

Are Two Teachers Better Than One?
The Effect of Co-Teaching on Students With and
Without Disabilities
Online Appendices

Nathan Jones, PhD

Associate Professor

Boston University

Marcus A. Winters, PhD

Associate Professor

Boston University

Appendices

A Data Appendix

A SIMS Data

The SIMS data comes from information transmitted from school districts to the state of Massachusetts. The data is reported to the state 3 times per year. We used only the information as reported in spring of the relevant academic year. The unit of observation in these data files is the student. After standardizing variable names to be common across years, we merged the files to generate a panel data set at the student-year level. From there, we resolved inconsistencies in the labeling of the data. For example, the gender variable sometimes coded males as “M” and others as “m”; we ensured such coding was common across all years.

B MCAS Data

The state of Massachusetts provided MCAS data for the spring test administration spanning the years 2008 through 2018. After standardizing variable names across years, we merged the files into a panel data set at the student-year level. For the years 2008-2014 and 2017-2018, we use raw MCAS scores and standardize them within year and grade to have mean 0 and standard deviation 1. For the years after 2015, some students in the state took Partnership for Assessment of Readiness for College and Careers (PARCC) test, some took MCAS, and others took both. For these years, we take the raw MCAS scores wherever available. The state was unable to locate raw PARCC scores for this study. For the 2015 test we used PARCC to MCASS concordance scores and for the 2016 test, we used PARCC theta scores.¹ Within each of these years, we standardized the test scores at the test-type (raw MCAS, PARCC concordance, PARCC theta) and grade level to have mean 0 and standard deviation 1. In addition, we control for test-type (raw MCAS, PARCC concordance, PARCC theta) in the relevant value-added and school quality specifications. For years 2017 and

2018, we only use the MCAS scores.

C EPIMS Data

The EPIMS data comes from information transmitted from school districts to the state of Massachusetts. The unit of observation in this data is a teacher-school-course-section-term. After standardizing variable names, we merged the files into a single data set at the teacher-year-school-course-term level. From there, we resolved inconsistencies in the data. For example, the gender variable sometimes coded males as “M” and others as “m”; we ensured such coding was common across all years.

D SCS Data

The SCS data come from information transmitted from school districts to DESE. Prior to 2011, the state did not collect data on student coursework. The unit of observation in this data is a student-school-course-section-term. After standardizing variable names, we merged the files into a single data set at the student-year-school-course-section-term level. This data came to us with consistent year-to-year coding and required virtually no cleaning after merging. The research assistant working on this project was very excited about this development.

B Additional Figures and Tables

Table B1: Descriptives: Math Sample

| | (1) Co-Teach; Narrow | (2) Co-Teach; Broad | (3) Single Teacher | (4) Difference (1)-(2) | (5) Difference (2)-(3) | (6) Difference (1)-(3) |
|-------------------|-------------------------|------------------------|-----------------------|---------------------------|---------------------------|---------------------------|
| Female | 0.456 | 0.478 | 0.494 | -0.023*** (0.002) | -0.016*** (0.001) | -0.038*** (0.002) |
| White | 0.764 | 0.782 | 0.819 | -0.017*** (0.002) | -0.037*** (0.001) | -0.055*** (0.002) |
| Black | 0.205 | 0.182 | 0.126 | 0.023*** (0.002) | 0.055*** (0.001) | 0.079*** (0.001) |
| Hispanic | 0.227 | 0.250 | 0.165 | -0.023*** (0.002) | 0.085*** (0.001) | 0.062*** (0.001) |
| Asian | 0.062 | 0.057 | 0.077 | 0.005*** (0.001) | -0.020*** (0.000) | -0.015*** (0.001) |
| Free Lunch | 0.524 | 0.458 | 0.316 | 0.066*** (0.002) | 0.142*** (0.001) | 0.208*** (0.002) |
| Reduced Lunch | 0.051 | 0.043 | 0.040 | 0.008*** (0.001) | 0.004*** (0.000) | 0.012*** (0.001) |
| IEP | 0.395 | 0.299 | 0.193 | 0.096*** (0.002) | 0.106*** (0.001) | 0.202*** (0.002) |
| Autism | 0.020 | 0.015 | 0.012 | 0.005*** (0.001) | 0.004*** (0.000) | 0.009*** (0.001) |
| Communication | 0.048 | 0.033 | 0.025 | 0.016*** (0.001) | 0.008*** (0.000) | 0.024*** (0.001) |
| Emotional | 0.031 | 0.028 | 0.014 | 0.003*** (0.001) | 0.014*** (0.000) | 0.017*** (0.001) |
| Health | 0.050 | 0.036 | 0.023 | 0.013*** (0.001) | 0.014*** (0.000) | 0.027*** (0.001) |
| Neurological | 0.017 | 0.015 | 0.009 | 0.002*** (0.000) | 0.006*** (0.000) | 0.008*** (0.000) |
| Specific Learning | 0.116 | 0.084 | 0.052 | 0.032*** (0.001) | 0.032*** (0.000) | 0.064*** (0.001) |
| ELA Score | -0.475 | -0.300 | 0.066 | -0.175*** (0.005) | -0.366*** (0.002) | -0.541*** (0.005) |
| Math Score | -0.501 | -0.306 | 0.073 | -0.195*** (0.005) | -0.379*** (0.002) | -0.574*** (0.004) |
| Observations | 79147 | 622060 | 4427394 | 701207 | 5049454 | 4506541 |

Table B2: Descriptives: ELA Sample, IEP Students Only

| | (1) Coteach; Narrow | (2) Coteach; Broad | (3) Single Teacher | (4) Difference (1)-(2) | (5) Difference (2)-(3) | (6) Difference (1)-(3) |
|---------------|------------------------|-----------------------|-----------------------|---------------------------|---------------------------|---------------------------|
| Female | 0.361 | 0.364 | 0.370 | -0.003 (0.003) | -0.006*** (0.001) | -0.009*** (0.003) |
| White | 0.786 | 0.800 | 0.836 | -0.014*** (0.002) | -0.036*** (0.001) | -0.050*** (0.002) |
| Black | 0.206 | 0.188 | 0.150 | 0.018*** (0.002) | 0.037*** (0.001) | 0.056*** (0.002) |
| Hispanic | 0.269 | 0.288 | 0.199 | -0.019*** (0.003) | 0.089*** (0.001) | 0.070*** (0.002) |
| Asian | 0.036 | 0.036 | 0.038 | 0.001 (0.001) | -0.002*** (0.000) | -0.001 (0.001) |
| Free Lunch | 0.561 | 0.540 | 0.408 | 0.020*** (0.003) | 0.132*** (0.001) | 0.153*** (0.003) |
| Reduced Lunch | 0.049 | 0.044 | 0.042 | 0.005*** (0.001) | 0.001* (0.000) | 0.006*** (0.001) |
| ELA Score | -1.050 | -1.024 | -0.710 | -0.026*** (0.007) | -0.313*** (0.003) | -0.339*** (0.007) |
| Math Score | -1.018 | -0.977 | -0.696 | -0.041*** (0.007) | -0.281*** (0.003) | -0.322*** (0.006) |
| Observations | 35834 | 210609 | 846030 | 246443 | 1056639 | 881864 |

Table B3: Descriptives: Math Sample, IEP Students Only

| | (1) Coteach; Narrow | (2) Coteach; Broad | (3) Single Teacher | (4) Difference (1)-(2) | (5) Difference (2)-(3) | (6) Difference (1)-(3) |
|---------------|------------------------|-----------------------|-----------------------|---------------------------|---------------------------|---------------------------|
| Female | 0.376 | 0.371 | 0.366 | 0.005 (0.003) | 0.005*** (0.001) | 0.010*** (0.003) |
| White | 0.786 | 0.793 | 0.836 | -0.007** (0.003) | -0.043*** (0.001) | -0.050*** (0.002) |
| Black | 0.213 | 0.198 | 0.150 | 0.015*** (0.002) | 0.048*** (0.001) | 0.063*** (0.002) |
| Hispanic | 0.234 | 0.267 | 0.202 | -0.032*** (0.003) | 0.064*** (0.001) | 0.032*** (0.002) |
| Asian | 0.033 | 0.034 | 0.038 | -0.001 (0.001) | -0.004*** (0.000) | -0.005*** (0.001) |
| Free Lunch | 0.571 | 0.530 | 0.410 | 0.041*** (0.003) | 0.120*** (0.001) | 0.162*** (0.003) |
| Reduced Lunch | 0.050 | 0.043 | 0.043 | 0.007*** (0.001) | 0.000 (0.001) | 0.008*** (0.001) |
| ELA Score | -1.056 | -0.981 | -0.718 | -0.075*** (0.007) | -0.263*** (0.003) | -0.337*** (0.007) |
| Math Score | -1.035 | -0.980 | -0.687 | -0.055*** (0.007) | -0.293*** (0.003) | -0.348*** (0.006) |
| Observations | 31229 | 185885 | 854276 | 217114 | 1040161 | 885505 |

Table B4: Descriptives: Two Co-teachers vs. Teacher & Co-Teacher

| | ELA Sample | | | Math sample | | |
|---------------|--------------------|-----------------------------|---------------------------|--------------------|-----------------------------|---------------------------|
| | (1) Co-Teachers | (2) Co-Teacher & Teacher | (3) Difference (1)-(2) | (4) Co-Teachers | (5) Co-Teacher & Teacher | (6) Difference (1)-(2) |
| Female | 0.461 | 0.447 | 0.014*** (0.003) | 0.457 | 0.455 | 0.002 (0.004) |
| White | 0.803 | 0.726 | 0.076*** (0.003) | 0.739 | 0.771 | -0.032*** (0.004) |
| Black | 0.161 | 0.221 | -0.060*** (0.003) | 0.205 | 0.205 | -0.000 (0.004) |
| Hispanic | 0.262 | 0.275 | -0.013*** (0.003) | 0.230 | 0.226 | 0.004 (0.004) |
| Asian | 0.057 | 0.079 | -0.022*** (0.002) | 0.097 | 0.053 | 0.044*** (0.002) |
| Free Lunch | 0.483 | 0.545 | -0.062*** (0.003) | 0.489 | 0.533 | -0.044*** (0.004) |
| Reduced Lunch | 0.049 | 0.045 | 0.004** (0.001) | 0.035 | 0.055 | -0.020*** (0.002) |
| IEP | 0.388 | 0.387 | 0.001 (0.003) | 0.411 | 0.390 | 0.021*** (0.004) |
| ELA | -0.392 | -0.528 | 0.136*** (0.010) | -0.421 | -0.488 | 0.067*** (0.012) |
| Math | -0.383 | -0.507 | 0.124*** (0.009) | -0.425 | -0.519 | 0.094*** (0.012) |
| Observations | 30518 | 62059 | 92577 | 16208 | 62939 | 79147 |

Table B5: Effect of Co-Teaching on ELA Scores by Grade Levels

| | Elementary | Secondary | Elementary | Secondary | Elementary | Secondary |
|---------------------------------|--------------------|----------------------|---------------------|----------------------|---------------------|----------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Co-Teaching; Narrow | 0.048** (0.020) | -0.048*** (0.014) | 0.049** (0.020) | -0.049*** (0.014) | 0.048** (0.020) | -0.049*** (0.014) |
| Co-Teaching; Narrow × No IEP | -0.044* (0.024) | 0.007 (0.017) | -0.044* (0.024) | 0.007 (0.017) | -0.044* (0.024) | 0.007 (0.017) |
| Co-teaching; Broad | 0.016 (0.010) | -0.034*** (0.005) | 0.016 (0.010) | -0.035*** (0.005) | 0.016 (0.010) | -0.035*** (0.005) |
| Co-teaching; Broad × No IEP | -0.012 (0.012) | 0.029*** (0.006) | -0.012 (0.012) | 0.029*** (0.006) | -0.012 (0.012) | 0.029*** (0.006) |
| IEP Share | | | -0.045** (0.018) | -0.035*** (0.008) | -0.014 (0.026) | -0.039*** (0.010) |
| IEP Share × No IEP | | | | | -0.071** (0.034) | 0.009 (0.014) |
| Observations | 748459 | 1685300 | 748459 | 1685300 | 748459 | 1685300 |
| r ² | 0.861 | 0.858 | 0.861 | 0.858 | 0.861 | 0.858 |
| Student FE | Yes | Yes | Yes | Yes | Yes | Yes |
| School FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes |
| <i>F Test p values</i> | | | | | | |
| Coteach; N + Interaction | 0.724 | 0.000 | 0.722 | 0.000 | 0.719 | 0.000 |
| Coteach; B + Interaction | 0.505 | 0.038 | 0.524 | 0.031 | 0.534 | 0.032 |
| IEP Share + Interaction | | | | | 0.000 | 0.006 |

Table B6: Effect of Co-Teaching on Math Scores by Grade Levels

| | Elementary | Secondary | Elementary | Secondary | Elementary | Secondary |
|---------------------------------|-------------------|-------------------|----------------------|----------------------|----------------------|----------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Co-Teaching; Narrow | 0.008 (0.021) | -0.007 (0.012) | 0.008 (0.021) | -0.008 (0.012) | 0.008 (0.021) | -0.008 (0.012) |
| Co-Teaching; Narrow × No IEP | -0.016 (0.024) | -0.001 (0.015) | -0.016 (0.024) | 0.001 (0.015) | -0.016 (0.024) | 0.000 (0.015) |
| Co-Teaching; Broad | 0.000 (0.010) | -0.003 (0.005) | -0.000 (0.010) | -0.004 (0.005) | -0.000 (0.010) | -0.004 (0.005) |
| Co-Teaching; Broad × No IEP | -0.012 (0.012) | 0.008 (0.005) | -0.013 (0.012) | 0.009* (0.005) | -0.013 (0.012) | 0.009 (0.005) |
| IEP Share | | | -0.094*** (0.018) | -0.076*** (0.005) | -0.080*** (0.026) | -0.041*** (0.009) |
| IEP Share × No IEP | | | | | -0.033 (0.033) | -0.068*** (0.011) |
| Observations | 731210 | 1689463 | 731210 | 1689463 | 731210 | 1689463 |
| r ² | 0.881 | 0.885 | 0.881 | 0.885 | 0.881 | 0.885 |
| Student FE | Yes | Yes | Yes | Yes | Yes | Yes |
| School FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes |
| <i>F Test p-values</i> | | | | | | |
| Co-Teach; N + Interaction | 0.557 | 0.355 | 0.544 | 0.377 | 0.539 | 0.382 |
| Co-Teach; B + Interaction | 0.041 | 0.079 | 0.032 | 0.078 | 0.030 | 0.087 |
| IEP Share + Interaction | | | | | 0.000 | 0.000 |

Table B7: Effect of Co-Teaching by Disability Classifications

| | All | | Elementary | | Secondary | |
|-------------------|-------------------|-------------------|-------------------|--------------------|----------------------|-------------------|
| | ELA (1) | Math (2) | ELA (3) | Math (4) | ELA (5) | Math (6) |
| Autism | 0.023 (0.055) | 0.052 (0.042) | 0.145 (0.091) | -0.024 (0.114) | -0.028 (0.069) | -0.027 (0.047) |
| Communication | 0.046 (0.029) | 0.009 (0.024) | 0.026 (0.047) | 0.023 (0.041) | 0.019 (0.040) | 0.019 (0.037) |
| Emotional | -0.050 (0.039) | 0.070* (0.036) | -0.040 (0.080) | 0.121 (0.080) | -0.161*** (0.050) | 0.057 (0.045) |
| Health | -0.041 (0.030) | 0.028 (0.024) | 0.062 (0.054) | 0.140** (0.059) | -0.041 (0.038) | 0.009 (0.030) |
| Neurological | -0.061 (0.045) | 0.009 (0.042) | -0.037 (0.085) | -0.003 (0.106) | -0.028 (0.062) | -0.027 (0.050) |
| Specific Learning | 0.020 (0.018) | 0.004 (0.017) | 0.063* (0.036) | -0.038 (0.035) | -0.053** (0.023) | -0.029 (0.022) |
| Observations | 2590219 | 2575778 | 748459 | 731210 | 1685300 | 1689463 |
| r ² | 0.835 | 0.865 | 0.861 | 0.881 | 0.858 | 0.885 |

Table B8: Effect of Co-Teaching Without School Fixed Effects

| | ELA | | | Math | | |
|---------------------------------|----------------------|----------------------|----------------------|---------------------|----------------------|----------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Co-Teaching; Narrow | 0.013 (0.011) | 0.013 (0.011) | 0.013 (0.011) | 0.005 (0.010) | 0.005 (0.010) | 0.006 (0.010) |
| Co-Teaching; Narrow × No IEP | -0.033** (0.013) | -0.033** (0.013) | -0.033** (0.013) | -0.027** (0.012) | -0.026** (0.012) | -0.027** (0.012) |
| Co-teaching; Broad | -0.015*** (0.004) | -0.015*** (0.004) | -0.015*** (0.004) | -0.005 (0.004) | -0.006 (0.004) | -0.005 (0.004) |
| Co-teaching; Broad × No IEP | 0.020*** (0.005) | 0.020*** (0.005) | 0.020*** (0.005) | 0.008* (0.005) | 0.009* (0.005) | 0.009* (0.005) |
| IEP Share | | 0.004 (0.006) | -0.025*** (0.008) | | -0.083*** (0.005) | -0.048*** (0.008) |
| IEP Share × No IEP | | | 0.076*** (0.012) | | | -0.068*** (0.010) |
| Observations | 2590228 | 2590228 | 2590228 | 2575781 | 2575781 | 2575781 |
| r ² | 0.829 | 0.829 | 0.829 | 0.859 | 0.859 | 0.859 |
| Student FE | Yes | Yes | Yes | Yes | Yes | Yes |
| School FE | No | No | No | No | No | No |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes |
| F Test p-values | | | | | | |
| Coteach; N + Interaction | 0.008 | 0.008 | 0.007 | 0.001 | 0.001 | 0.002 |
| Coteach; B+ Interaction | 0.031 | 0.031 | 0.024 | 0.120 | 0.133 | 0.144 |
| IEP Share + Interaction | | | 0.000 | | | 0.000 |

Table B10: Effect of Co-Teaching with “Helper” Controls

| | All | | Elementary | | Secondary | |
|---------------------------------|----------------------|----------------------|---------------------|----------------------|----------------------|----------------------|
| | ELA | Math | ELA | Math | ELA | Math |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Co-Teaching; Narrow | -0.002 (0.011) | 0.016* (0.010) | 0.048** (0.020) | 0.010 (0.021) | -0.050*** (0.014) | -0.008 (0.012) |
| Co-Teaching; Narrow × No IEP | -0.034** (0.013) | -0.023** (0.012) | -0.043* (0.024) | -0.015 (0.024) | 0.008 (0.017) | 0.000 (0.015) |
| Co-Teaching; Broad | -0.020*** (0.004) | -0.002 (0.004) | 0.015 (0.010) | -0.001 (0.010) | -0.035*** (0.005) | -0.004 (0.005) |
| Co-Teaching; Broad × No IEP | 0.014*** (0.005) | 0.003 (0.005) | -0.012 (0.012) | -0.013 (0.012) | 0.029*** (0.006) | 0.009 (0.005) |
| IEP Share | -0.008 (0.008) | -0.044*** (0.008) | -0.015 (0.026) | -0.080*** (0.026) | -0.039*** (0.010) | -0.041*** (0.009) |
| IEP Share × No IEP | -0.021* (0.012) | -0.098*** (0.010) | -0.070** (0.034) | -0.032 (0.033) | 0.009 (0.014) | -0.069*** (0.011) |
| Observations | 2590219 | 2575778 | 748459 | 731210 | 1685300 | 1689463 |
| r ² | 0.835 | 0.865 | 0.861 | 0.881 | 0.858 | 0.885 |
| Student FE | Yes | Yes | Yes | Yes | Yes | Yes |
| School FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Helper Controls | Yes | Yes | Yes | Yes | Yes | Yes |
| <i>F Test p values</i> | | | | | | |
| Co-Teach; N + Interaction | 0.000 | 0.290 | 0.736 | 0.682 | 0.000 | 0.374 |
| Co-Teach; B+ Interaction | 0.008 | 0.511 | 0.560 | 0.024 | 0.024 | 0.098 |
| IEP Share + Interaction | 0.001 | 0.000 | 0.000 | 0.000 | 0.005 | 0.000 |

Table B11: Effect of Co-Teaching, Restricted to Students Ever in a Special Education Classroom

| | ELA | | | Math | | |
|---------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|---------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Coteaching; Narrow=1 | -0.004 (0.013) | -0.003 (0.015) | -0.016 (0.017) | 0.013 (0.011) | 0.009 (0.013) | 0.001 (0.016) |
| Co-Teaching; Narrow × No IEP | -0.052*** (0.016) | -0.059*** (0.020) | -0.088*** (0.029) | -0.038*** (0.014) | -0.045*** (0.016) | -0.032 (0.027) |
| Co-teaching; Broad | -0.019*** (0.005) | -0.020*** (0.006) | -0.022*** (0.006) | -0.012** (0.005) | -0.011** (0.005) | -0.013** (0.006) |
| Co-teaching; Broad × No IEP | 0.018*** (0.006) | 0.011 (0.007) | -0.010 (0.010) | 0.009* (0.005) | -0.005 (0.007) | 0.009 (0.009) |
| Observations | 1589319 | 826628 | 375846 | 1468548 | 846933 | 421559 |
| r ² | 0.834 | 0.831 | 0.800 | 0.862 | 0.849 | 0.816 |
| Student FE | Yes | Yes | Yes | Yes | Yes | Yes |
| School FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes |
| <i>F Test p-values</i> | | | | | | |
| Coteach; N + Interaction | 0.000 | 0.000 | 0.000 | 0.002 | 0.000 | 0.143 |
| Coteach; B + Interaction | 0.775 | 0.036 | 0.000 | 0.446 | 0.000 | 0.564 |

Note: Each column represents models using different ways of identifying special education classrooms. In columns (1) and (4), a special education classroom is identified when the teacher has a job assignment of special education or when the share of IEP students is higher than 80%; In columns (2) and (5), a special education classroom is identified when the teacher has a job assignment of special education and the share of IEP students in the class is higher than 25% or when the share of IEP students is higher than 80%; In columns (3) and (6), a special education classroom is identified when the share of IEP students is higher than 40%.