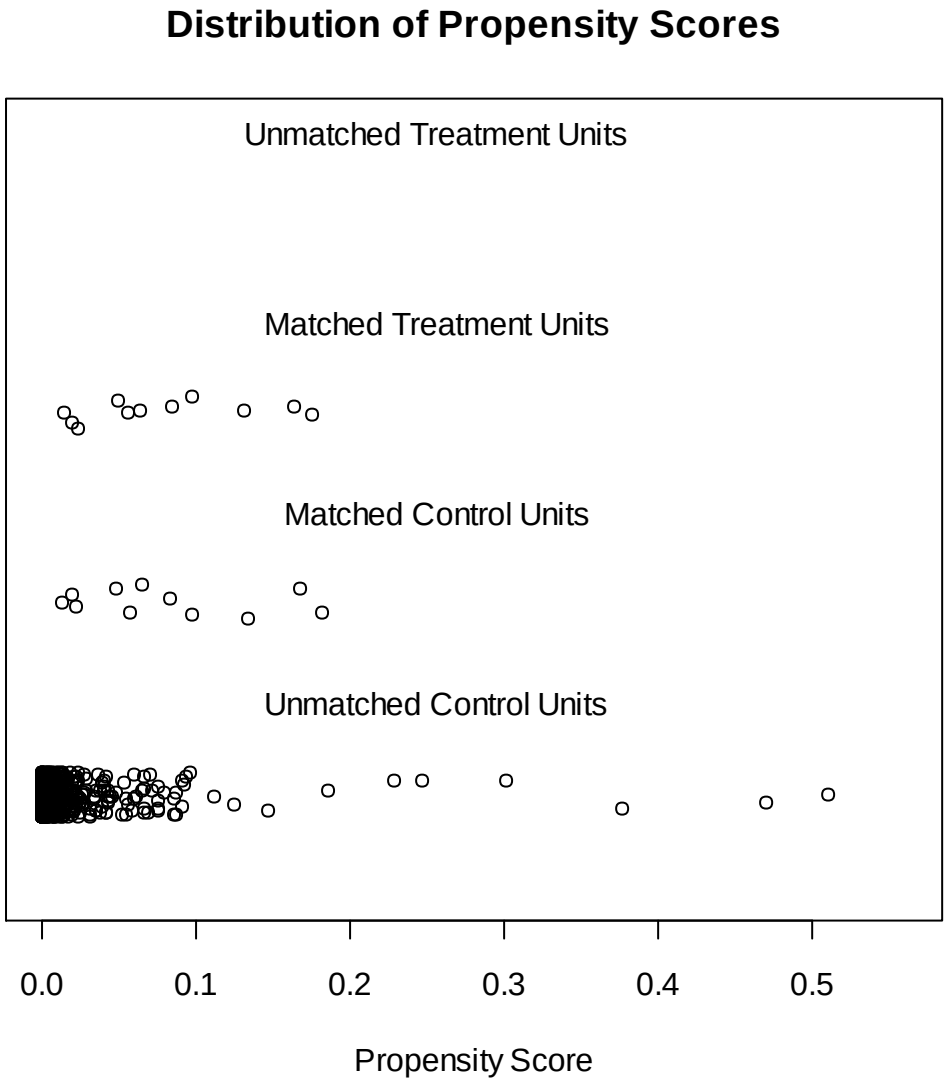

Figure 3
Comparison between treatment and control 5 schools via distribution of propensity scores

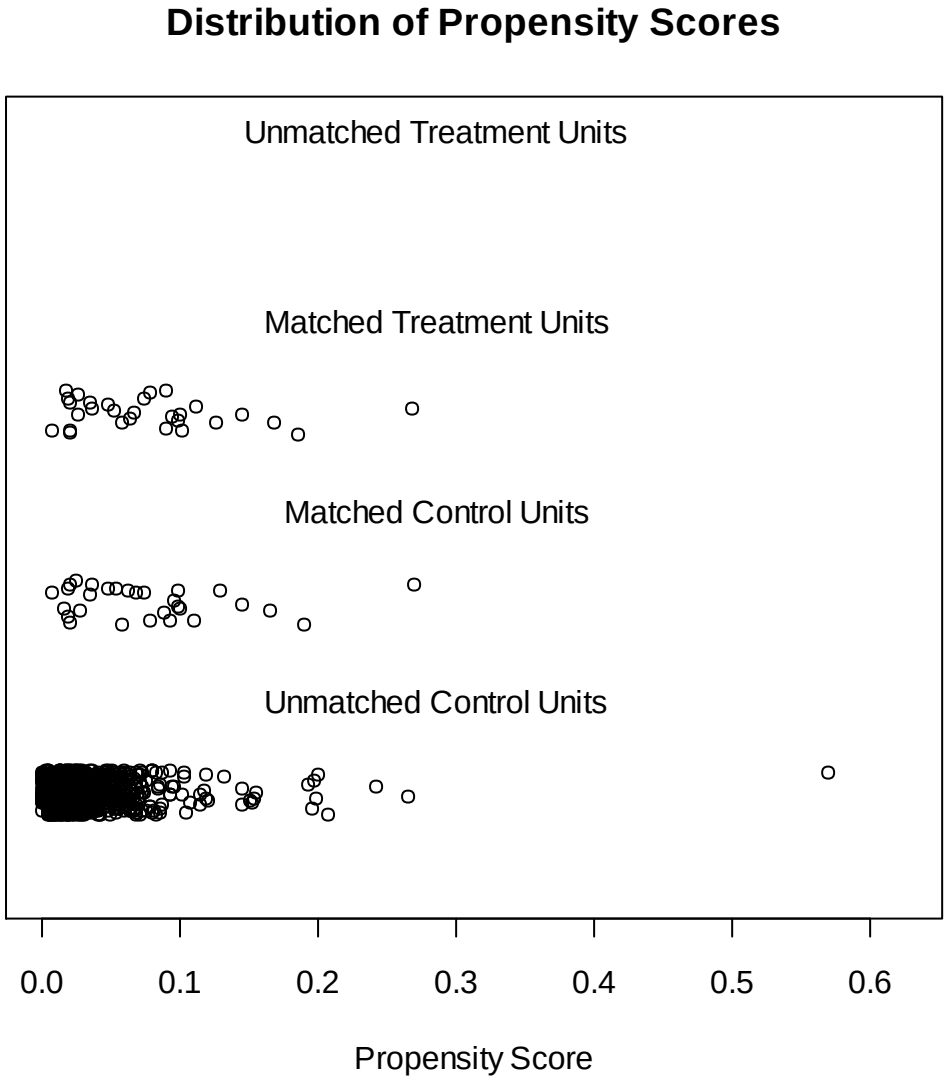

Figure 4

Mean changes of MCA II – Mathematics conditioned on SW-PBIS at Cohort 3 and its matched sample

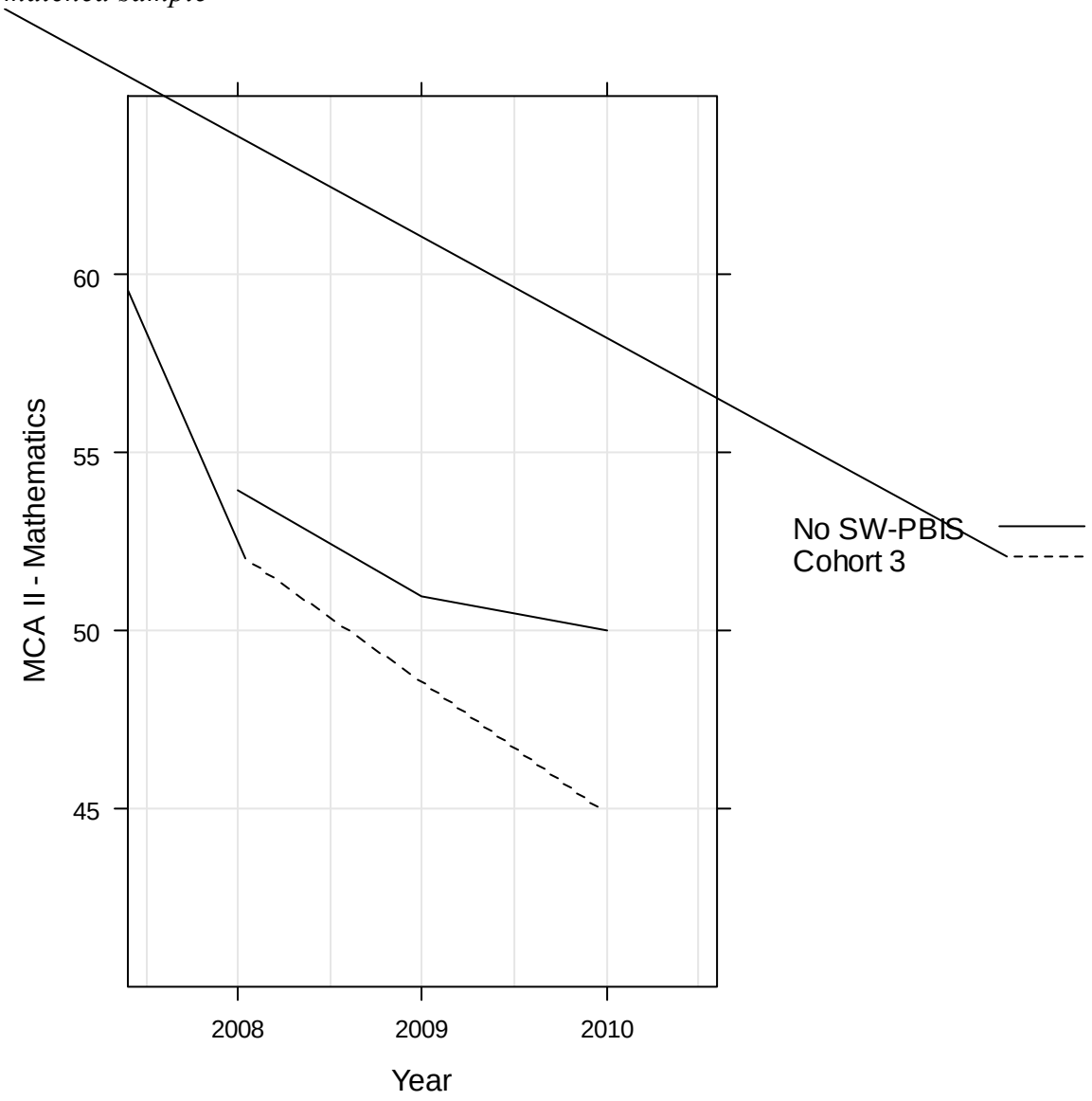

Figure 5

Mean changes of MCA II – Mathematics conditioned on SW-PBIS at Cohort 4 and its matched sample

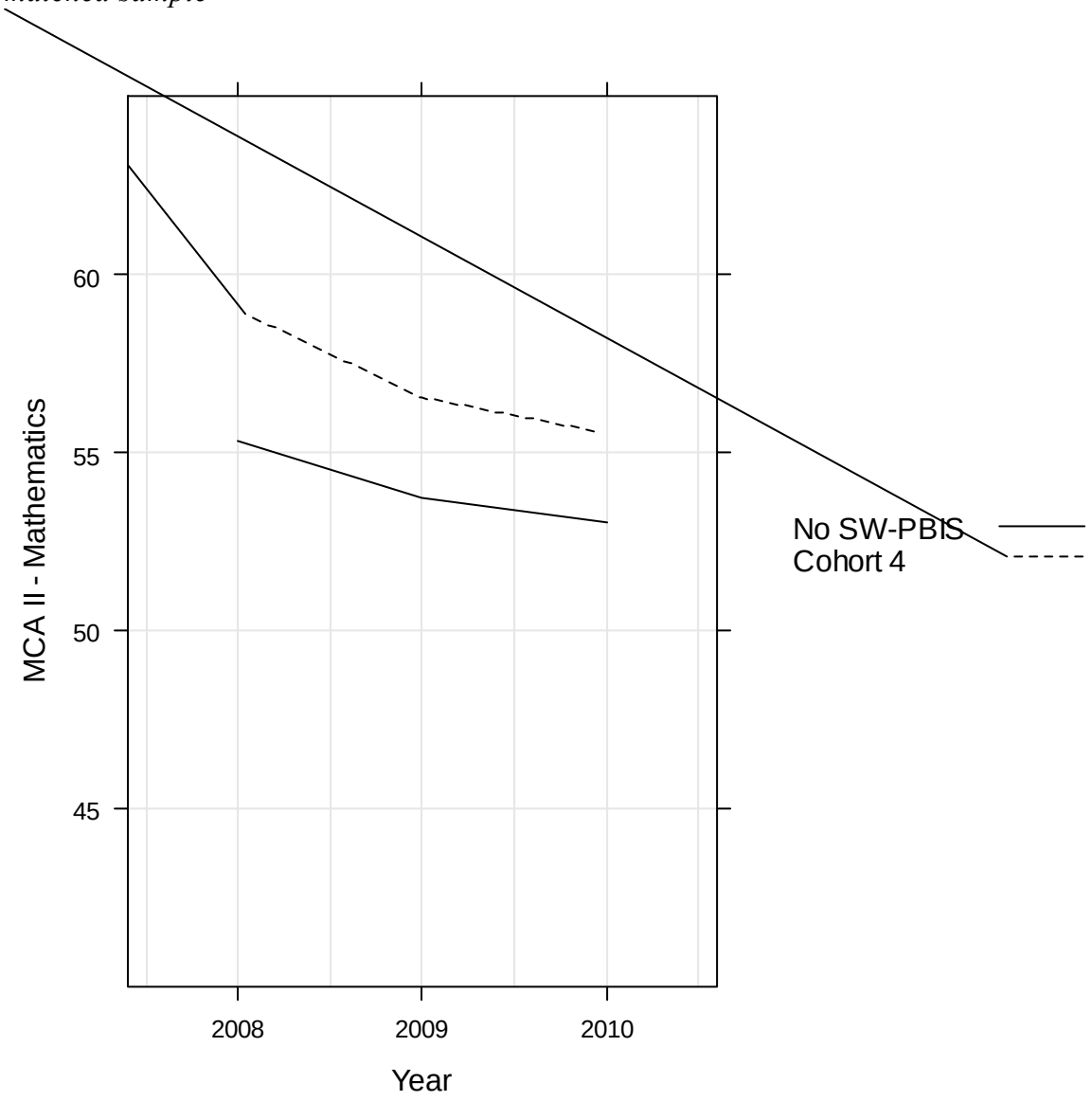

Figure 6

Mean changes of MCA II – Mathematics conditioned on SW-PBIS at Cohort 5 and its matched sample

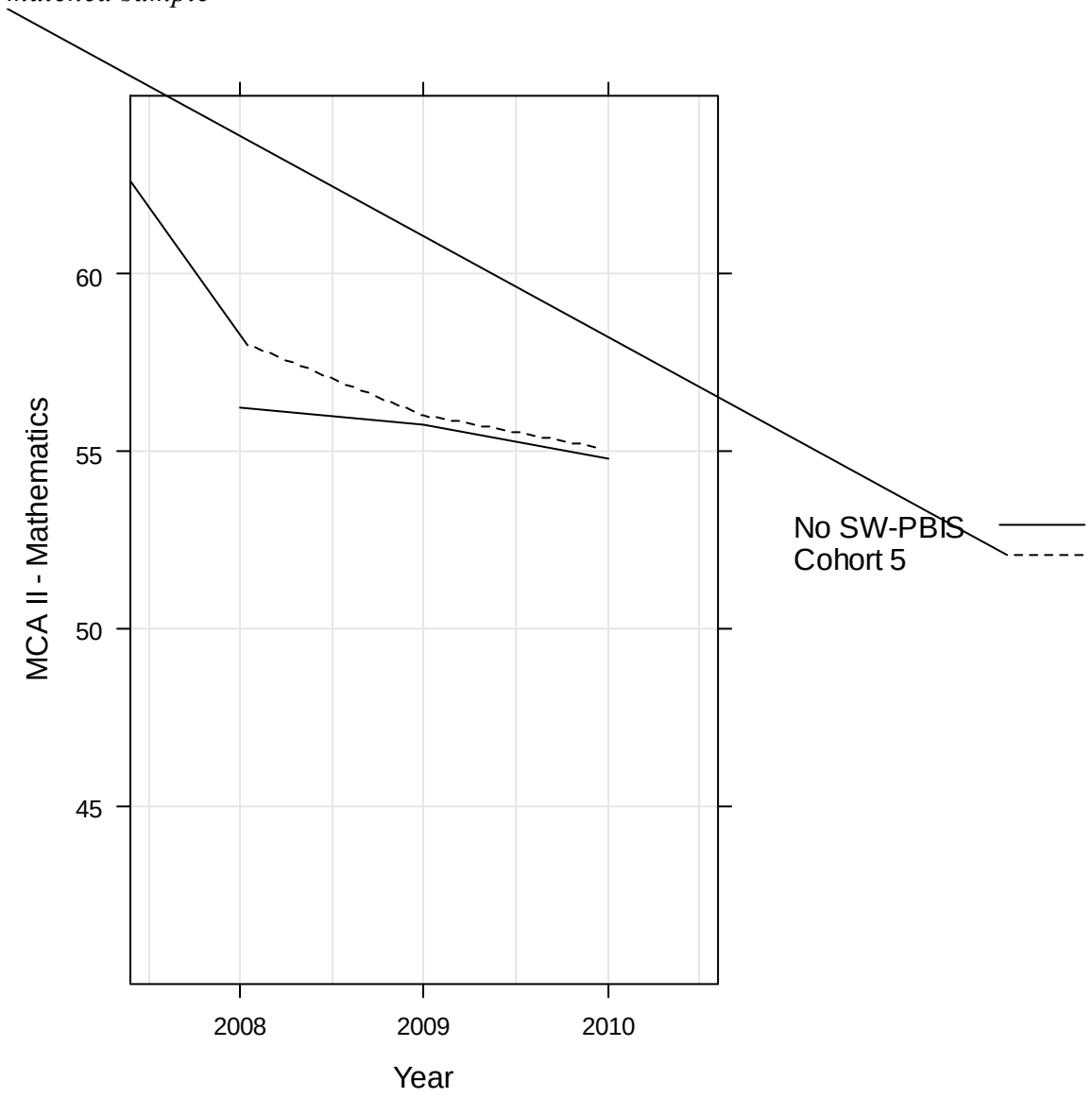

Figure 7

Mean changes of MCA II – Reading conditioned on SW-PBIS at Cohort 3 and its matched sample

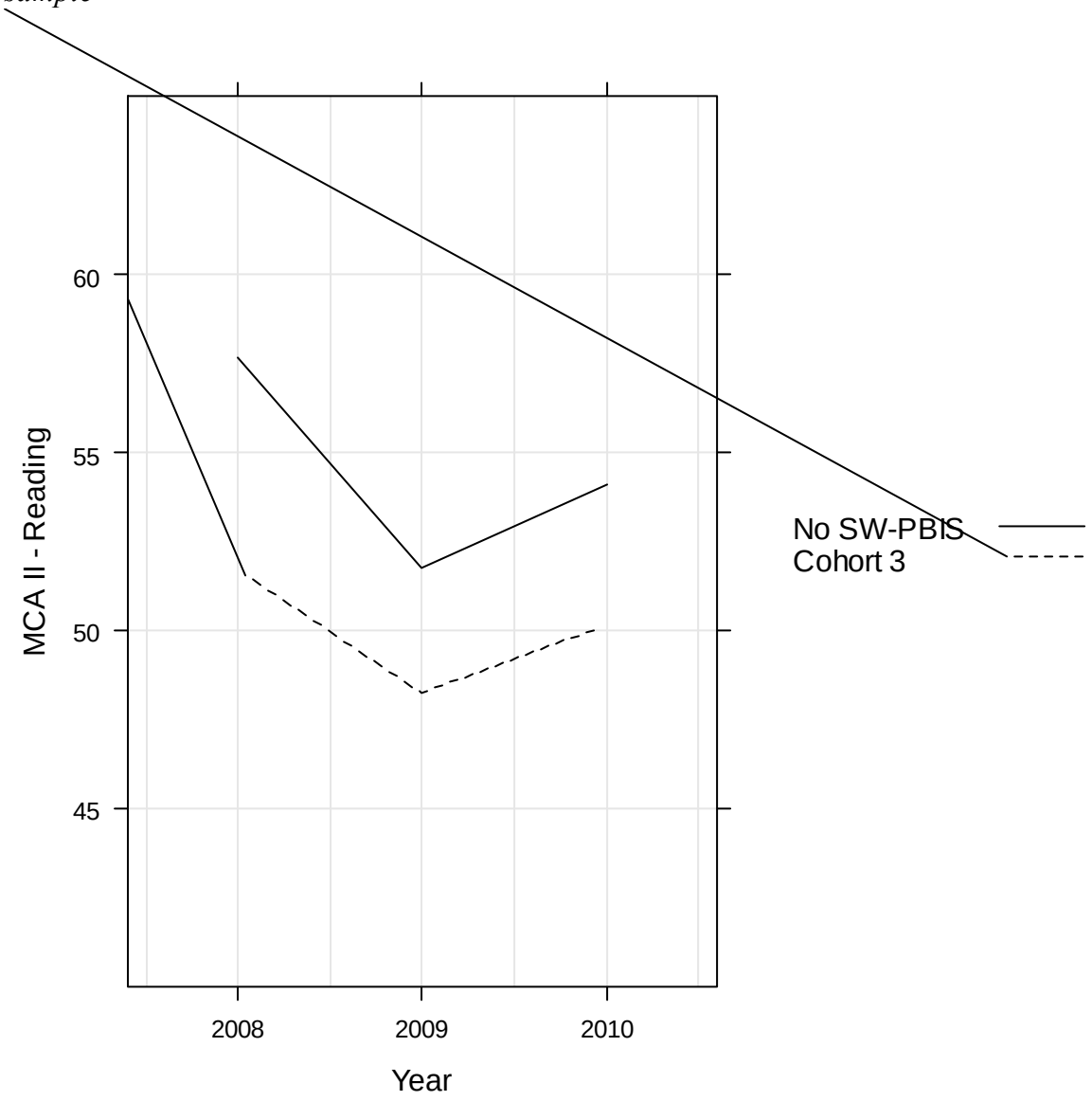

Figure 8

Mean changes of MCA II – Reading conditioned on SW-PBIS at Cohort 4 and its matched sample

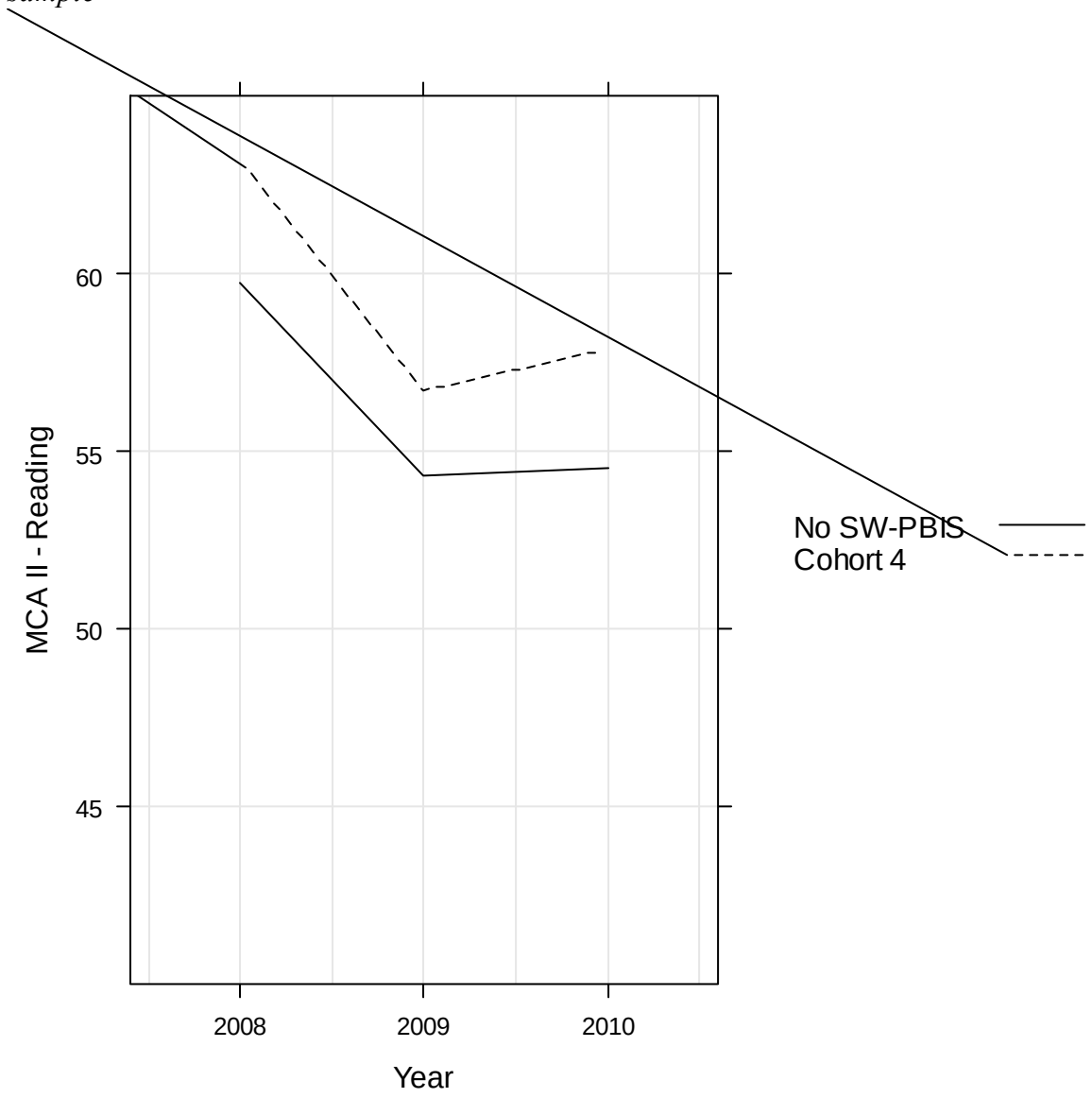

Figure 9

Mean changes of MCA II – Reading conditioned on SW-PBIS at Cohort 5 and its matched sample