Online Appendix
Appendix Figure 1: Covariates by District Number of Spanish LEP Students in First Grade Cohort




Appendix Table 1: By-Grade OLS Estimates of Relationship Between District Bilingual Education Provision and TAKS Achievement

|  | Math |  |  | Reading |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 3rd Grade (1) | 4th Grade (2) | 5th Grade (3) | 3rd Grade (4) | 4th Grade (5) | 5th Grade (6) |
|  | A. "Non-LEP, Non-Spanish Home Language" Students |  |  |  |  |  |
| Mean Standardized <br> Achievement | $\begin{aligned} & -0.014 \\ & (0.036) \end{aligned}$ | $\begin{gathered} 0.021 \\ (0.038) \end{gathered}$ | $\begin{gathered} 0.020 \\ (0.033) \end{gathered}$ | $\begin{aligned} & -0.014 \\ & (0.030) \end{aligned}$ | $\begin{gathered} 0.024 \\ (0.031) \end{gathered}$ | $\begin{gathered} 0.010 \\ (0.028) \end{gathered}$ |
| Passing Rate | $\begin{aligned} & -0.832 \\ & (1.188) \end{aligned}$ | $\begin{aligned} & -0.390 \\ & (1.250) \end{aligned}$ | $\begin{gathered} 0.617 \\ (1.342) \end{gathered}$ | $\begin{gathered} -1.479 * \\ (0.835) \end{gathered}$ | $\begin{gathered} 0.253 \\ (1.053) \end{gathered}$ | $\begin{gathered} 0.189 \\ (1.070) \end{gathered}$ |
| Commended Rate | $\begin{gathered} -0.223 \\ (1.256) \end{gathered}$ | $\begin{gathered} 1.287 \\ (1.446) \end{gathered}$ | $\begin{gathered} 0.950 \\ (1.098) \end{gathered}$ | $\begin{gathered} 0.234 \\ (1.199) \end{gathered}$ | $\begin{gathered} 0.471 \\ (0.950) \end{gathered}$ | $\begin{gathered} 0.885 \\ (0.822) \end{gathered}$ |
| Observations | B. "Spanish Home Language" Students |  |  |  |  | 1,224 |
| Mean Standardized Achievement | $\begin{aligned} & -0.036 \\ & (0.044) \end{aligned}$ | $\begin{aligned} & -0.059 \\ & (0.052) \end{aligned}$ | $\begin{aligned} & -0.074 \\ & (0.047) \end{aligned}$ | $\begin{gathered} -0.048 \\ (0.043) \end{gathered}$ | $\begin{gathered} -0.087 * \\ (0.050) \end{gathered}$ | $\begin{aligned} & -0.082^{*} \\ & (0.045) \end{aligned}$ |
| Passing Rate | $\begin{aligned} & -0.512 \\ & (2.072) \end{aligned}$ | $\begin{aligned} & -2.116 \\ & (2.189) \end{aligned}$ | $\begin{aligned} & -2.612 \\ & (2.106) \end{aligned}$ | $\begin{gathered} -1.738 \\ (1.650) \end{gathered}$ | $\begin{gathered} -4.155^{*} \\ (2.199) \end{gathered}$ | $\begin{aligned} & -3.437 \\ & (2.201) \end{aligned}$ |
| Commended Rate | $\begin{gathered} -1.444 \\ (1.252) \end{gathered}$ | $\begin{aligned} & -1.892 \\ & (1.470) \end{aligned}$ | $\begin{aligned} & -2.795^{*} \\ & (1.539) \end{aligned}$ | $\begin{gathered} -0.955 \\ (1.440) \end{gathered}$ | $\begin{aligned} & -1.373 \\ & (1.246) \end{aligned}$ | $\begin{aligned} & -1.159 \\ & (0.949) \end{aligned}$ |
| Observations | C. All Students |  |  |  |  | 1,010 |
| Mean Standardized Achievement | $\begin{aligned} & -0.012 \\ & (0.037) \end{aligned}$ | $\begin{aligned} & -0.001 \\ & (0.040) \end{aligned}$ | $\begin{aligned} & -0.006 \\ & (0.035) \end{aligned}$ | $\begin{gathered} -0.015 \\ (0.031) \end{gathered}$ | $\begin{aligned} & -0.006 \\ & (0.035) \end{aligned}$ | $\begin{gathered} -0.019 \\ (0.030) \end{gathered}$ |
| Passing Rate | $\begin{gathered} -0.680 \\ (1.370) \end{gathered}$ | $\begin{aligned} & -1.128 \\ & (1.329) \end{aligned}$ | $\begin{aligned} & -0.747 \\ & (1.432) \end{aligned}$ | $\begin{aligned} & -1.420 \\ & (0.913) \end{aligned}$ | $\begin{aligned} & -1.108 \\ & (1.219) \end{aligned}$ | $\begin{aligned} & -1.121 \\ & (1.227) \end{aligned}$ |
| Commended Rate | $\begin{aligned} & -0.095 \\ & (1.197) \end{aligned}$ | $\begin{gathered} 0.785 \\ (1.417) \end{gathered}$ | $\begin{gathered} 0.361 \\ (1.119) \end{gathered}$ | $\begin{gathered} 0.277 \\ (1.157) \end{gathered}$ | $\begin{aligned} & -0.056 \\ & (0.999) \end{aligned}$ | $\begin{gathered} 0.421 \\ (0.768) \end{gathered}$ |
| Observations | 1,314 | 1,266 | 1,239 | 1,314 | 1,266 | 1,239 |

Notes: Observations are at the school-grade-year level, and cover the 2002-03 through 2009-10 school years. Sample is limited to observations in districts with fewer than 200 students in the 1st grade cohort in 2004-05, in district-grade-years with between 8 and 39 LEP students in the 1st grade cohort, and with non-missing achievement variables. The observations differ slightly across the panels because the incidence of masked achievement outcomes differs across the student categories. Each coefficient and associated standard error reported comes from a separate regression that also controls for grade-year fixed effects, the percent of the school-grade-year overall who are female, economically disadvantaged, white, black and Hispanic, and the percent of students in the student category listed in the panel heading in each school-grade-year who are female or economically disadvantaged. Standard errors clustered by district are in parentheses. *, ** and *** denote significance at the $10 \%, 5 \%$ and $1 \%$ levels, respectively.

Appendix Table 2: By Grade Estimates of Effect of District Bilingual Education Provision on the TAKS Achievement of "Non-LEP, Non-Spanish Home Language" Students

| Math |  |  | Reading |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 3rd Grade <br> (1) | 4th Grade <br> (2) | 5th Grade <br> (3) | 3rd Grade <br> (4) | 4th Grade <br> (5) | 5th Grade <br> (6) |

A. Reduced Form - OLS Coefficient for "District Has $>=20$ Spanish LEP Students in 1st Grade Cohort"

| Mean Standardized Achievement | $\begin{aligned} & 0.069^{*} \\ & (0.037) \end{aligned}$ | $\begin{gathered} 0.028 \\ (0.036) \end{gathered}$ | $\begin{gathered} 0.085 * * \\ (0.038) \end{gathered}$ | $\begin{aligned} & 0.059 * \\ & (0.033) \end{aligned}$ | $\begin{gathered} 0.025 \\ (0.030) \end{gathered}$ | $\begin{aligned} & 0.056^{*} \\ & (0.029) \end{aligned}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Passing Rate | $\begin{gathered} 1.407 \\ (1.375) \end{gathered}$ | $\begin{gathered} -0.608 \\ (1.211) \end{gathered}$ | $\begin{gathered} 2.478 \\ (1.548) \end{gathered}$ | $\begin{gathered} 1.362 \\ (1.059) \end{gathered}$ | $\begin{gathered} 1.243 \\ (1.139) \end{gathered}$ | $\begin{gathered} 1.736 \\ (1.174) \end{gathered}$ |
| Commended Rate | $\begin{aligned} & 2.083 * \\ & (1.245) \end{aligned}$ | $\begin{gathered} 1.836 \\ (1.425) \end{gathered}$ | $\begin{gathered} 2.911 * * \\ (1.294) \end{gathered}$ | $\begin{aligned} & 2.267^{*} \\ & (1.308) \end{aligned}$ | $\begin{gathered} 0.473 \\ (1.048) \end{gathered}$ | $\begin{gathered} 0.936 \\ (1.006) \end{gathered}$ |
|  | B. 2SLS - Endogenous Regressor is "District has Any Bilingual Program in 1st Grade Cohort" |  |  |  |  |  |
| 1st Stage, OLS coefficient for 1 st Grade LEP Count >= 20 | $\begin{gathered} 0.256 * * * \\ (0.060) \end{gathered}$ | $\begin{gathered} 0.280 * * * \\ (0.062) \end{gathered}$ | $\begin{gathered} 0.296 * * * \\ (0.060) \end{gathered}$ | $\begin{gathered} 0.276 * * * \\ (0.065) \end{gathered}$ | $\begin{gathered} 0.300 * * * \\ (0.070) \end{gathered}$ | $\begin{gathered} 0.294 * * * \\ (0.074) \end{gathered}$ |
| 2nd Stage - Mean Standardized Achievement | $\begin{aligned} & 0.268^{*} \\ & (0.152) \end{aligned}$ | $\begin{gathered} 0.102 \\ (0.129) \end{gathered}$ | $\begin{aligned} & 0.288^{*} \\ & (0.149) \end{aligned}$ | $\begin{gathered} 0.225 \\ (0.180) \end{gathered}$ | $\begin{gathered} 0.025 \\ (0.162) \end{gathered}$ | $\begin{gathered} 0.081 \\ (0.167) \end{gathered}$ |
| 2nd Stage - Passing Rate | $\begin{gathered} 5.505 \\ (5.425) \end{gathered}$ | $\begin{aligned} & -2.176 \\ & (4.359) \end{aligned}$ | $\begin{gathered} 8.377 \\ (5.715) \end{gathered}$ | $\begin{gathered} 5.650 \\ (5.189) \end{gathered}$ | $\begin{gathered} 2.654 \\ (5.596) \end{gathered}$ | $\begin{gathered} 2.745 \\ (5.967) \end{gathered}$ |
| 2nd Stage - Commended Rate | $\begin{gathered} 8.149 \\ (4.979) \end{gathered}$ | $\begin{gathered} 6.568 \\ (5.025) \end{gathered}$ | $\begin{aligned} & 9.840^{*} \\ & (5.012) \end{aligned}$ | $\begin{gathered} 8.200 \\ (6.787) \end{gathered}$ | $\begin{gathered} -0.608 \\ (5.063) \end{gathered}$ | $\begin{gathered} -0.344 \\ (4.883) \end{gathered}$ |
| Observations | 1,291 | 1,246 | 1,222 | 1,291 | 1,246 | 1,224 |

[^0]Appendix Table 3: Estimates of Effect of District Bilingual Education Provision on the TAKS Achievement of "Spanish Home Language" Students

|  | Math |  |  | Reading |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 3rd Grade <br> (1) | 4th Grade (2) | 5th Grade <br> (3) | 3rd Grade <br> (4) | 4th Grade (5) | 5th Grade <br> (6) |
|  | A. Reduced Form - OLS Coefficient for "District Has $>=20$ Spanish LEP Students in 1st Grade Cohort" |  |  |  |  |  |
| Mean Standardized Achievement | $\begin{gathered} 0.053 \\ (0.052) \end{gathered}$ | $\begin{aligned} & -0.015 \\ & (0.054) \end{aligned}$ | $\begin{gathered} 0.050 \\ (0.054) \end{gathered}$ | $\begin{gathered} 0.025 \\ (0.049) \end{gathered}$ | $\begin{gathered} -0.012 \\ (0.054) \end{gathered}$ | $\begin{gathered} 0.017 \\ (0.056) \end{gathered}$ |
| Passing Rate | $\begin{gathered} 2.220 \\ (2.646) \end{gathered}$ | $\begin{gathered} -2.406 \\ (2.439) \end{gathered}$ | $\begin{gathered} 1.294 \\ (2.508) \end{gathered}$ | $\begin{gathered} -0.463 \\ (1.956) \end{gathered}$ | $\begin{aligned} & -0.857 \\ & (2.377) \end{aligned}$ | $\begin{gathered} 0.952 \\ (2.663) \end{gathered}$ |
| Commended Rate | $\begin{gathered} 0.896 \\ (1.401) \end{gathered}$ | $\begin{gathered} 0.305 \\ (1.784) \end{gathered}$ | $\begin{gathered} 1.842 \\ (2.004) \end{gathered}$ | $\begin{gathered} 2.396 \\ (1.882) \end{gathered}$ | $\begin{gathered} 0.529 \\ (1.397) \end{gathered}$ | $\begin{gathered} -0.787 \\ (1.332) \end{gathered}$ |
|  | B. 2SLS - Endogenous Regressor is "District has Any Bilingual Program in 1st Grade Cohort" |  |  |  |  |  |
| 1st Stage, OLS coefficient for 1st Grade LEP Count >= 20 | $\begin{gathered} 0.279 * * * \\ (0.052) \end{gathered}$ | $\begin{gathered} 0.270^{* * *} \\ (0.057) \end{gathered}$ | $\begin{gathered} 0.273 * * * \\ (0.059) \end{gathered}$ | $\begin{gathered} 0.282 * * * \\ (0.052) \end{gathered}$ | $\begin{gathered} 0.276 * * * \\ (0.057) \end{gathered}$ | $\begin{gathered} 0.269 * * * \\ (0.059) \end{gathered}$ |
| 2nd Stage - Mean Standardized Achievement | $\begin{gathered} 0.190 \\ (0.184) \end{gathered}$ | $\begin{gathered} -0.056 \\ (0.200) \end{gathered}$ | $\begin{gathered} 0.182 \\ (0.202) \end{gathered}$ | $\begin{gathered} 0.088 \\ (0.171) \end{gathered}$ | $\begin{gathered} -0.044 \\ (0.197) \end{gathered}$ | $\begin{gathered} 0.064 \\ (0.208) \end{gathered}$ |
| 2nd Stage - Passing Rate | $\begin{gathered} 7.964 \\ (9.273) \end{gathered}$ | $\begin{aligned} & -8.897 \\ & (9.503) \end{aligned}$ | $\begin{gathered} 4.735 \\ (9.147) \end{gathered}$ | $\begin{aligned} & -1.644 \\ & (6.970) \end{aligned}$ | $\begin{aligned} & -3.099 \\ & (8.666) \end{aligned}$ | $\begin{gathered} 3.537 \\ (9.910) \end{gathered}$ |
| 2nd Stage - Commended Rate | $\begin{gathered} 3.215 \\ (4.969) \end{gathered}$ | $\begin{gathered} 1.129 \\ (6.589) \end{gathered}$ | $\begin{gathered} 6.739 \\ (7.514) \end{gathered}$ | $\begin{gathered} 8.503 \\ (6.516) \end{gathered}$ | $\begin{gathered} 1.912 \\ (4.963) \end{gathered}$ | $\begin{gathered} -2.922 \\ (5.018) \end{gathered}$ |
| Observations | 1,168 | 1,067 | 1,012 | 1,170 | 1,064 | 1,010 |


 standard error reported comes from a separate regression that also controls for district-wide Spanish LEP count in the relevant 1st grade cohort, district-wide LEP count interacted with a dummy for being above 20 Spanish LEP students, grade-year fixed effects, the percent of the school-grade-year overall who are female, economically disadvantaged, white, black and Hispanic, and the percent of "Spanish home language" students in a school-grade-year who are female or economically disadvantaged. Standard errors clustered by district are in parentheses. *, ** and *** denote significance at the $10 \%, 5 \%$ and $1 \%$ levels, respectively.

Appendix Table 4: Estimates of Effect of District Bilingual Education Provision on the TAKS Achievement of All Students

|  | Math |  |  | Reading |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 3rd Grade <br> (2) | 4th Grade <br> (3) | 5th Grade <br> (4) | 3rd Grade <br> (6) | 4th Grade <br> (7) | 5th Grade <br> (8) |
|  | A. Reduced Form - OLS Coefficient for "District Has >=20 Spanish LEP Students in 1st Grade Cohort" |  |  |  |  |  |
| Mean Standardized Achievement | $\begin{aligned} & 0.068^{*} \\ & (0.036) \end{aligned}$ | $\begin{gathered} 0.015 \\ (0.035) \end{gathered}$ | $\begin{gathered} 0.090^{* *} \\ (0.036) \end{gathered}$ | $\begin{gathered} 0.049 \\ (0.032) \end{gathered}$ | $\begin{gathered} 0.010 \\ (0.029) \end{gathered}$ | $\begin{aligned} & 0.057 * \\ & (0.032) \end{aligned}$ |
| Passing Rate | $\begin{gathered} 1.581 \\ (1.449) \end{gathered}$ | $\begin{gathered} -1.333 \\ (1.227) \end{gathered}$ | $\begin{aligned} & 2.684^{*} \\ & (1.486) \end{aligned}$ | $\begin{gathered} 0.829 \\ (1.058) \end{gathered}$ | $\begin{gathered} 0.367 \\ (1.135) \end{gathered}$ | $\begin{gathered} 2.018 \\ (1.358) \end{gathered}$ |
| Commended Rate | $\begin{aligned} & 1.926 * \\ & (1.105) \end{aligned}$ | $\begin{gathered} 1.598 \\ (1.353) \end{gathered}$ | $\begin{gathered} 3.297 * * * \\ (1.269) \end{gathered}$ | $\begin{aligned} & 2.320 * \\ & (1.206) \end{aligned}$ | $\begin{gathered} 0.358 \\ (0.947) \end{gathered}$ | $\begin{gathered} 1.070 \\ (0.920) \end{gathered}$ |
|  | B. 2SLS - Endogenous Regressor is "District has Any Bilingual Program in 1st Grade Cohort" |  |  |  |  |  |
| 1st Stage, OLS coefficient for 1st Grade LEP Count >= 20 | $\begin{gathered} 0.251^{* * *} \\ (0.061) \end{gathered}$ | $\begin{gathered} 0.282 * * * \\ (0.063) \end{gathered}$ | $\begin{gathered} 0.282 * * * \\ (0.061) \end{gathered}$ | $\begin{gathered} 0.268 * * * \\ (0.065) \end{gathered}$ | $\begin{gathered} 0.295 * * * \\ (0.069) \end{gathered}$ | $\begin{gathered} 0.286 * * * \\ (0.072) \end{gathered}$ |
| 2nd Stage - Mean Standardized Achievement | $\begin{aligned} & 0.270^{*} \\ & (0.150) \end{aligned}$ | $\begin{gathered} 0.052 \\ (0.123) \end{gathered}$ | $\begin{aligned} & 0.320 * * \\ & (0.155) \end{aligned}$ | $\begin{gathered} 0.178 \\ (0.181) \end{gathered}$ | $\begin{gathered} -0.004 \\ (0.165) \end{gathered}$ | $\begin{gathered} 0.085 \\ (0.173) \end{gathered}$ |
| 2nd Stage - Passing Rate | $\begin{gathered} 6.297 \\ (5.840) \end{gathered}$ | $\begin{aligned} & -4.722 \\ & (4.508) \end{aligned}$ | $\begin{gathered} 9.520 \\ (5.885) \end{gathered}$ | $\begin{gathered} 3.374 \\ (5.317) \end{gathered}$ | $\begin{gathered} 0.333 \\ (5.613) \end{gathered}$ | $\begin{gathered} 3.579 \\ (6.484) \end{gathered}$ |
| 2nd Stage - Commended Rate | $\begin{aligned} & 7.670^{*} \\ & (4.448) \end{aligned}$ | $\begin{gathered} 5.659 \\ (4.654) \end{gathered}$ | $\begin{gathered} 11.691^{* *} \\ (5.232) \end{gathered}$ | $\begin{gathered} 8.146 \\ (6.743) \end{gathered}$ | $\begin{gathered} -0.067 \\ (5.017) \end{gathered}$ | $\begin{gathered} 0.160 \\ (4.722) \end{gathered}$ |
| Observations | 1,314 | 1,266 | 1,239 | 1,314 | 1,266 | 1,239 |

Notes: Observations are at the school-grade-year level, and cover the 2002-03 through 2009-10 school years. Sample is limited to observations in districts with fewer than 200 students in the 1st grade cohort in 2004-05, in district-grade-years with between 8 and 39 LEP students in the 1st grade cohort, and with non-missing achievement variables. Each coefficient and associated standard error reported comes from a separate regression that also controls for district-wide Spanish LEP count in the relevant 1st grade cohort, district-wide LEP count interacted with a dummy for being above 20 Spanish LEP students, grade-year fixed effects, and the percent of the school-grade-year overall who are female, economically disadvantaged, white, black and Hispanic. Standard errors clustered by district are in parentheses. *, ** and ${ }^{* * *}$ denote significance at the $10 \%, 5 \%$ and $1 \%$ levels, respectively.

Appendix Table 5: Summary Statistics for "Spanish Home Language" Sample, 2002-03 through 2009-10

|  | Full Sample (8 to 39 LEP in 1st Grade Cohort) | 8 to 19 LEP in 1st Grade Cohort | 20 to 39 LEP in 1st Grade Cohort |
| :---: | :---: | :---: | :---: |
| Mean (Standard Deviation) Among All Students in Same School-Grade |  |  |  |
| \% Female | 48.5 | 48.4 | 48.8 |
|  | (5.8) | (6.0) | (5.4) |
| \% White | 42.2 | 46.7 | 30.0 |
|  | (24.4) | (23.4) | (22.9) |
| \% Hispanic | 49.6 | 44.7 | 62.7 |
|  | (26.9) | (25.1) | (27.1) |
| \% Black | 7.7 | 8.0 | 6.9 |
|  | (10.5) | (10.9) | (9.2) |
| \% Economically Disadvantaged | 64.5 | 61.9 | 71.6 |
|  | (17.3) | (17.0) | (16.1) |
| \% LEP | 13.3 | 11.6 | 17.8 |
|  | (12.3) | (10.8) | (14.6) |
| \% in Bilingual Program | 4.0 | 1.4 | 11.1 |
|  | (9.8) | (5.1) | (14.6) |
| \% in Special Education Program | 11.0 | 11.3 | 10.2 |
|  | (5.0) | (5.1) | (4.7) |
| \% in Gifted and Talented Program | 7.0 | 6.9 | 7.1 |
|  | (4.7) | (4.8) | (4.4) |
| Mean (S.D.) Among Spanish Home Language Students in Same School-Grade |  |  |  |
| TAKS Math Standardized Scale Score | -0.37 | -0.35 | -0.41 |
|  | (0.43) | (0.45) | (0.37) |
| TAKS Math Passing Rate | 72.2 | 72.9 | 70.2 |
|  | (21.0) | (21.7) | (19.0) |
| TAKS Math Commended Rate | 17.5 | 17.6 | 17.3 |
|  | (16.2) | (17.1) | (13.4) |
| TAKS Reading Standardized Scale Score | -0.46 | -0.44 | -0.53 |
|  | (0.41) | (0.43) | (0.34) |
| TAKS Reading Passing Rate | 71.6 | 72.7 | 68.7 |
|  | (20.9) | (21.4) | (19.1) |
| TAKS Reading Commended Rate | 13.8 | 14.0 | 13.3 |
|  | (13.6) | (14.5) | (10.9) |
| Observations (School-Grade-Year) | 3244 | 2364 | 880 |
| \# of Schools | 301 | 343 | 143 |
| \# of Districts | 251 | 238 | 88 |

Notes: Each school-grade-year for grades 3 through 5 is a separate observation. Sample is limited to observations in districts with fewer than 200 students in the 1st grade cohort in 2004-05, in district-grade-years with between 8 and 39 LEP students in the 1st grade cohort, and with non-missing math or reading achievement variables.

Appendix Table 6: Summary Statistics for "All Students" Sample, 2002-03 through 2009-10

|  | Full Sample (8 to 39 LEP in 1st Grade Cohort) | 8 to 19 LEP in 1st Grade Cohort | 20 to 39 LEP in 1st Grade Cohort |
| :---: | :---: | :---: | :---: |
| Mean (Standard Deviation) Among All Students in Same School-Grade |  |  |  |
| \% Female | $\begin{aligned} & 48.6 \\ & (6.2) \end{aligned}$ | $\begin{aligned} & 48.5 \\ & (6.4) \end{aligned}$ | $\begin{aligned} & 48.8 \\ & (5.9) \end{aligned}$ |
| \% White | $\begin{gathered} 43.2 \\ (24.8) \end{gathered}$ | $\begin{gathered} 47.4 \\ (23.8) \end{gathered}$ | $\begin{gathered} 30.4 \\ (23.2) \end{gathered}$ |
| \% Hispanic | $\begin{gathered} 48.7 \\ (27.5) \end{gathered}$ | $\begin{gathered} 44.1 \\ (25.9) \end{gathered}$ | $\begin{gathered} 62.5 \\ (27.7) \end{gathered}$ |
| \% Black | $\begin{gathered} 7.7 \\ (10.4) \end{gathered}$ | $\begin{gathered} 7.9 \\ (10.8) \end{gathered}$ | $\begin{gathered} 6.8 \\ (9.2) \end{gathered}$ |
| \% Economically Disadvantaged | $\begin{gathered} 63.5 \\ (18.1) \end{gathered}$ | $\begin{gathered} 61.1 \\ (17.6) \end{gathered}$ | $\begin{gathered} 70.9 \\ (17.5) \end{gathered}$ |
| \% LEP | $\begin{gathered} 12.5 \\ (12.1) \end{gathered}$ | $\begin{gathered} 10.8 \\ (10.6) \end{gathered}$ | $\begin{gathered} 17.4 \\ (14.8) \end{gathered}$ |
| \% in Bilingual Program | $\begin{gathered} 3.7 \\ (9.6) \end{gathered}$ | $\begin{gathered} 1.3 \\ (5.3) \end{gathered}$ | $\begin{gathered} 10.9 \\ (14.7) \end{gathered}$ |
| \% in Special Education Program | $\begin{aligned} & 11.3 \\ & (5.6) \end{aligned}$ | $\begin{aligned} & 11.7 \\ & (5.7) \end{aligned}$ | $\begin{aligned} & 10.2 \\ & (4.9) \end{aligned}$ |
| \% in Gifted and Talented Program | $\begin{gathered} 7.1 \\ (5.0) \end{gathered}$ | $\begin{gathered} 7.1 \\ (5.1) \end{gathered}$ | $\begin{gathered} 7.2 \\ (4.7) \end{gathered}$ |
| Mean (S.D.) Among All Students in Same School-Grade |  |  |  |
| TAKS Math Standardized Scale Score | $\begin{gathered} -0.13 \\ (0.36) \end{gathered}$ | $\begin{gathered} -0.11 \\ (0.36) \end{gathered}$ | $\begin{gathered} -0.20 \\ (0.34) \end{gathered}$ |
| TAKS Math Passing Rate | $\begin{gathered} 78.5 \\ (14.6) \end{gathered}$ | $\begin{gathered} 79.2 \\ (14.3) \end{gathered}$ | $\begin{gathered} 76.1 \\ (15.1) \end{gathered}$ |
| TAKS Math Commended Rate | $\begin{gathered} 26.0 \\ (14.0) \end{gathered}$ | $\begin{gathered} 26.4 \\ (14.2) \end{gathered}$ | $\begin{gathered} 24.8 \\ (13.5) \end{gathered}$ |
| TAKS Reading Standardized Scale Score | $\begin{gathered} -0.10 \\ (0.33) \end{gathered}$ | $\begin{gathered} -0.08 \\ (0.33) \end{gathered}$ | $\begin{gathered} -0.19 \\ (0.31) \end{gathered}$ |
| TAKS Reading Passing Rate | $\begin{gathered} 80.9 \\ (13.1) \end{gathered}$ | $\begin{gathered} 81.7 \\ (12.8) \end{gathered}$ | $\begin{gathered} 78.2 \\ (13.5) \end{gathered}$ |
| TAKS Reading Commended Rate | $\begin{gathered} 25.8 \\ (13.2) \end{gathered}$ | $\begin{gathered} 26.5 \\ (13.4) \end{gathered}$ | $\begin{gathered} 23.9 \\ (12.4) \end{gathered}$ |
| Observations (School-Grade-Year) | 3819 | 2868 | 951 |
| \# of Schools | 415 | 379 | 149 |
| \# of Districts | 263 | 250 | 90 |

Notes: Each school-grade-year for grades 3 through 5 is a separate observation. Sample is limited to observations in districts with fewer than 200 students in the 1st grade cohort in 2004-05, in district-grade-years with between 8 and 39 LEP students in the 1st grade cohort, and with non-missing math or reading achievement variables.
A. Mean Covariate Among All Students in Same School-Grade-Year

|  | Demographic Composition |  |  |  |  |  | School Program Participation |  | Enrollment(9) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | \% Female <br> (1) | \% White <br> (2) | \% Hispanic <br> (3) | \% Black <br> (4) | \% Disadv <br> (8) | $\begin{gathered} \text { \% LEP } \\ (5) \end{gathered}$ | \% Gifted <br> (6) | \% SpecEd <br> (7) |  |
| 1st Grade Spanish LEP Count $>=20$ | 0.136 | -0.657 | 1.656 | -1.022 | 2.288 | 0.184 | 0.444 | -0.449 | 41.368* |
|  | (0.654) | (3.514) | (4.004) | (1.594) | (2.678) | (1.634) | (0.577) | (0.645) | (21.422) |
| Observations | 3,819 | 3,819 | 3,819 | 3,819 | 3,819 | 3,819 | 3,819 | 3,819 | 3,819 |

B. Mean Among "Non-LEP, Non-Spanish Home Language" Students Only

| 1st Grade Spanish LEP Count >= 20 | \% Female <br> (1) | \% Disadv <br> (3) | \% Gifted <br> (2) |
| :---: | :---: | :---: | :---: |
|  | 0.532 | 0.346 | 2.880 |
|  | (0.804) | (0.736) | (3.023) |
| Observations | 3,761 | 3,761 | 3,761 |
| Joint Significance Test (Prob > Chi2) |  | 0.57 |  |
| C. Mean Among "Spanish Home Language" Students Among |  |  |  |
|  | \% Female <br> (1) | \% Disadv <br> (3) | \% Gifted <br> (2) |
| 1st Grade Spanish LEP Count >= 20 | -1.739 | 0.519 | 1.033 |
|  | (1.309) | (0.890) | (1.292) |
| Observations | 3,262 | 3,262 | 3,262 |
| Joint Significance Test (Prob > Chi2) |  | 0.43 |  |

Notes: Observations are at the school-grade-year level, and cover the 2002-03 through 2009-10 school years. Sample is limited to observations in districts with fewer than 200 students in the 1 st grade cohort in 2004-05, in district-grade-years with between 8 and 39 LEP students in the 1st grade cohort, and with non-missing achievement variables. Each coefficient and associated standard error reported comes from a separate regression that also controls for district-wide Spanish LEP count in the relevant 1st grade cohort, and district-wide LEP count interacted with a dummy for being above 20 Spanish LEP students. Standard errors clustered by district are in parentheses. *, ** and ${ }^{* * *}$ denote significance at the $10 \%, 5 \%$ and $1 \%$ levels, respectively.

Appendix Table 8: Additional Sensitivity Analysis of 2SLS Estimates of Effects on "Non-LEP, NonSpanish Home Language" Students

| Math |  |  |  |  | Reading |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Mean | Passing | Commended | Mean | Passing | Commended |
| Achievement | Rate | Rate | Achievement | Rate | Rate |  |
|  | (1) | (2) | (3) | (4) | (5) | (6) |

1) Baseline (From Table 3, Columns 1 and 2)

| District | $0.213^{*}$ | 3.547 | $7.987^{* *}$ | $0.169^{*}$ | 5.010 | 4.666 |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: |
| Provides BE | $(0.114)$ | $(3.714)$ | $(4.050)$ | $(0.092)$ | $(3.356)$ | $(3.206)$ |
| Observations | 3,759 | 3,759 | 3,759 | 3,761 | 3,761 | 3,761 |

2) Assign Masked Values with 1 Student

| District | $0.201^{*}$ | 3.132 | $7.656^{*}$ | 0.150 | 4.398 | 4.074 |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: |
| Provides BE | $(0.116)$ | $(3.706)$ | $(4.147)$ | $(0.095)$ | $(3.314)$ | $(3.341)$ |
| Observations | 3,759 | 3,759 | 3,759 | 3,761 | 3,761 | 3,761 |

3) Assign Masked Values with 4 Students

| District | $0.211^{*}$ | 3.504 | $7.931^{* *}$ | $0.170^{*}$ | 5.080 | 4.715 |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: |
| Provides BE | $(0.113)$ | $(3.677)$ | $(4.021)$ | $(0.092)$ | $(3.345)$ | $(3.196)$ |
| Observations | 3,759 | 3,759 | 3,759 | 3,761 | 3,761 | 3,761 |

4) Restrict to Districts with Fewer than 200 Students in 1st Grade in 2000 instead of 2004

| District | $0.176^{*}$ | 2.461 | $7.301^{* *}$ | 0.120 | 3.024 | 3.974 |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: |
| Provides BE | $(0.103)$ | $(3.499)$ | $(3.516)$ | $(0.080)$ | $(2.866)$ | $(2.764)$ |
| Observations | 4,119 | 4,119 | 4,119 | 4,121 | 4,121 | 4,121 |

5) Restrict to Districts with Fewer than 200 Students in 1st Grade in 2008 instead of 2004

| District | 0.161 | 1.813 | $6.476^{*}$ | 0.137 | 3.520 | 4.429 |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: |
| Provides BE | $(0.109)$ | $(3.564)$ | $(3.701)$ | $(0.083)$ | $(3.024)$ | $(2.876)$ |
| Observations | 3,757 | 3,757 | 3,757 | 3,759 | 3,759 | 3,759 |

6) Restrict to Districts with 300 or Fewer Students in 1st Grade in 2004

| District | 0.073 | -0.650 | 4.448 | 0.029 | 0.386 | 1.335 |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: |
| Provides BE | $(0.148)$ | $(4.732)$ | $(5.266)$ | $(0.119)$ | $(3.870)$ | $(4.343)$ |
| Observations | 5,237 | 5,237 | 5,237 | 5,239 | 5,239 | 5,239 |

7) Restrict to Districts with 400 or Fewer Students in 1st Grade in 2004

| District | -0.009 | -2.313 | 0.808 | -0.182 | -2.169 | -8.525 |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: |
| Provides BE | $(0.224)$ | $(6.774)$ | $(8.185)$ | $(0.265)$ | $(6.090)$ | $(11.448)$ |
| Observations | 6,869 | 6,869 | 6,869 | 6,871 | 6,871 | 6,871 |

Notes: See Table 3 notes regarding base sample and specification. Reported is the 2SLS coefficient for the endogenous regressor, "District has Any Bilingual Program in 1st Grade Cohort" where the identifying instrument is "District Has >=20 Spanish LEP Students in 1st Grade Cohort". Standard errors clustered by district are in parentheses. *, ** and ${ }^{* * *}$ denote significance at the $10 \%, 5 \%$ and $1 \%$ levels, respectively.

Appendix Table 9: Sensitivity Analysis of 2SLS Estimates of Effects on "Spanish Home Language" Students

| Students |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Math |  |  | Reading |  |  |
|  | Mean <br> Achievement <br> (1) | Passing Rate <br> (2) | Commended Rate <br> (3) | Mean Achievement (4) | Passing Rate (5) | Commended Rate <br> (6) |
| 1) Baseline (From Table 3, Columns 3 and 4) |  |  |  |  |  |  |
| District <br> Provides BE | $\begin{gathered} 0.107 \\ (0.155) \end{gathered}$ | $\begin{gathered} 1.652 \\ (7.368) \end{gathered}$ | $\begin{gathered} 3.462 \\ (4.761) \end{gathered}$ | $\begin{gathered} 0.040 \\ (0.156) \end{gathered}$ | $\begin{aligned} & -0.509 \\ & (6.830) \end{aligned}$ | $\begin{gathered} 3.058 \\ (4.316) \end{gathered}$ |
| Observations | 3,247 | 3,247 | 3,247 | 3,244 | 3,244 | 3,244 |
| 2) Quadratic Smoother |  |  |  |  |  |  |
| District <br> Provides BE | $\begin{aligned} & -0.383 \\ & (0.265) \end{aligned}$ | $\begin{gathered} -18.915 \\ (12.320) \end{gathered}$ | $\begin{aligned} & -9.778 \\ & (8.037) \end{aligned}$ | $\begin{gathered} -0.227 \\ (0.237) \end{gathered}$ | $\begin{aligned} & -11.827 \\ & (10.600) \end{aligned}$ | $\begin{aligned} & -2.598 \\ & (6.407) \end{aligned}$ |
| Observations | 3,247 | 3,247 | 3,247 | 3,244 | 3,244 | 3,244 |
| 3) Cubic Smoother |  |  |  |  |  |  |
| District <br> Provides BE | $\begin{aligned} & -0.145 \\ & (0.201) \end{aligned}$ | $\begin{aligned} & -7.581 \\ & (8.525) \end{aligned}$ | $\begin{aligned} & -1.188 \\ & (6.862) \end{aligned}$ | $\begin{gathered} -0.147 \\ (0.182) \end{gathered}$ | $\begin{gathered} -6.536 \\ (8.437) \end{gathered}$ | $\begin{aligned} & -0.954 \\ & (5.089) \end{aligned}$ |
| Observations | 3,247 | 3,247 | 3,247 | 3,244 | 3,244 | 3,244 |
| 4) Bandwidth of 10 to 29 |  |  |  |  |  |  |
| District <br> Provides BE | $\begin{aligned} & -0.078 \\ & (0.199) \end{aligned}$ | $\begin{aligned} & -9.305 \\ & (9.364) \end{aligned}$ | $\begin{gathered} 0.106 \\ (6.274) \end{gathered}$ | $\begin{aligned} & -0.078 \\ & (0.199) \end{aligned}$ | $\begin{aligned} & -9.105 \\ & (8.965) \end{aligned}$ | $\begin{gathered} 3.748 \\ (5.305) \end{gathered}$ |
| Observations | 2,453 | 2,453 | 2,453 | 2,448 | 2,448 | 2,448 |
| 5) Bandwidth of 8 to 49 |  |  |  |  |  |  |
| District <br> Provides BE | $\begin{gathered} 0.086 \\ (0.149) \end{gathered}$ | $\begin{gathered} 3.338 \\ (4.445) \end{gathered}$ | $\begin{gathered} 3.338 \\ (4.445) \end{gathered}$ | $\begin{gathered} 0.001 \\ (0.151) \end{gathered}$ | $\begin{gathered} -2.643 \\ (6.733) \end{gathered}$ | $\begin{gathered} 1.745 \\ (4.022) \end{gathered}$ |
| Observations | 3,387 | 3,387 | 3,387 | 3,384 | 3,384 | 3,384 |
| 6) . No Controls or Fixed-Effects |  |  |  |  |  |  |
| District <br> Provides BE | $\begin{gathered} 0.066 \\ (0.153) \end{gathered}$ | $\begin{gathered} 1.887 \\ (7.745) \end{gathered}$ | $\begin{gathered} 4.337 \\ (5.031) \end{gathered}$ | $\begin{aligned} & -0.013 \\ & (0.158) \end{aligned}$ | $\begin{gathered} 0.032 \\ (7.243) \end{gathered}$ | $\begin{gathered} 3.198 \\ (4.558) \end{gathered}$ |
| Observations | 3,247 | 3,247 | 3,247 | 3,244 | 3,244 | 3,244 |

Notes: See Table 3 notes regarding base sample and specification. Reported is the 2SLS coefficient for the endogenous regressor, "District has Any Bilingual Program in 1st Grade Cohort" where the identifying instrument is "District Has >=20 Spanish LEP Students in 1st Grade Cohort". Standard errors clustered by district are in parentheses. *, ** and *** denote significance at the $10 \%, 5 \%$ and $1 \%$ levels, respectively.

Appendix Table 10: Sensitivity Analysis of 2SLS Estimates of Effects on All Students

|  | Math |  |  | Reading |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Mean Achievement (1) | Passing Rate (2) | Commended Rate <br> (3) | Mean Achievement (4) | Passing Rate (5) | Commended Rate <br> (6) |
| 1) Baseline (From Table 3, Columns 5 and 6) |  |  |  |  |  |  |
| District <br> Provides BE | $\begin{aligned} & 0.206 * \\ & (0.112) \end{aligned}$ | $\begin{gathered} 3.232 \\ (3.946) \end{gathered}$ | $\begin{gathered} 8.124 * * \\ (3.802) \end{gathered}$ | $\begin{gathered} 0.143 \\ (0.095) \end{gathered}$ | $\begin{gathered} 3.727 \\ (3.576) \end{gathered}$ | $\begin{gathered} 4.826 \\ (3.050) \end{gathered}$ |
| Observations | 3,819 | 3,819 | 3,819 | 3,819 | 3,819 | 3,819 |
| 2) Quadratic Smoother |  |  |  |  |  |  |
| District <br> Provides BE | $\begin{gathered} 0.073 \\ (0.211) \end{gathered}$ | $\begin{aligned} & -0.534 \\ & (6.898) \end{aligned}$ | $\begin{gathered} 0.404 \\ (7.091) \end{gathered}$ | $\begin{gathered} 0.042 \\ (0.171) \end{gathered}$ | $\begin{gathered} 1.771 \\ (6.295) \end{gathered}$ | $\begin{gathered} 0.960 \\ (5.714) \end{gathered}$ |
| Observations | 3,819 | 3,819 | 3,819 | 3,819 | 3,819 | 3,819 |
| 3) Cubic Smoother |  |  |  |  |  |  |
| District <br> Provides BE | $\begin{gathered} 0.103 \\ (0.199) \end{gathered}$ | $\begin{gathered} 1.922 \\ (6.196) \end{gathered}$ | $\begin{gathered} 0.014 \\ (6.169) \end{gathered}$ | $\begin{aligned} & -0.018 \\ & (0.138) \end{aligned}$ | $\begin{gathered} 1.547 \\ (5.264) \end{gathered}$ | $\begin{aligned} & -2.222 \\ & (4.648) \end{aligned}$ |
| Observations | 3,819 | 3,819 | 3,819 | 3,819 | 3,819 | 3,819 |
| 4) Bandwidth of 10 to 29 |  |  |  |  |  |  |
| District <br> Provides BE | $\begin{gathered} 0.120 \\ (0.136) \end{gathered}$ | $\begin{gathered} 0.110 \\ (4.567) \end{gathered}$ | $\begin{gathered} 4.693 \\ (4.732) \end{gathered}$ | $\begin{gathered} 0.101 \\ (0.116) \end{gathered}$ | $\begin{gathered} 1.616 \\ (4.217) \end{gathered}$ | $\begin{gathered} 4.694 \\ (3.750) \end{gathered}$ |
| Observations | 2,784 | 2,784 | 2,784 | 2,784 | 2,784 | 2,784 |
| 5) Bandwidth of 8 to 49 |  |  |  |  |  |  |
| District <br> Provides BE | $\begin{aligned} & 0.193 * \\ & (0.111) \end{aligned}$ | $\begin{aligned} & 7.785 * * \\ & (3.672) \end{aligned}$ | $\begin{aligned} & 7.785 * * \\ & (3.672) \end{aligned}$ | $\begin{gathered} 0.117 \\ (0.090) \end{gathered}$ | $\begin{gathered} 2.654 \\ (3.413) \end{gathered}$ | $\begin{gathered} 4.278 \\ (2.802) \end{gathered}$ |
| Observations | 3,962 | 3,962 | 3,962 | 3,962 | 3,962 | 3,962 |
| 6) . No Controls or Fixed-Effects |  |  |  |  |  |  |
| District <br> Provides BE | $\begin{gathered} 0.141 \\ (0.166) \end{gathered}$ | $\begin{gathered} 3.334 \\ (5.909) \end{gathered}$ | $\begin{gathered} 8.386 \\ (6.472) \end{gathered}$ | $\begin{gathered} 0.084 \\ (0.158) \end{gathered}$ | $\begin{gathered} 3.516 \\ (5.621) \end{gathered}$ | $\begin{gathered} 4.399 \\ (5.699) \end{gathered}$ |
| Observations | 3,819 | 3,819 | 3,819 | 3,819 | 3,819 | 3,819 |

Notes: See Table 3 notes regarding base sample and specification. Reported is the 2SLS coefficient for the endogenous regressor, "District has Any Bilingual Program in 1st Grade Cohort" where the identifying instrument is "District Has >=20 Spanish LEP Students in 1st Grade Cohort". Standard errors clustered by district are in parentheses. *, ** and *** denote significance at the $10 \%, 5 \%$ and $1 \%$ levels, respectively.


[^0]:    Notes: Observations are at the school-grade-year level, and cover the 2002-03 through 2009-10 school years. Sample is limited to observations in districts with fewer than 200 students in the
    1 st grade cohort in 2004-05, in district-grade-years with between 8 and 39 LEP students in the 1 st grade cohort, and with non-missing achievement variables. Each coefficient and associated standard error reported comes from a separate regression that also controls for district-wide Spanish LEP count in the relevant 1st grade cohort, district-wide LEP count interacted with a dummy for being above 20 Spanish LEP students, grade-year fixed effects, the percent of the school-grade-year overall who are female, economically disadvantaged, white, black and Hispanic, and the percent of "non-LEP, non-Spanish home language" students in a school-grade-year who are female or economically disadvantaged. Standard errors clustered by district are in parentheses. ${ }^{*},{ }^{* *}$ and ${ }^{* * *}$ denote significance at the $10 \%, 5 \%$ and $1 \%$ levels, respectively.

