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Online Appendix for "Does Delivery Location Matter?: A National Study of the Impact of Early Dual Enrollment on College Readiness and First-Year Academic Momentum"

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Appendix A. Descriptive Summary of Variables

Variable	All DE Students				College-Attending DE Students			
	Sampling weights		Propensity score weights		Sampling weights		Propensity score weights	
	No DE on College Campus	At least some DE on College Campus	No DE on College Campus	At least some DE on College Campus	No DE on College Campus	At least some DE on College Campus	No DE on College Campus	At least some DE on College Campus
Race/Ethnicity								
White	56.73%	46.51%	49.39%	56.54%	60.24%	49.53%	50.33%	56.62%
African American/Black	11.89%	19.18%	14.30%	9.51%	10.14%	14.36%	13.57%	9.69%
Latinx	18.34%	20.56%	15.01%	14.10%	18.08%	22.32%	14.97%	13.86%
Asian/Pacific Islander	4.10%	5.81%	12.63%	10.96%	4.76%	5.70%	13.07%	11.08%
Other	8.94%	7.94%	8.66%	8.89%	6.77%	8.10%	8.06%	8.75%
Female	52.45%	58.89%	66.44%	58.58%	54.99%	63.82%	67.19%	61.09%
SES	0.038	0.173	0.390	0.335	0.124	0.228	0.437	0.384
High school GPA for academic courses in 2009	2.894	3.134	3.241	3.232	3.024	3.218	3.301	3.319
Educational aspiration in 2009								
Don't know	16.71%	12.51%	11.51%	10.91%	16.01%	12.00%	11.06%	10.28%
High School or Below	7.95%	6.71%	4.63%	3.52%	5.58%	3.33%	3.73%	2.24%
Start and/or complete associate degree	5.59%	3.12%	2.34%	3.94%	5.05%	2.58%	2.09%	3.21%
Start and/or complete bachelor's degree	20.00%	18.10%	13.91%	17.61%	20.13%	19.09%	13.77%	17.56%
Start and/or complete master's degree	25.10%	21.37%	23.05%	17.32%	27.15%	23.68%	23.37%	29.20%

Start and/or complete doctoral or professional degree	24.65%	38.19%	44.55%	36.70%	26.09%	39.32%	45.98%	37.51%
9th grader talk to school counselor about courses	34.65%	34.44%	38.18%	35.54%	35.89%	35.30%	39.84%	37.20%
Education plan in place	52.38%	62.11%	62.77%	61.20%	53.50%	61.69%	63.56%	62.42%
Math self-efficacy belief	0.188	0.461	0.519	0.441	0.203	0.490	0.532	0.472
Science self-efficacy belief	0.158	0.342	0.344	0.355	0.201	0.358	0.368	0.391
Highest math level in 12th grade								
Algebra 1 or below	3.67%	5.26%	1.44%	3.47%	1.50%	2.15%	0.86%	2.91%
Geometry	6.43%	4.02%	3.16%	4.05%	4.52%	2.71%	2.66%	2.93%
Algebra 2	20.21%	17.72%	13.88%	17.06%	18.02%	15.93%	12.16%	15.52%
Advanced Algebra/ Trigonometry/ other level 3 course	23.69%	30.35%	19.45%	22.61%	23.70%	29.70%	18.91%	21.80%
Calculus or Precalculus	46.00%	42.65%	62.07%	52.82%	52.27%	49.51%	65.40%	56.83%
Number of earned AP/IB credits	1.492	1.940	2.367	1.787	1.696	2.171	2.521	1.951

NOTE: DE = dual enrollment.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Longitudinal Study of 2009.
Selected years 2009, 2012, 2013, and 2016.

Appendix B

Multiple regression and logistic regression analyses (propensity score weights)

Variables	High School GPA ^a	College Attendance ^a	Taking Developmental Courses ^b	Delayed Enrollment ^b	Full-time Enrollment ^b
DE on college campus	0.024 (0.021)	0.130 (0.194)	-0.185 (0.172)	-0.007 (0.206)	-0.222 (0.171)
Race/Ethnicity					
African American/Black	-0.042 (0.034)	0.544 (0.279)	0.391 (0.242)	-0.628 (0.326)	0.223 (0.298)
Hispanic/Latinx	-0.016 (0.033)	0.370 (0.286)	0.560* (0.227)	0.179 (0.273)	-0.424 (0.234)
Asian/Pacific Islander	-0.026 (0.033)	-0.275 (0.410)	0.433 (0.313)	-0.812 (0.526)	0.075 (0.312)
Other	-0.053 (0.032)	-0.291 (0.305)	0.13 (0.308)	0.488 (0.357)	-0.467 (0.296)
Female	0.077** (0.022)	0.314 (0.197)	-0.047 (0.170)	-0.055 (0.249)	0.017 (0.217)
SES	0.077*** (0.015)	0.620*** (0.131)	-0.291* (0.119)	-0.175 (0.132)	0.414** (0.145)
High school GPA for academic courses in 2009	0.745*** (0.028)	0.890*** (0.130)	-0.425** (0.130)	-0.530** (0.163)	0.422** (0.159)
Educational aspiration in 2009					
High School or Below	0.014 (0.052)	-0.458 (0.409)	0.246 (0.363)	-0.214 (0.538)	0.103 (0.414)
Start and/or complete associate degree	-0.039 (0.081)	-0.386 (0.476)	-0.034 (0.387)	0.126 (0.605)	0.059 (0.487)
Start and/or complete bachelor's degree	0.051 (0.036)	0.105 (0.314)	-0.413 (0.263)	0.038 (0.340)	-0.351 (0.269)
Start and/or complete master's degree	0.051 (0.036)	0.563 (0.291)	-0.631* (0.256)	0.050 (0.295)	0.199 (0.262)
Start and/or complete doctoral/professional degree	0.042 (0.037)	0.192 (0.277)	-0.752** (0.246)	0.145 (0.263)	0.573* (0.263)
Education plan in place	-0.011 (0.020)	0.163 (0.195)	-0.162 (0.168)	-0.212 (0.210)	-0.120 (0.187)

9th grader talk to school counselor about courses	0.028 (0.021)	0.688*** (0.195)	0.041 (0.184)	-0.258 (0.228)	-0.052 (0.187)
Math self-efficacy belief	-0.001 (0.012)	-0.060 (0.111)	-0.244* (0.112)	0.048 (0.126)	0.041 (0.113)
Science self-efficacy belief	0.003 (0.013)	-0.001 (0.106)	-0.028 (0.100)	-0.178 (0.127)	0.188 (0.114)
Highest level math course taken in 12th grade					
Geometry	-0.079 (0.108)	-0.921 (0.559)	0.289 (0.515)	0.765 (0.668)	-2.162* (0.873)
Algebra 2	-0.060 (0.098)	-0.802* (0.405)	0.458 (0.438)	0.229 (0.594)	-0.922 (0.813)
Advanced Algebra/ Trigonometry/ other level 3 course	0.052 (0.100)	-0.436 (0.460)	-0.298 (0.461)	-0.276 (0.586)	-0.961 (0.812)
Calculus or Precalculus	0.189 (0.098)	-0.250 (0.458)	-0.441 (0.473)	-0.488 (0.643)	-0.295 (0.864)
Number of earned AP/IB credits	0.046*** (0.004)	0.180** (0.064)	-0.103* (0.044)	-0.169** (0.064)	0.032 (0.049)
# of observations	3,410	3,490	2,270	2,420	2,430

NOTE: The statistical significance of the estimated coefficients are based on robust standard errors. Please refer to Table 1 for a complete description of the variables. All models were estimated with the robust maximum likelihood estimator (MLR) and weighted by the product of sampling weight and propensity score weight, divided by the mean of the product term; DE = dual enrollment.

* $p < .05$ ** $p < .01$ *** $p < .001$

^a Based on students who have taken dual enrollment courses

^b Based on students who have taken dual enrollment courses and attended a postsecondary institution

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Longitudinal Study of 2009. Selected years 2009, 2012, 2013, and 2016.

Appendix C-1

Multiple regression and logistic regression analyses for lower SES subgroup (propensity score weights)

Variables	High School GPA ^a	College Attendance ^a	Taking Developmental Courses ^b	Delayed enrollment ^b	Full-time enrollment ^b
DE on college campus	-0.021 (0.028)	0.258 (0.250)	0.290 (0.196)	-0.452 (0.280)	-0.470** (0.166)
Race/Ethnicity					
African American/Black	-0.030 (0.044)	0.659* (0.321)	0.239 (0.290)	-0.668* (0.305)	1.095*** (0.244)
Hispanic/Latinx	0.022 (0.043)	0.486 (0.256)	0.373 (0.238)	0.448 (0.324)	-0.263 (0.255)
Asian/Pacific Islander	0.073 (0.049)	1.506 (0.820)	0.507 (0.340)	-1.400*** (0.352)	0.455 (0.425)
Other	-0.003 (0.045)	0.439 (0.421)	-0.256 (0.403)	0.302 (0.388)	-0.317 (0.347)
Female	0.061* (0.030)	0.371 (0.219)	-0.021 (0.226)	0.276 (0.256)	-0.082 (0.251)
High school GPA for academic courses in 2009	0.763*** (0.027)	0.940*** (0.173)	-0.554** (0.156)	-0.854*** (0.182)	0.248 (0.172)
Educational aspiration in 2009					
High School or Below	0.051 (0.069)	-0.549 (0.428)	0.180 (0.347)	-0.774 (0.489)	0.324 (0.330)
Start and/or complete associate degree	-0.084 (0.097)	-0.621 (0.433)	0.002 (0.346)	-1.358** (0.464)	0.428 (0.284)
Start and/or complete bachelor's degree	-0.005 (0.590)	0.187 (0.363)	-0.49 (0.332)	-0.017 (0.326)	-0.085 (0.284)
Start and/or complete master's degree	0.012 (0.059)	0.587 (0.330)	-0.556 (0.285)	-0.248 (0.373)	0.523 (0.283)
Start and/or complete doctoral/professional degree	0.040 (0.057)	-0.392 (0.342)	-0.633* (0.300)	0.107 (0.365)	0.913** (0.294)
Education plan in place	0.012 (0.027)	-0.100 (0.197)	0.000 (0.200)	0.259 (0.229)	-0.186 (0.183)
	0.058	0.818***	0.185	-0.116	0.066

9th grader talked to school counselor about courses	(0.034)	(0.211)	(0.300)	(0.237)	(0.198)
Math self-efficacy belief	-0.014 (0.018)	-0.010 (0.124)	-0.041 (0.146)	0.202 (0.155)	0.014 (0.119)
Science self-efficacy belief	-0.022 (0.020)	-0.141 (0.163)	-0.060 (0.101)	-0.200 (0.149)	0.036 (0.142)
Highest level math course taken in 12th grade					
Geometry	-0.211 (0.133)	-1.043 (0.644)	-0.319 (0.633)	0.387 (0.876)	-1.159 (0.913)
Algebra 2	-0.106 (0.125)	-0.879 (0.488)	0.213 (0.560)	0.176 (0.809)	-0.110 (0.863)
Advanced Algebra/Trigonometry/ other level 3 course	-0.031 (0.125)	-0.559 (0.493)	-0.954 (0.585)	0.033 (0.805)	-0.543 (0.875)
Calculus or Precalculus	0.110 (0.124)	-0.106 (0.549)	-0.910 (0.595)	0.180 (0.848)	0.500 (0.920)
Number of earned AP/IB credits	0.052*** (0.006)	0.219 (0.106)	-0.019 (0.054)	-0.268* (0.102)	-0.051 (0.055)

NOTE: The statistical significance of the estimated coefficients are based on robust standard errors. Please refer to Table 1 for a complete description of the variables. All models were estimated with the robust maximum likelihood estimator (MLR) and weighted by the product of sampling weight and propensity score weight, divided by the mean of the product term; DE = dual enrollment.

* $p < .05$ ** $p < .01$ *** $p < .001$

^a Based on lower SES students who have taken dual enrollment courses

^b Based on lower SES students who have taken dual enrollment courses and attended a postsecondary institution

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Longitudinal Study of 2009. Selected years 2009, 2012, 2013, and 2016.

Appendix C-2

*Multiple regression and logistic regression analyses for higher SES subgroup
(propensity score weights)*

Variables	High School GPA ^a	College Attendance ^a	Taking Developmental Courses ^b	Delayed enrollment ^b	Full-time enrollment ^b
DE on college campus	0.058* (0.026)	0.181 (0.237)	-0.986** (0.337)	0.422 (0.278)	0.252 (0.264)
Race/Ethnicity					
African American/Black	-0.045 (0.046)	0.555 (0.452)	0.569 (0.312)	-1.036* (0.502)	-0.504 (0.394)
Hispanic/Latinx	-0.074 (0.041)	-0.447 (0.437)	0.628* (0.308)	0.11 (0.427)	-0.577 (0.400)
Asian/Pacific Islander	-0.058 (0.039)	-1.390*** (0.339)	-0.147 (0.602)	-1.128 (0.805)	-0.362 (0.403)
Other	-0.066 (0.037)	-1.250** (0.363)	0.674 (0.346)	0.568 (0.425)	-0.877* (0.408)
Female	0.087** (0.027)	0.203 (0.287)	-0.103 (0.211)	-0.228 (0.366)	0.233 (0.287)
High school GPA for academic courses in 2009	0.723*** (0.048)	0.994*** (0.186)	-0.220 (0.188)	-0.380 (0.241)	0.747** (0.255)
Educational aspiration in 2009					
High School or Below	-0.100 (0.076)	-1.064 (1.168)	0.290 (0.522)	2.471*** (0.622)	-0.870 (0.483)
Start and/or complete associate degree	-0.007 (0.117)	-0.023 (0.972)	0.060 (0.618)	0.774 (0.862)	-0.391 (0.796)
Start and/or complete bachelor's degree	0.100* (0.043)	0.061 (0.464)	-0.314 (0.376)	0.356 (0.801)	-0.747* (0.351)
Start and/or complete master's degree	0.096* (0.038)	0.331 (0.493)	-0.790 (0.420)	0.740 (0.421)	-0.382 (0.337)
Start and/or complete doctoral/professional degree	0.066 (0.036)	0.214 (0.425)	-0.768* (0.360)	0.732 (0.405)	0.034 (0.390)
Education plan in place	-0.037 (0.027)	0.277 (0.274)	-0.207 (0.222)	-0.845** (0.292)	-0.263 (0.279)
9th grader talked to school counselor about courses	0.007 (0.025)	0.369 (0.276)	-0.152 (0.262)	-0.446 (0.263)	-0.197 (0.268)

Math self-efficacy belief	0.009 (0.015)	-0.156 (0.183)	-0.579*** (0.106)	-0.135 (0.216)	0.044 (0.173)
Science self-efficacy belief	0.022 (0.015)	0.110 (0.146)	0.093 (0.153)	-0.071 (0.167)	0.372* (0.171)
Highest level math course taken in 12th grade					
Geometry	0.181 (0.133)	-1.019 (1.067)	4.254*** (1.073)	1.001 (1.007)	-2.057** (0.624)
Algebra 2	0.067 (0.126)	-0.751 (0.601)	3.802*** (1.058)	0.404 (0.197)	-0.511 (0.292)
Advanced Algebra/ Trigonometry/ other level 3 course	0.203 (0.127)	-0.364 (0.640)	3.520** (1.056)	-0.52 (0.910)	-0.235 (0.331)
Calculus or Precalculus	0.358* (0.132)	-0.285 (0.644)	2.902* (1.125)	-0.926 (1.019)	-
Number of earned AP/IB credits	0.050*** (0.004)	0.185* (0.078)	-0.176** (0.064)	-0.123 (0.071)	0.230** (0.067)

NOTE: The statistical significance of the estimated coefficients are based on robust standard errors. Please refer to Table 1 for a complete description of the variables. All models were estimated with the robust maximum likelihood estimator (MLR) and weighted by the product of sampling weight and propensity score weight, divided by the mean of the product term; DE = dual enrollment.

* $p < .05$ ** $p < .01$ *** $p < .001$

^a Based on higher SES students who have taken dual enrollment courses

^b Based on higher SES students who have taken dual enrollment courses and attended a postsecondary institution

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Longitudinal Study of 2009. Selected years 2009, 2012, 2013, and 2016.

Appendix C-3

*Multiple regression and logistic regression analyses for students of color subgroup
(propensity score weights)*

Variables	High School GPA ^a	College Attendance ^a	Taking Developmental Courses ^b	Delayed enrollment ^b	Full-time enrollment ^b
DE on college campus	0.055 (0.031)	0.152 (0.287)	-0.185 (0.208)	-0.181 (0.297)	-0.259 (0.215)
Female	0.035 (0.030)	0.307 (0.226)	0.078 (0.185)	0.491 (0.290)	-0.031 (0.195)
SES	0.053** (0.016)	0.252 (0.163)	-0.148 (0.112)	-0.209 (0.178)	0.179 (0.152)
High school GPA for academic courses in 2009	0.728*** (0.027)	0.713*** (0.195)	-0.261* (0.124)	-0.374* (0.176)	0.401* (0.165)
Educational aspiration in 2009					
High School or Below	-0.041 (0.066)	-0.813 (0.471)	0.994** (0.347)	-0.328 (0.359)	0.131 (0.374)
Start and/or complete associate degree	-0.03 (0.105)	-0.022 (0.628)	0.022 (0.403)	-1.953*** (0.490)	1.261*** (0.186)
Start and/or complete bachelor's degree	0.035 (0.041)	-0.368 (0.320)	-0.611* (0.297)	-0.186 (0.368)	-0.300 (0.290)
Start and/or complete master's degree	0.086 (0.046)	0.291 (0.351)	-.417 (0.310)	1.273** (0.384)	0.186 (0.295)
Start and/or complete doctoral/professional degree	0.043 (0.042)	0.066 (0.317)	-0.845** (0.305)	-0.358 (0.303)	0.514 (0.311)
Education plan in place	-0.046 (0.024)	0.301 (0.287)	-0.180 (0.199)	0.048 (0.253)	-0.022 (0.194)
9th grader talked to school counselor about courses	0.060* (0.030)	0.544 (0.283)	-0.053 (0.207)	-0.38 (0.246)	0.134 (0.222)
Math self-efficacy belief	0.009 (0.017)	-0.141 (0.154)	-0.182 (0.121)	-0.108 (0.149)	0.029 (0.130)
Science self-efficacy belief	-0.018 (0.016)	-0.108 (0.140)	-0.115 (0.093)	-0.163 (0.171)	0.115 (0.131)
Highest level math course taken in 12th grade					

Geometry	-0.162 (0.129)	-0.521 (0.682)	0.410 (0.661)	1.756* (0.804)	-2.734** (0.992)
Algebra 2	-0.107 (0.128)	-.755 (0.564)	0.615 (0.565)	0.814 (0.780)	-1.422 (0.976)
Advanced Algebra/ Trigonometry/ other level 3 course	-0.010 (0.129)	-0.089 (0.635)	-0.160 (0.564)	0.749 (0.805)	-1.422 (0.964)
Calculus or Precalculus	0.140 (0.122)	-0.015 (0.609)	-0.390 (0.560)	0.22 (0.819)	-0.954 (1.002)
Number of earned AP/IB credits	0.048*** (0.006)	0.128 (0.068)	-0.138** (0.047)	-0.356*** (0.085)	0.052 (0.054)

NOTE: The statistical significance of the estimated coefficients are based on robust standard errors. Please refer to Table 1 for a complete description of the variables. All models were estimated with the robust maximum likelihood estimator (MLR) and weighted by the product of sampling weight and propensity score weight, divided by the mean of the product term; DE = dual enrollment.

* $p < .05$ ** $p < .01$ *** $p < .001$

^a Based on students of color who have taken dual enrollment courses

^b Based on students of color who have taken dual enrollment courses and attended a postsecondary institution

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Longitudinal Study of 2009. Selected years 2009, 2012, 2013, and 2016.

Appendix C-4

*Multiple regression and logistic regression analyses for White student subgroup
(propensity score weights)*

Variables	High School GPA ^a	College Attendance ^a	Taking Developmental Courses ^b	Delayed enrollment ^b	Full-time enrollment ^b
DE on college campus	-0.011 (0.026)	0.023 (0.215)	-0.180 (0.246)	0.179 (0.264)	-0.256 (0.210)
Female	0.107*** (0.027)	0.493 (0.315)	-0.161 (0.203)	-0.375 (0.299)	0.046 (0.284)
SES	0.106*** (0.020)	1.138*** (0.202)	-0.549** (0.166)	-0.332 (0.185)	0.946*** (0.160)
High school GPA for academic courses in 2009	0.761*** (0.040)	1.001*** (0.190)	-0.660** (0.208)	-0.652** (0.225)	0.348 (0.263)
Educational aspiration in 2009					
High School or Below	0.095 (0.056)	0.204 (0.531)	-1.252** (0.417)	-1.102 (0.735)	0.345 (0.742)
Start and/or complete associate degree	-0.039 (0.072)	-0.721 (0.565)	-0.09 (0.552)	1.199* (0.591)	-0.603 (0.380)
Start and/or complete bachelor's degree	0.062 (0.043)	0.598 (0.420)	-0.274 (0.343)	0.206 (0.460)	-0.296 (0.277)
Start and/or complete master's degree	0.021 (0.041)	0.815* (0.348)	-0.799* (0.339)	1.033** (0.336)	0.341 (0.328)
Start and/or complete doctoral/professional degree	0.037 (0.044)	0.327 (0.379)	-0.712 (0.365)	0.601 (0.359)	1.019** (0.330)
Education plan in place	0.0012 (0.029)	-0.057 (0.267)	-0.135 (0.214)	-0.308 (0.285)	-0.492 (0.257)
9th grader talked to school counselor about courses	0.003 (0.025)	0.779** (0.268)	0.082 (0.229)	-0.374 (0.259)	-0.245 (0.229)
Math self-efficacy belief	-0.012 (0.014)	0.006 (0.166)	-0.309** (0.104)	0.144 (0.170)	0.007 (0.169)
Science self-efficacy belief	0.027 (0.018)	0.131 (0.180)	0.095 (0.159)	-0.069 (0.144)	0.252 (0.196)

Highest level math course taken in 12th grade

Geometry	-0.011 (0.150)	-1.498 (0.796)	0.073 (0.610)	-0.262 (0.864)	-1.371 (1.231)
Algebra 2	0.015 (0.117)	-.455 (0.600)	0.286 (0.652)	-0.442 (0.829)	0.054 (1.153)
Advanced Algebra/ Trigonometry/ other level 3 course	0.11 (0.115)	-0.727 (0.594)	-0.323 (0.665)	-1.007 (0.829)	-0.376 1.197
Calculus or Precalculus	0.237 (0.119)	-0.331 (0.569)	-0.463 (0.675)	-1.064 (0.864)	0.653 (1.204)
Number of earned AP/IB credits	0.043*** (0.005)	0.256* (0.102)	-0.033 (0.053)	-0.053 (0.064)	0.010 (0.050)

NOTE: The statistical significance of the estimated coefficients are based on robust standard errors. Please refer to Table 1 for a complete description of the variables. All models were estimated with the robust maximum likelihood estimator (MLR) and weighted by the product of sampling weight and propensity score weight, divided by the mean of the product term; DE = dual enrollment.

* $p < .05$ ** $p < .01$ *** $p < .001$

^a Based on White students who have taken dual enrollment courses

^b Based on White students who have taken dual enrollment courses and attended a postsecondary institution

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Longitudinal Study of 2009. Selected years 2009, 2012, 2013, and 2016.