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ARE COMMUNITY COLLEGES MAKING GOOD PLACEMENT DECISIONS IN THEIR MATH TRAJECTORIES?

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This brief is a product of a larger study, the main objective of which is to evaluate the effectiveness of math placement policies in the Los Angeles Community College District (LACCD) for entering community college students. The research was funded by a grant from the U.S. Department of Education's Institute of Education Sciences (IES).

SUMMARY

The decentralized governance structure of California community colleges results in substantial variation in how students are assessed for developmental education. In this brief, we illustrate a procedure to evaluate whether colleges are effectively placing students in developmental math. We show that some colleges are placing students more effectively into the courses that constitute the developmental math sequences than others. At colleges with effective policies, placement decisions at the margin (for students whose skills place them at the cut point between two courses) do not have strong effects on students' subsequent progress toward graduation. At colleges with less effective policies such marginal students' success is much more dependent on which course they are initially placed in. Based on our results, we recommend that states with decentralized governance structures adopt a central support system that could help local colleges validate cut scores used to sort students into different courses.

Most community college students—about 60 percent nationwide—are initially placed in developmental math classes. In California, students must currently pass intermediate algebra to earn an associate degree (A.A.), and a transfer-level math course to transfer to a four-year college. As students first enroll in community college, they are assessed using a standardized placement test and then placed somewhere in the college's developmental math sequence, which typically consists of at least four courses: arithmetic, pre-algebra, elementary algebra, and intermediate algebra. (Students specializing in math or other science and technology fields often take more advanced courses as well.) Research has documented that the lower the initial placement, the less likely the student is to attain a degree or transfer (Bailey, Jeong, & Cho, 2010; Fong, Melguizo, & Prather, 2013). To a large degree this reflects the fact that students who score lower on placement tests are less well prepared to succeed in college. However, when researchers control for a student's initial placement score, some of the disadvantage of lower placements may remain, which would indicate that students at the margin (i.e., those placed

either just above or just below the cut-off) may do better if they were placed in a more difficult course and that placement cut scores should be lowered.

This research brief provides an example of how a quantitative analytical technique known as a regression discontinuity design (RDD) can be used to evaluate the cut scores that colleges use to place their students into different math courses and, depending on the results, how to re-calibrate the cut scores and placement rules. We illustrate this for two of the nine colleges in the Los Angeles Community College District (LACCD), the largest community college district in California and one of the largest in the U.S. In the LACCD, the responsibility for placing community college students in different math courses is in the hands of the math faculty, who must select an assessment tool, decide how many sub-tests students should take to be placed (i.e., what branching system to use), as well as any multiple measures (i.e., highest math course taken in high school) that may be used in conjunction with the test results to place students.[1] Because the decision to assign students to developmental and transfer-level math is decentralized, placement policies vary substantially by college.

To evaluate the placement policies for developmental math, we examined the effects of placement decisions at two LACCD colleges on two outcomes: whether students passed the course above the placement cut score and whether they accumulated 30 credits toward their degree (see Methodology textbox). In this brief, we present results for two of the nine LACCD colleges, whose differences offer the clearest illustration of the differential effectiveness of the current placement system.

This study is unique in several ways. Unlike other evaluations of math placement decisions, we evaluated placement decisions in all the courses of the developmental math sequence. We also examined these effects over a four-year period, which takes into account the fact that most students attend college part-time and therefore take five years on average to complete an A.A. or transfer. We also combine the results of qualitative (description of assessment and placement practices) and quantitative (estimation of the impact of placement decisions) parts of our study, to provide an evaluation reflective of how placement decisions are made and the degree to which they are effective. Finally, our study is relevant to practitioners who can replicate this evaluation in their colleges and use it as a tool to evaluate whether their placement decisions could be improved.

[1] For a detailed description of the assessment and placement policies in the LACCD, see research brief by Kosiewicz, Melguizo, Prather, & Bos (2013) and for a more detailed description see Melguizo, Kosiewicz, Prather, & Bos (Under review).

METHODOLOGY

We focused our evaluation on students whose score just above or just below a cut score. Using a statistical method known as a regression discontinuity design, we are able to compare the success of students with very similar characteristics and preparation levels when they are placed in adjacent courses in the math sequence. If students placed in the lower course have greater success in the subsequent course than students in the higher course, then this suggests that those scoring just above the cut point would have benefited by being placed in the lower course (that is, cut scores should be higher). If those placed in the lower course have less success than their higher-placed counterparts, then those scoring just below the cut point would have benefited by enrolling directly in the higher-level course (that is, cut scores should be lower). This approach alone cannot define the "correct" cut point, but a series of iterations and adjustments in the direction suggested by this analysis should lead to the most effective solution.

IN COLLEGE A, PLACEMENT OF STUDENTS IS EFFECTIVE

Our results are presented as a comparison of the outcomes of the placement policies of College A and College C. For the purpose of this brief, we focus on lower-level math placements.[2] Both these colleges use the ACCUPLACER placement test to determine which math class is appropriate for a given student. ACCUPLACER is the most common test used in the district and nationwide even though the content of the test is not fully aligned with what students learn in high school, and there are no external evaluations of its validity and reliability. One of the most appealing features of the test is its branching system, which means that the test is very flexible relative to the initial skill level of the student (i.e., a student is initially exposed to an initial set of questions and depending on the answers given, he or she might be directed to easier or more difficult questions). By quickly switching between different sub-tests, the differentiating properties of the placement test can be maximized for each individual student. Unfortunately, not all colleges use all possible sub-tests as doing so increases the expense of using the ACCUPLACER (Melguizo, Kosiewicz, Prather, & Bos, 2013).

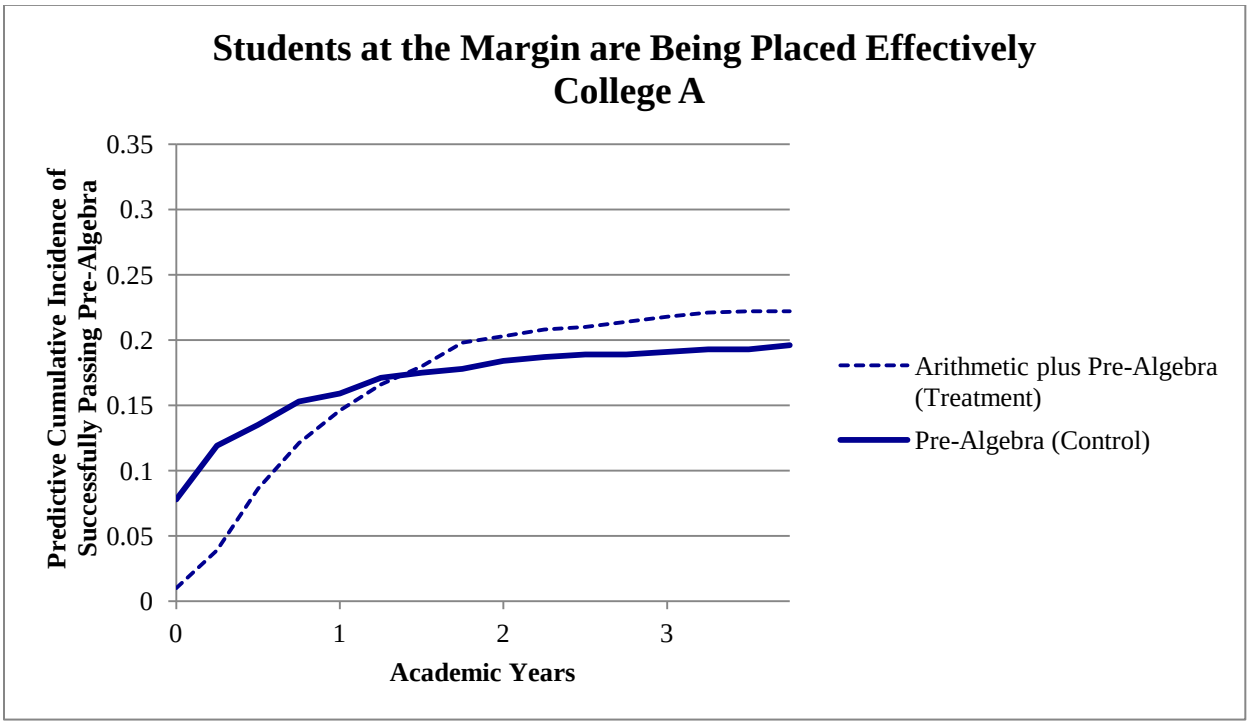
Figure 1 compares the predicted educational outcome trajectory of two sets of students who had similar ACCUPLACER scores: (1) students who were placed into arithmetic and later took pre-algebra and (2) students who were placed directly into pre-algebra. The lines show the percentage of students in both groups who were predicted to pass pre-algebra at a certain point of time. What Figure 1 shows is that after about two years, students initially placed in arithmetic were predicted to pass pre-algebra at higher rates than those placed directly in pre-algebra. Initially, the solid line was above the dotted line, suggesting higher passing rates for those initially placed in pre-algebra (above the cut point). However, over time the trend reverted and the dotted line moved above the solid line. After two years the predicted pre-algebra passing rate of students initially placed in arithmetic was about 20 percent, or 2 percent higher than their counterparts who were placed directly into pre-algebra. The positive trend in these results continues over time.

This is an important finding because it suggests that when colleges place students in the courses where they are most likely to succeed, students can actually benefit from being placed into the

[2] See Melguizo, Bos, & Prather (2013) for results from all the levels for all colleges that used ACCUPLACER.

lower-level math course. (Our findings also demonstrate the power of this approach in validating cut scores). To the best of our knowledge this is the first study to find such a positive long-term effect of an initial lower placement. However, it is important to mention that this positive result only applies to students at the margin. The reality in this college is that only about 45 percent of all the students who are placed into arithmetic successfully passed pre-algebra within four years.

Figure 1: Rate at which students in arithmetic pass pre-algebra compared to students placed in pre-algebra at College A



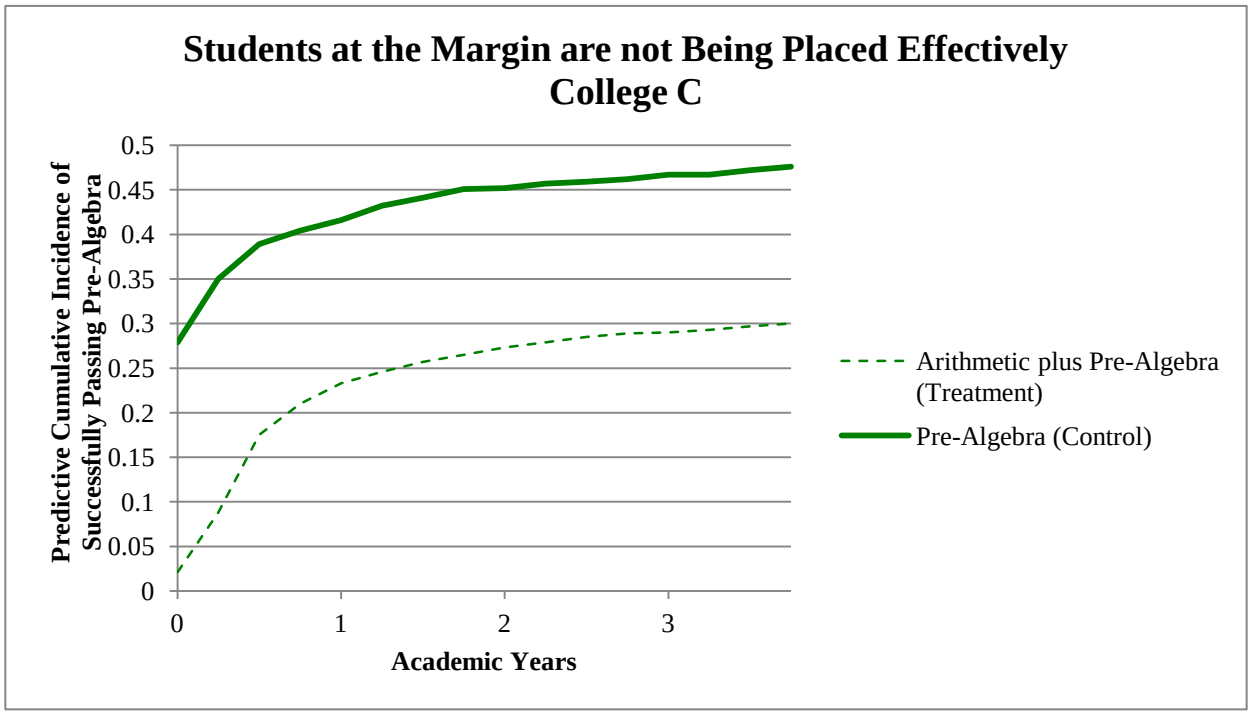
IN COLLEGE C, PLACEMENT OF STUDENTS IS NOT EFFECTIVE

Similar to Figure 1, Figure 2 traces the pass rate for pre-algebra among two groups of students: those who took arithmetic first and then pre-algebra, and those who were placed directly into pre-algebra. The results for this college (College C) are different from those for College A. Although both groups have higher overall predicted passing rates than the students from College A, students who were placed in arithmetic never caught up with those placed directly in pre-algebra. In fact, there is a 20-percentage-point difference in the predicted passing rates between these two groups. About 50 percent of students placed in pre-algebra were predicted to pass the course, and just 30 percent of students placed in arithmetic were predicted to pass pre-algebra.

This finding suggests that College C was not placing students effectively and should consider lowering its placement cut point between arithmetic and pre-algebra. If the cut scores had been set correctly, the dotted line would eventually cross the solid line or approach it closely. In other words, students in College C whose ACCUPLACER scores originally fell just below the cutoff would have benefited by being placed directly into pre-algebra.

As described above, College C at the time of this study had questionable placement policies that may partially explain our findings. Besides setting the cut scores too high, the college added a fifth developmental math course that precedes arithmetic, failed to use the branching and referral mechanism to move students to a more appropriate placement test, and did not use multiple measures in some years. Taken together, these decisions created a system that made it more difficult for students placed in the lower levels of the developmental math trajectory to succeed. This college is currently engaged in making major changes to its placement process.

Figure 2: Rate at which students in arithmetic pass pre-algebra compared to students placed in pre-algebra at College C

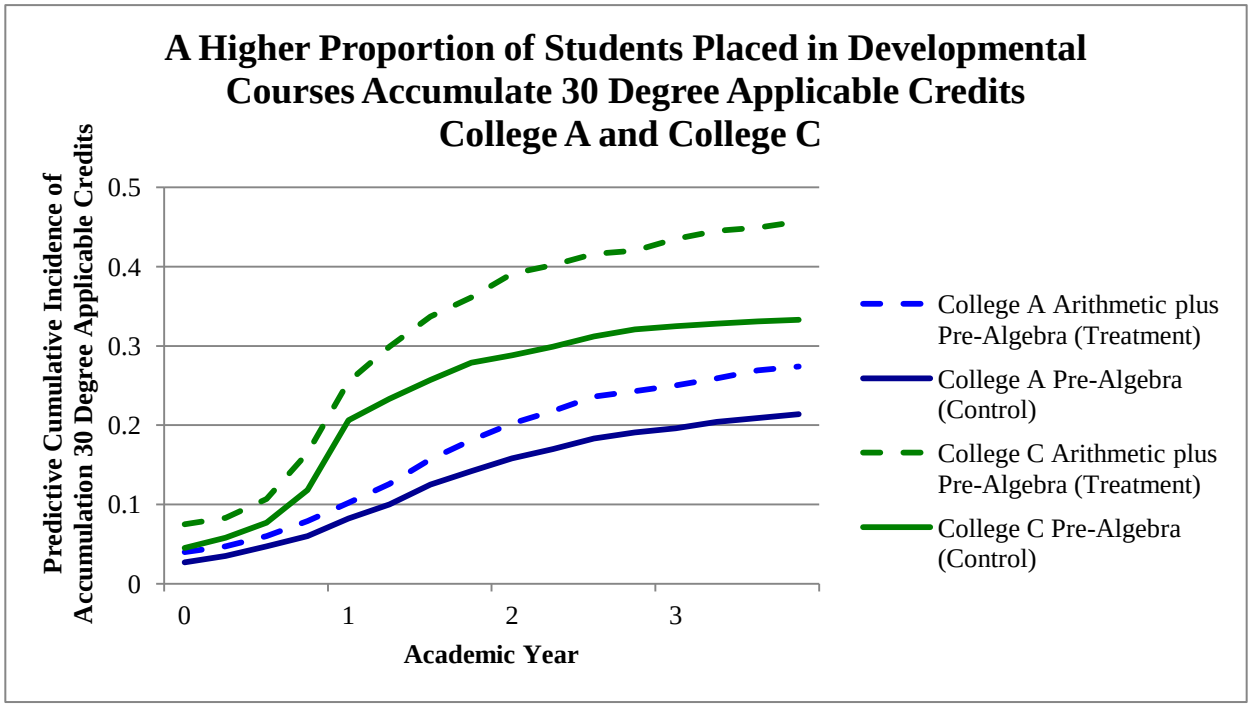


IN SOME CASES, STUDENTS PLACED IN LOWER-LEVEL MATH COURSES DO NOT FALL BEHIND OTHER STUDENTS IN DEGREE-APPLICABLE CREDITS; THEY ARE PREDICTED TO ACCUMULATE CREDITS MORE QUICKLY

It is often argued that students who are placed in lower-level math courses take longer to accumulate degree-applicable credits. In our study, we found no evidence of this penalty among students who scored near the cutoff point on ACCUPLACER exams. On the contrary, over time lower-placed students accumulated more degree-applicable credits than students who qualified for higher-level math courses when they entered the college. Figure 3 shows the predicted proportion of students placed into arithmetic and those placed into pre-algebra who achieved 30 credits toward their degrees in Colleges A and C. The results show that the students at the margin placed in the lowest level of the developmental math sequence paid no penalty in moving toward their degree and in fact moved more quickly than those placed in the higher-level course.

These findings are plausible because students in California can postpone taking their developmental math and English courses and enroll in college-level courses that do not require math or English pre-requisites. It is important to keep in mind, however, that until students pass the necessary math pre-requisite(s), they cannot acquire a credential or degree. In other states students are not allowed to enroll in transfer-level coursework until they pass their developmental education pre-requisites. Such a policy may motivate students to complete their pre-requisites, but it could lengthen the time necessary to complete a degree.

Figure 3: Rate at which students in low-level developmental math classes complete 30 credits toward their degree



CONCLUSIONS

There is considerable variation in the way colleges are placing students in the developmental math trajectory. Because these placement decisions are not equally effective, many students could benefit from the adoption of a more centrally supported system that would validate the placement procedures and associated cutoffs in individual colleges.

Colleges could use the method proposed and illustrated here as they engage in the process of validating cut scores. This approach alone cannot define the "correct" cut point, but a series of iterations and adjustments in the direction suggested by this analysis should lead to the most effective solution.

References

Bailey, T., Jeong, D. W., & Cho, S. (2010). Referral, enrollment, and completion in developmental education sequences in community colleges. *Economics of Education Review, 29,* 255–270.

Fong, K., Melguizo, T., & Prather, G. (2013). A different view on how we understand progression through the developmental math trajectory. Los Angeles, CA: The University of Southern California.

Kosiewicz, H., Melguizo, T., Prather, G., & Bos, J. M. (2013). How are assessment and placement policies designed and implemented in California community colleges? Los Angeles, CA: The University of Southern California.

Melguizo, T., Bos, J. M., & Prather, G. (Under review). Using a regression discontinuity design to estimate the impact of placement decisions in developmental math.

Melguizo, T., Kosiewicz, H., Prather, G., & Bos, J. M. (Under review). How are community college students assessed and placed in math? Grounding our understanding in reality.