EFFECTS OF REMEDIAL EDUCATION

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INTRODUCTION

Learning skills beyond those taught in high school is a necessity for an estimated 80% of employment opportunities in the United States today (McCabe, 2000) and 85% by 2010 (McCabe and Day, 1998); 88% of 8th graders surveyed say they plan on getting a bachelor’s degree because of how it can help them in the job market (Kirst, 2007); however, approximately 30% of first-year college students at approximately 75% of higher education institutions are not prepared for college level work (NCES, 2003). The need for additional education beyond high school is a recognized one, and the unpreparedness of a notable number of college students is also acknowledged and agreed upon by many. However, the nature of problems is that they do not have easy solutions, and consequently a plethora of suggestions, debates, and opinions - and a few analytical research endeavors - have ensued as to how best to address these societal needs. At the heart of all the debates lie a few underlying issues: 1) whose responsibility is it to pay for this needed education, 2) where is the best place for this type of education in society, and 3) what are effective means of treating this need. More detail on the terminology used in the field will follow, but a typically accepted term for this needed education is “remedial education.” Another way to word the latter two questions presented above is, “What works in remedial education, and where should it be enacted?”

These two issues lie at the heart of this paper, but not in an all-encompassing approach; rather they are combined in a question referring to a specifically focused area: “Does remedial
education appear to be beneficial when used in four-year public institutions in the United States with student populations greater than 10,000?” Consequently, a small portion of the circulating debates is addressed in a question almost limited to a “yes” or “no” response. Although this paper will give a brief overview as to some of the suggestions for the most effective pedagogical approaches to remedial education and a brief look at the history of higher education in the United States, giving some suggestions as to how remedial education became a part of the higher education system today, no original suggestions as to how effective the different philosophies of teaching seem to be are given. This paper attempts to take a strictly analytical look at if remedial education is beneficial to students at the institutions mentioned above. “Beneficial” will be measured in two ways: does remediation positively impact 1) first-year retention rates and 2) six-year graduation rates?

One of the differences found between this paper and much of the literature on remedial education is an attempt to isolate the impact of remediation to just remediation. This is first done by looking at the relationship between the end result (retention or graduation) and a number of other explanatory variables, including remediation. There are numerous things that can impact the experience of an institution’s student body. There are various results from academic exposure and assistance, student services, financial considerations, the environment of the school and surrounding area, and the personalities of faculty, staff, and other students. Students’ experiences are shaped by the entire environment in which they find themselves. Therefore, if one simply looks at the relationship between remediation and retention or graduation, if there is any correlation between the aforementioned “other factors” and remediation, some explanation of these end results will be inaccurately attributed to remedial
policies. This paper therefore first looks at the relationship between remedial policies - and other factors that impact retention and graduation – and how they together relate to retention and graduation through Ordinary Least Squares (OLS) regression models.

Even when adding additional explanatory variables to control for other factors besides remediation that could impact the end results being considered, there are still some inherent factors having to do with students themselves, the schools they attend, where they live, etc. that can never be perfectly modeled. In additional attempts to further try and isolate the impact of remediation itself on retention and graduation, more approaches are used. Each school is matched with peer institutions, with “peer” defined as schools that are similar based on 11 specific factors (none of which is remediation) and then seeing if the existence of a remedial policy at a school seems to explain a difference between the retention or graduation rates of the specific school and a representative measure (mean or median) of the group of peer institutions. Then, in a final attempt to eliminate factors that are impacting graduation (retention data was not available for this last method of analysis), but are being inaccurately attributed to remediation, changes over time are considered. This fixed effects method eliminates factors impacting graduation that do not change over time, thus allowing to more precisely hone in on the effects caused by the changing variables included in the analysis.

The results suggest that remediation can be beneficial to improving graduation rates, but only when used with a low-caliber student body. In other words, the higher the academic ability of an institution’s undergraduate students (as measured by the median SAT score of incoming freshmen), the less effective remediation becomes. Additionally, remediation showed no significant effect on retention, positively or negatively. Considering these together,
remediation does seem to have a positive long-term impact at institutions with more “at risk”
students (due to low academic ability) by helping them continue through to completion with a
baccalaureate program. This would suggest that if a bachelor’s degree is necessary for
employment in America’s labor force, then investing in remedial education at four-year public
institutions with a relatively high percentage of low-caliber students is a good choice. However,
if the only “additional skills” needed for employment opportunities can be met by just an
additional year of school at the four-year institution level, and if the goal of higher education is
really to prepare people for the labor market, then investment in remedial programs at four-
year institutions is not necessary.
1.1 TERMINOLOGY

When referring to courses taught to college students, the term “remedial” means courses generally considered to be precollege level (Boylan, Bonham, & White, 1999). However, one may hear the terms “developmental,” and in a few cases one may see the descriptors “basic-skills,” or “non-traditional coursework,” when discussing remedial education. While one will encounter other terms to describe the same idea, below seem to be the most commonly accepted uses for the words “remedial” and “developmental.”

The overall movement or approach to assisting students so they can better succeed in college is frequently termed “developmental education” by professionals in the field (Boylan, Bonham, and White, 1999). This involves more than one piece of assistance given to students but rather a pedagogical approach to help students not only with particular areas of need in certain courses but also with developing study skills, improving time management skills, meeting advising needs, etc. Thus, in developmental education students typically receive multiple areas of assistance; it is viewed as “. . . a continuum of services ranging from remedial courses at the low end to tutoring or learning assistance centers at the high end. Developmental education is something of an umbrella under which a variety of interventions designed to develop the diverse talents of students may fit” (Boylan, Bonham, & White, 1999, p. 88). Below is a
summary by McCabe and Day (1998) of the work of Kathryn P. Cross (1971) which suggests a guide for successful developmental programs:

1. Programs should integrate skills training and instruction with the student’s other college experiences.
2. Attention should be given to the social and emotional development of the student, as well as to academic achievement.
3. Staff should be selected for their interest and commitment to working with remedial students, as well as for their knowledge of learning problems.
4. Remediation should be approached with flexibility and open-mindedness – a spirit of exploration into student learning and success skills should be cultivated (p. 19).

However, with the concerns that too much money is being allocated to the needs of remedial students, when they could otherwise go toward furthering university research and advancing well-prepared students, cost efficient ways of addressing the needs of underprepared students are sought out. The method that seems to get the most information to the largest group of students in an efficient manner is through the remedial course (Boylan, Bonham, & White, 1999). Students typically take these precollege level courses, while in college, to prepare for the college level course(s) that they are required to take for their academic program. These tend to be semester- (or quarter-) long classes with college course numbers below that indicated for the freshman level (e.g. 090 instead of 101). While one will sometimes hear these courses described as “developmental,” “basic-skills,” “college prep,” or “non-traditional coursework,” “the term ‘remedial’ refers exclusively to courses generally considered to be precollege level” (Boylan, Bonham, & White, 1999, p. 88). Many believe that remedial courses are re-teaching material that students have been exposed to in the past; however in some cases when students are taking “remedial” course(s) in college, it is the first time they have seen the material. This may be because they are adult students who never intended to go to college and
therefore never took a college preparatory track of classes, or it could be students who planned
on going to college but knew they could graduate from high school and be admitted into an
institution by completing only a fraction of the recommended college-preparatory classes. In
these cases the courses are usually still referred to with the term “remedial” since it has become
an accepted descriptor of the precollege level class. One will find some discrepancies with these
uses in the literature, but the above descriptions seem to capture the most widely accepted
uses of these words, including the uses in this paper. 1 Finally, remedial courses are sometimes
used to describe courses other than the traditional English, reading, and mathematics classes
(English as a second language or additional skills training, for example); however for this paper
remedial courses refer solely to English,2 mathematics, and reading precollege level material
taught to college students.

1.2 COSTS AND NEEDS

As stated above, education is a vital prerequisite for many job opportunities. Not only
do individuals suffer from not being employable, but the economy overall will suffer as well. As
the baby boomers retire, not only will the need for a work force to supply funds to support
systems like Social Security and Medicare increase (Boylan, Bonham, & White, 1999), but so will
the need for a skilled workforce to meet society’s everyday demands (Ellis, 2007). In 1900 only
one in four Americans was over 65 years old, and when America’s Social Security system began
in 1935, 17 to 20 workers paid into Social Security for each retired person receiving Social
Security benefits. Prior to the change in the retirement age, it was predicted that by 2020 there

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1 The Wepner study discussed below does not follow the remedial/developmental terminology as
described here. When this study is discussed, the definitions as used by Wepner are given.
2 “Writing” and “English” are used interchangeably in this text, when referring to the remedial course(s)
used to prepare students for their typical freshman level English class.
will only be two people paying into Social Security for every person receiving benefits (McCabe & Day, 1998).

Although there were admitted difficulties in accurately representing the following cost, in 1988 it was estimated that one billion dollars were spent nationwide on remedial courses; at the time this was just under 1% of the public higher education’s 115 billion dollar budget (Breneman & Haarlow, 1998). While the percent is not high, the one billion dollars could also be put to many other uses at higher education institutions, and some argue that teaching high school level courses has no place in a college or university. This amount does, “represent a reasonable public investment of funds, if the alternative were to deny access to higher education to students requiring remedial work” (Breneman & Haarlow, 1998, p.2). Rather, the need to somehow allow these students access to further developing employable skills is a recognized one. One side of the debates surrounding remediation is that eliminating developmental education is simply not a viable alternative. “The social, political, educational, and economic consequences of such a move range from merely uncomfortable to bordering on disastrous” (Boylan, Bonham, & White, 1999, p.99).

1.3 HISTORY

1.3.1 Higher education

Over time policies have been enacted in the field of higher education which permitted and encouraged college participation by groups previously excluded. In 1833 Oberlin College became the first coeducational college in the United States (Sadovnik, Cookson, & Semel, 2006). In 1839 the first normal school (teacher training college) was founded. While widespread access
to higher education was not available to women at this time, these two events did begin to provide more opportunities. As John R. Thelin (2004) stated, “Any discussion of the advanced education of women in the nineteenth century ultimately overlaps with the subject of teacher education” (p. 84). In response to these new opportunities for women, some Southern states built women’s colleges in the vicinity, so that women from their communities would be less likely to travel elsewhere and be taught the ideas of these other schools. As a result of these mixed motivations for increasing access, the growth of opportunities for advanced education for women became one of the most prominent happenings in higher education following 1850 (Thelin, 2004). The Morrill Land Grant Acts of 1862 and 1890 eventually encouraged support in practical education and helped to extend education to blacks who were typically excluded (although the support blacks received paled in comparison to the whites who received support from the Morrill Land Grant Acts). “Some historians have hailed this legislation (Morrill Land Grant Act of 1862) as the genesis of ‘democracy’s colleges’ – sources of affordable, practical higher education offered by state colleges and universities” (Thelin, 2004, p.75). The Act of 1890 brought three federal units, the Departments of Agriculture, Interior, and War, into a close working relationship with state higher education systems. In 1944 the Serviceman’s Readjustment Act (G.I. Bill of Rights) extended college opportunities to a “new type of student,” encouraging, among other things, age diversification among student bodies. (Kuhn, in press; McCabe & Day, 1998; Reynolds, 2007). The United States had great pride in its WWII veterans and wanted to give these heroes “. . . the most valuable gift possible. In response Congress enacted the G.I. Bill and gave returning veterans an unprecedented opportunity to attend college” (McCabe & Day, 1998, p.3). The result of this was colleges and universities admitting veterans who did not meet existing admission criteria. Some view this single act as the
beginning of expanding college access to large numbers of people. McCabe and Day (1998) review the idea even further to say that it was the success of these admitted veterans, who outperformed their “selectively admitted peers,” which really encouraged admitting the “non-traditional” college student. Following this were years of a wider opening of doors to “non-typical” students. In 1948 the “Truman Report” emphasized the importance of equal opportunity and encouraged broadening the reach of higher education (McCabe & Day, 1998). The National Defense Education Act was passed in 1958 in response to the Soviet Union launching Sputnik, thus approving millions of dollars to be directed toward math, science, and gifted education (Reynolds, 2007; Sadovnik, Cookson, & Semel, 2006, p.90). The Higher Education Act of 1965 continued to open the doors to postsecondary opportunities (Breneman & Haarlow, 1998), and in 1969 the City University of New York (CUNY) approved its Open Admissions policy, which guaranteed all high school graduates a spot in either one of its senior colleges or community colleges, depending on the senior’s grade point average (Sadovnik, Cookson, & Semel, 2006). While access was being increased, the reasons for attending college diversified, and the numbers of nontraditional students who were not yet prepared for college level work increased as well (Boylan, Bonham, & White, 1999).

Although this point will not be addressed anymore in this paper, a sidenote worth mentioning is that there appear to be some interesting parallels between the movements surrounding the Morrill Land Grant Acts of 1862 and 1890, and the discussions that arise related to remedial education today. The Morrill Land Grant Acts were enacted to help support education and training in areas that were practical, beneficial, and perhaps necessary, to the economy and society at the time. However, similar to today, much debate and disagreement
arose regarding issues like the type of education that was appropriate for higher education institutions and speculations as to whether or not the proposed changes would be beneficial.

Another similarity is that education was extended to groups which previously had more obstacles impeding their access to higher education. Some examples of these questions, debates, and situations are found in Thelin’s (2004, pp. 82-83 & 136-137) work and are quoted below:

1) “... there was substantial yet scattered support for technical education. This groundswell of curiosity elicited diverse recommendations and often complicated proposals to fund programs. Lack of consensus...not lack of interest, was the ironic obstacle...”

2) “Where should practical education stand in relation to the liberal arts of the established colleges?”

3) “... many farmers doubted whether taxpayer subsidies of agricultural education would have much influence on crop production. On the one hand, the variety of philosophies and strategies over practical education created a fertile educational environment. On the other hand, disagreements and tensions between institutions and groups impeded consensus in the drafting of state or federal policies.”

4) “... it extended access and services to blacks...” (although this treatment was far from equal to that received by whites).

1.3.2 Remedial education

It is recorded that as early as the 1630’s tutors were found at Harvard College (Bettinger & Long, 2007a) and in 1849 the first remedial education program was offered at the University of Wisconsin with courses in reading, writing, and arithmetic (Boylan, Bonham, & White, 1999). However, comparing remedial education programs of the past with remedial education
programs in the late 20th and early 21st centuries may be comparing apples to oranges. The type of person who is a college student has fit different descriptions over time, and therefore tutoring or remedial services cannot be expected to have served the same purposes throughout the history of higher education in the United States (Kuhn, in press). The students best served by remedial education will depend on the varying backgrounds of the students and the demands of higher education for which remedial education is meant to prepare. Kuhn (in press) captures the history of operations of America’s higher education institutions with accounts of actual students and visitors of these institutions, illustrating how compact operations were, showing that the idea of faculty, administration, and tutors is largely different from our perceptions today. “A president, two professors, and one or two tutors perform the whole duty of instruction and government” (Brown, 1862, p. 10). In 1830 Samuel Osgood, a Harvard student, discussed the disconnect that was happening between students and those in charge, clearly grouping tutors with professors, illustrating that tutor meant something different than the perceived meaning today. Osgood mentions two “parties,” 1- the pupils and 2- everyone else (president, professors, and tutors). The tutors of colonial colleges worked with at least one class in all subjects, and they were the primary source of guidance for college students at this time (Frost, 2000). These accounts are not meant to say that assisting underprepared students did not exist until recently, and they do not prove that remedial education as we know it today did not exist, however they illustrate how entire purposes and operating styles of institutions change over time. Therefore, one should exercise caution before assuming that a remedial need of the past is the same as a need today, simultaneously cautioning the acceptance that something that has worked in the past will work today as well.
Boylan, Bonham, and White (1999) wrote that the University of Wisconsin’s College Preparatory Program of 1849 does provide a possible starting point for what has evolved into today’s developmental programs. This, and the tutors mentioned above, reflect how academic needs of students were met throughout time, and thus how academic assistance programs have evolved. For example, perhaps the University of Wisconsin’s program was a result of the new developments in education in the United States that started in the previous 15-20 years and were continuing to exhibit growth. These changes to higher education increased access to groups who were previously denied, hence creating a need to prepare new students for their new academic encounters. These groups had not previously planned on preparing for higher education (i.e. prior schooling was not set up with the intention of preparing these people for additional education), thus requiring opportunities to make up for the education they had not yet received.

Boylan, Bonham, and White (1999) state that although assistance with courses has probably been available as long as formal education, more formal “movements” in developmental education have only been documented since the 1960’s. Shortly following the diversification of the student body in higher education institutions came changes in course offerings and the needs met by advising and student services professionals (Kuhn, in press). Simultaneous with the diversification of the student body came a diversification of backgrounds and college preparedness within the student body (Phipps, 1998). “Once focused on Latin, the principle targets of remediation today are language arts and mathematics” (McCabe & Day, 3 Coeducation was first observed in 1833, normal schools began in 1839, and additional women’s opportunities grew out of these beginnings.
The situation facing America today is the need to educate a skilled labor force, and in some cases this means first preparing future workers to receive this necessary education.

None of these historical accounts and accompanying proposals is meant to describe the history of higher education in detail, or to prove definite links between increased access to higher education and remedial education; they are simply a background to keep in mind when viewing remedial education policies and their developments over time.

1.4 HIGH SCHOOL PREPARATION

1.4.1 Mixed Signals

College students are labeled “in need of remediation” if they are not academically prepared for the college-level courses at their higher education institution. Yet, graduation from high school implies to many that they are ready for college, and certainly admission to college implies college preparedness. So when students are told they are not well-enough prepared to be placed into traditional entry level college courses, many are surprised. In other words, even if postsecondary access has been a key initiative of high schools; postsecondary preparation has not.

Part of the reason for this “surprising” placement in college could be that high schools may not be aware of what is asked on the placement exams that colleges administer to their students, determining if they need remediation. For institutions that use placement tests to determine remediation, different tests are used by different institutions, even within the same state. So, with these different possibilities high schools are not sure how to best prepare their students, and in some cases high schools do not even have access to these placement tests (Rosenbaum, 2001). On the other hand, even if this explains some of disconnect between high
school and postsecondary messages, it cannot explain everything, because only 60% of schools administer these placement exams to all of their incoming freshmen. About 30% of schools only administer placement exams to students who they feel “may be” in need of remedial education, based on their admission profile, and approximately 10% of schools do not administer any placement exams and completely decide whether or not remediation is needed based on the student’s admissions information (NCES, 2003). Since high schools are traditionally aware of what is reviewed in an admissions decision, students attending at least 40% of schools should have some idea that they may not be prepared for college level classes.

There are other possible explanations for the mixed signals that students receive. State academic content standards, many of which were developed in the 1990’s, could have been used to help smooth the high school – postsecondary transition; however, many were developed to create ‘‘well-educated citizens’ and ensuring that all students were prepared to enter the workforce, not necessarily college” (Conley, 2005, p. 37). Additionally, Michael Kirst (2007) found that most state-wide assessment tests are tested at 10th grade for the highest level. Additionally, the guidelines as to what should be tested vary from state to state. At least two states have made efforts to remedy this, Illinois and Colorado, by issuing their tests in the 11th grade and by designing their tests based on ACT questions.

These differences in testing are just some of the ways that communication about postsecondary education, between high schools and prospective college students, results in mixed signals being received by students. Because of the open enrollment policies of many institutions, students know they will be admitted to college. Without someone educating them on the concept that admission is not nearly the same thing as succeeding in college, their first
indication may be when they are placed into a remedial course. The work has to be done at some point, but if this is not presented strongly to high school students, then there is not much incentive to put forth the effort in high school (Kirst, 2007).

Even guidance counselors do not always give accurate college information. Counselors do not want to be the bearers of bad news by telling students that their chances of success in college are not good; they do not want to tell the students “who have completed no science classes that they cannot become doctors.” As one counselor stated, “I don’t want to be remembered as one of the counselors who said that a student could never make it, because I heard that when I was young” (Rosenbaum, 2001, p.93). In addition to not wanting to be the bearers of bad news themselves, counselors receive other pressures to not discourage students from making unrealistic college plans, “. . . counselors report that they do not want to do it, they cannot make students do it, parents will not let them do it, and they do not have the authority” (Rosenbaum, 2001, p.93).

Teachers in schools are also responsible for conveying information about what is needed to succeed in college. The fault is not necessarily that high school teachers simply choose not to teach relevant material, but that they do not know what colleges require. Many teachers are not only unaware of what is found on college placement tests, but many do not even know that placement tests exist (Kirst, 2007); this is likely to be accompanied by a lack of knowledge of what is required to actually succeed in college-level courses. For example, in California “literature” is the focus of high school English classes, while initial community colleges focus on grammar and writing and the University of California emphasizes rhetoric. In Maryland state math standards emphasize story problems and “real-life situations” at the high school
level, while the Baltimore City Community Colleges emphasize math concepts that go beyond Algebra II in their placement exams (Kirst, 2007).

A few groups of students who do receive accurate information about what is required for college success are those in advanced placement classes (AP), International Baccalaureate (IB) programs, postsecondary enrollment options (PSEO), and early college high schools. These courses send accurate signals of college requirements because they are designed to teach material found in college-level classes; in fact, many PSEO and early college high school classes are actual college courses (Conley, 2005). These courses are available to advanced high school students who will more typically qualify for merit-based financial gift-aid; will more likely be able to get into the necessary courses which are essential to ensuring an on-time graduation; and will likely be able to skip some of the typical freshmen requirements, because of the college credits they earned in high school. Meanwhile, those less like to qualify for gift-aid, who may also need more time in college before reaching graduation, and who may need to take additional courses (i.e. spend more money) to reach this point, are the same students who are not receiving accurate information from their high schools as to what they need to do to prepare for college-level work. “In some ways, the better high school students are becoming more closely aligned with higher education, but the weaker students are more disconnected” (Kirst, 2007, p. 55).

In summary, if college is to be a viable option for many high school graduates, something must be done to prepare them for this. As of yet, there do not seem to be many K-16 initiatives geared for this, so at least until there is more structure designed for this transition, remedial courses may be the best way to prepare these students for what lies ahead for those who choose college.
1.5 REMEDIAL STUDENTS AND REMEDIATION

The reasons given above do give some possibilities as to why certain students are determined to be in need of remedial courses in order to succeed in college. For some remedial students, failure to receive accurate information in high school seems to be a cause. However, there are many other types of students for whom it is believed that remedial courses will help them succeed.

Below is Carlette Hardin’s (1988) six-category summary of students typically in need of remedial/developmental education:

1) Those with poor academic prospects due to bad decision-making in the past
2) Adult students who return to school with additional responsibilities beyond what the typical college student experiences
3) The students whose academic weaknesses were not attended to but rather ignored in previous educational settings
4) Students with disabilities
5) Those who struggle with the English language
6) Those with weak academic commitments

To summarize, many different types of students, from different backgrounds, in an effort to meet different needs, are recipients of remedial education. While the above information was not mentioned in an effort to determine how or where remedial education should be offered, it does stress the importance of keeping remedial education available through some easily accessible venue.
1.6 REMEDIATION STATISTICS

1.6.1 PEQIS surveys

The Postsecondary Education Quick Information Center (PEQIS) is a division of the National Center for Education Statistics (NCES) with, essentially, the purpose of performing research quickly. If information is desired for a full-scale study, but time does not allow for it, PEQIS has a standing sample of a nationally representative body of higher education institutions. The number of institutions they work with is approximately 1600; this includes two- and four-year public and private schools. In most cases, the only reported results that will be listed below pertain to the entire sample of higher education institutions or just the four-year public institutions.

In 1995 and 2000 PEQIS surveyed the schools mentioned above on their remedial policies. In addition to reporting the basic findings of the more recent survey, the 2000 report also includes comparisons of results between 1995 and 2000 that are at least statistically significant, and some other comparisons are included as well. Unless stated otherwise, all of the remaining information in section 1.6 comes from the aforementioned 2000 PEQIS report.

1.6.2 Prevalence of remediation overall and at four-year public institutions

In Fall 2000, 76% of institutions offered at least one remedial course in reading, writing, or mathematics to the 28% of incoming freshmen who enrolled in remedial courses. The average number of remedial courses offered in these fields was 2.0 for reading and writing and 2.5 for mathematics. Of the sampled four-year schools, 80% offered remedial courses to an

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4 It should be noted that for comparisons between the two surveys, definitions of eligible schools for PEQIS surveys changed in the time between the two, to only include schools eligible for Title-IV financial aid programs. Because this information was not available for schools in the 1995 survey, 14 institutions were removed from the 1995 respondents to most closely reflect the type of institutions which are Title-IV eligible (NCES, 2003).
average of 20% of their incoming freshman class, and nearly all (98%) public two-year institutions offered remedial classes to 42% of their entering freshmen. The average number of remedial courses offered at public four-year schools was 1.6 for reading and writing and 2.1 for mathematics. The percent of institutions found offering more than 5 remedial courses (per subject area) were 4, 5, and 8 for reading, writing, and mathematics, respectively. If schools did not offer remedial courses in all three subject areas, then they were more likely to offer remedial math courses, followed by writing, and finally reading.

1.6.3 Reasons remedial courses are not offered and time limits on remediation

For institutions that did not offer remedial courses, the following reasons were given. (Note that more than one response per institution is permitted, thus giving totals greater than 100 percent.)

<table>
<thead>
<tr>
<th>2000:</th>
<th>1995:</th>
</tr>
</thead>
<tbody>
<tr>
<td>59 percent</td>
<td>66 percent</td>
</tr>
<tr>
<td>Courses not needed</td>
<td>Students who need remediation take it elsewhere</td>
</tr>
<tr>
<td>29 percent</td>
<td>22 percent</td>
</tr>
<tr>
<td>Students who need remediation take it elsewhere</td>
<td>Institutional policy does not allow remedial courses</td>
</tr>
<tr>
<td>26 percent</td>
<td>27 percent</td>
</tr>
<tr>
<td>Institutional policy does not allow remedial courses</td>
<td>State policy or law does not allow remedial courses</td>
</tr>
<tr>
<td>8 percent</td>
<td>5 percent</td>
</tr>
<tr>
<td>State policy or law does not allow remedial courses</td>
<td>Other</td>
</tr>
<tr>
<td>15 percent</td>
<td>9 percent</td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>

Additionally, some schools offer remedial policies, but there is a time limit as to how long one may be enrolled in these courses. This is the case among approximately 26% of
institutions (29% of public 4-year institutions) that do offer remedial courses. Reasons for this are approximately 75% institutional policies and 25% state policies.\(^5\)

1.6.4 Recommended but not required

Of schools offering remedial courses 18% (writing), 19% (math), and 25% (reading) did not require that students who were deemed to be in need of remediation take remedial courses. Out of four-year public institutions 16% “recommended but did not require” remediation for these students.

<table>
<thead>
<tr>
<th>Year and Institution Type</th>
<th>Reading</th>
<th>Writing</th>
<th>Mathematics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Required</td>
<td>Recommended but not required</td>
<td>Required</td>
</tr>
<tr>
<td>2000 All Schools</td>
<td>75%</td>
<td>25%</td>
<td>82%</td>
</tr>
<tr>
<td>Public 4-year</td>
<td>77%</td>
<td>23%</td>
<td>84%</td>
</tr>
<tr>
<td>1995 All Schools</td>
<td>71%</td>
<td>29%</td>
<td>79%</td>
</tr>
<tr>
<td>Public 4-year</td>
<td>74%</td>
<td>26%</td>
<td>86%</td>
</tr>
</tbody>
</table>

1.6.5 Time in remediation

About 60% of institutions offering remedial courses report that on average students spend less than one year in remedial courses. There were some noticeable changes in the time spent with remediation between 1995 and 2000.

\(^5\) Reasons for the time limits for the entire sample of schools was 71% institutional policy and 24% state policy (5% other); for public 4-year colleges and universities these were 70% institutional and 27% state policy.
### Average Length of Time a Student Takes Remedial Courses at an Institution

<table>
<thead>
<tr>
<th>Year and Institution Type</th>
<th>Less than 1 year</th>
<th>1 year</th>
<th>Greater than 1 year</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2000</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All Institutions</td>
<td>60%</td>
<td>35%</td>
<td>5%</td>
</tr>
<tr>
<td>Public 4-Year Institutions</td>
<td>62%</td>
<td>35%</td>
<td>3%</td>
</tr>
<tr>
<td><strong>1995</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All Institutions</td>
<td>67%</td>
<td>28%</td>
<td>5%</td>
</tr>
<tr>
<td>Public 4-Year Institutions</td>
<td>69%</td>
<td>28%</td>
<td>3%*</td>
</tr>
</tbody>
</table>

*Interpret with caution; coefficient of variation greater than 50%

1.6.6 Other course restrictions

Another area of significant change from 1995 to 2000 was in the restriction of other courses. A very small number of schools will not permit students to take any “college-level” (i.e. generally 100 level or above) course on their campus until students have fulfilled any remedial course requirements they have, even if the requirement is only in one field. However, there are many schools which have some class limitations for students who are determined to be in need of remediation; typically this means that a student will not be permitted to enroll in college-level courses in the field where remediation is needed or in departments that build on skills from that field (i.e. math and English or classes that require math and English like computer science and advertising, respectively).
<table>
<thead>
<tr>
<th>Year and subject area</th>
<th>No restrictions</th>
<th>Some restrictions</th>
<th>Totally restricted</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading</td>
<td>18%</td>
<td>82%</td>
<td>#</td>
</tr>
<tr>
<td>Writing</td>
<td>12%</td>
<td>88%</td>
<td>1%</td>
</tr>
<tr>
<td>Mathematics</td>
<td>14%</td>
<td>86%</td>
<td>1%</td>
</tr>
<tr>
<td>1995</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading</td>
<td>33%</td>
<td>65%</td>
<td>2%</td>
</tr>
<tr>
<td>Writing</td>
<td>30%</td>
<td>69%</td>
<td>2%</td>
</tr>
<tr>
<td>Mathematics</td>
<td>35%</td>
<td>64%</td>
<td>2%</td>
</tr>
</tbody>
</table>

# Rounds to zero
Per cents may not total 100 due to rounding

1.6.7 Remedial instructors

For most institutions (57% reading, 70% writing, and 72% math) remedial courses were taught by the academic department. 19-28% of institutions reported a remedial department which taught most of the courses, 7-13% of institutions reported a learning center as the most frequent provider of remedial education, and 1-2% said that a physically separate location provided their remedial courses.

1.6.8 Nonconformity in approaches to remedial education

The previous sections illustrate the wide range in policies, preparations, requirements, etc. that are found in different remedial and developmental education programs. This verifies that the numerous suggestions for how to best approach remedial and developmental education are encountered in the carrying out of programs nationwide. These summaries further suggest that for the results that follow (found in Chapters 2 & 3), indicating where
remedial education is effective, more research can be done in those areas if information on the involvement of a school’s developmental education program is collected, in an effort to recommend what degree of developmental education seems to be most beneficial to different types of schools.

1.7 ANALYSES

Although there appears to be an abundance of literature available on recommendations for the best pedagogical approaches to education, how to apply these philosophies to students in need of remediation, the causes for the lack of preparedness for college-level courses, and the ways to remedy some of these problems, there is a surprising lack of analytical reports regarding how effective remedial policies are (Bettinger & Long, 2007a). In response to many of the typical questions found in remedial education discussions and debates, Phipps (1998) states, “Unfortunately, too little information is available to provide definitive answers to many of these questions. As a result conjecture and criticism have filled the void created by the lack of basic information” (p. 5). “For all studies reviewed here, 74.4% of identified problems were related to design. . . . Methodology employed in developmental education does not seem to have reached a level of attainment commensurate with the needs of the profession” (O’Hear & MacDonald, 1995, pp. 3-4). Most of the reports that do exist do not control for other factors that can determine a student’s outcome besides the remedial class alone, thus biasing the estimated effects of remediation. Additionally, most of the analytical literature involves a review of one or just a few institutions, not a large sample that would better allow the effect of remediation to be captured rather than other inherent characteristics of a school.
Below is a summary of four different studies concerning the effectiveness of remedial education. The first two seem more representative of the typical reports found in the remedial and developmental education arena, in that they look almost exclusively at the end percent of students who pass, or show competence in some way, of the material in either the remedial course or the freshman-level standard course in that department. The first looks only at mathematics remediation at one school; the second report looks at passing rates of students for remedial courses and standard courses, in reading, writing, and mathematics for 19 different institutions (10 four-year institutions and 9 two-year institutions). Although the authors report the results of these studies, they readily admit that a random assignment with a control group would provide much more accurate results, that other experiences of the students outside of the remedial class can influence how well they do, and that since only students who passed the remedial course go on to the standard course, the estimated effect of remediation will be biased upwards in the likely event that those who passed the remedial course had a higher ability in the discipline tested than students who never passed and therefore never even got to take the standard course evaluations.

The third report again only uses one school in one discipline – English, but it randomly assigns students in need of remediation to either a remedial course or a standard English class. It also assigns just one remedial student to any standard English class, in an attempt to capture the effect of how a remedial student does in a standard English class, rather than how a remedial student performs in a course that may have adjusted to the needs of the less prepared individuals in the class. The careful precision for this experiment sets up a situation designed to account for many naturally occurring situations that could bias the predictions. However, one
should exercise caution if attempting to apply these results to other institutions, since the entire sample was just from the population of one school.

The final study is the most thorough one presented in this paper, and the authors are perhaps the most thorough in remedial education literature using empirical analyses to estimate effectiveness of remediation. The authors’ methodology uses a number of control factors to isolate the effects of remediation from other biases, and they use an instrumental variables approach that attempts to mimic the effect of random assignment to remediation. Finally, the experiment uses a large sample with a variety of schools, and although all of the schools come from one state, they are believed to be relatively representative of the nation as a whole. The methodologies employed and controls included in this study help promote confidence in the ability of the estimated models to make reliable predictions concerning the effectiveness of remedial education on students found in the range of those who may be assigned to remedial studies.

1.7.1 Gabriella Wepner -1988

A study was performed at Ramapo College of New Jersey to try and determine if remedial mathematics courses were beneficial to students. For this study, the end goal of the remedial course is to allow students to be as prepared for the standard course as their non-remedial peers. The questions addressed in this study were as follows:

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6 All of the information found in this section is from Evaluation of a Mathematics Program by Gabriella Wepner, unless stated otherwise.
1) Do significant differences exist between the pre-instructional skills assessment of students in remedial/developmental mathematics courses and their post-instructional skills assessment?

2) Are these differences consistent, i.e. does the program achieve similar results each year?

3) Do students who have participated in the program demonstrate retention of content over time?

4) Do students successfully completing the remedial and/or developmental courses demonstrate similar achievement when compared to non-developmental students in the same subsequent math courses?

Observations for this experiment involved 604 remedial/developmental students and 130 non-remedial students with their placement scores, pretest and posttest scores in computation and/or algebra, and final grades in College Algebra (standard math) classes; observations were made from 1981-1984 (not following students, but rather observing for consistency in results year to year); and ages of the students ranged from 17-55 with an equal distribution of traditional full-time college freshmen and returning older part-time students.

All entering freshmen take the New Jersey College Basic Skills Placement Test (NJCBSPT), used for determining if students need to be placed in remedial, developmental, or standard courses. Then for students taking either the remedial or developmental course, they take a pretest during the first week of classes and a posttest, which is another form of the NJCBSPT, during the last week of classes. These were used to see if test scores improved, in an attempt to determine if remedial courses were beneficial.

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As used in this study, remedial “refers to students demonstrating severe deficiencies in computational skills, as evidenced by a score of less than 50% correct on the Computation section of the New Jersey College Basic Skills Placement Test(NJCBSPT)” and developmental is “referring to students demonstrating skill deficiencies in elementary algebra as evidenced by a score of less than 70% correct on the Algebra section of the NJCBSPT and between 50% and 80% correct on the Computations section of the NJCBSPT.”
Another portion of the experiment used outcomes from the standard course, College Algebra. The College Algebra classes used had at least 5 former remedial/developmental students in them. This particular part of the data came from 130 non-remedial students and 75 former remedial/developmental students.

The final portion of the experiment involved testing students again at least one semester after completing their remedial course, to see if the material was retained.

When comparing pre and posttest means for the classes evaluated, all remedial and developmental classes showed large improvements, “revealing notable gains in content mastery.”

Also, when comparing pretest scores to retention test scores, tests taken at least one semester after the remedial course was taken, there were also large improvements. However, when comparing posttest scores and retention scores, the posttest scores were higher. Finally, when reviewing how former remedial students performed in the standard math class, compared to students who did not take remedial courses, former remedial/developmental students fared slightly better. The table below summarizes these last results.

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8 The report does indicate that 74% of the entire population (not just sample size) of remedial/developmental students pass their remedial course, and that passing is a 24, or above, out of 30. However, there is no indication as to how many of the 26% who did not pass were still tested. One can assume they were not included in the standard course evaluations or retention tests, but it is not clear if they were included in the posttest scores from tests issued during the last week of the remedial class.

9 It is not surprising that retention was good, since many of the students likely had the chance to further understand the material by revisiting the fundamentals, and then expanding on them, in the standard math class which followed the remedial but which was likely taken before the retention test. It is also not surprising that the retention scores were lower than posttest scores, since posttest scores were issued the last week of the class, while everything is extremely fresh in students minds; it is possible that the posttests were studied for with more fervor, as they may have contributed to a final grade in the class.
Final Grade Analysis in College Algebra for Former Remedial/Developmental Students and Non-Remedial/Non-Developmental Students

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Passing</th>
<th></th>
<th>Failing</th>
<th></th>
<th>Withdrawal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
</tr>
<tr>
<td>Former Remedial/Dev.</td>
<td>75.0</td>
<td>61.0</td>
<td>81.3</td>
<td>7.0</td>
<td>7.0</td>
<td>9.3</td>
</tr>
<tr>
<td>Non-R / Non-Dev.</td>
<td>130.0</td>
<td>104.0</td>
<td>80.0</td>
<td>10.0</td>
<td>16.0</td>
<td>12.0</td>
</tr>
</tbody>
</table>

In summary, this study finds that the goals of remedial courses were met, because students did benefit from taking precollege level courses, illustrated by 1) improvements on test scores at the end of the class and a retention test performed at least one semester following that and 2) their equal (even slightly better) success rate in the traditional course when compared to those who did not take any remedial or developmental classes. However, one should be cautious when inferring much from these results because some methods of the methodology could cause inaccurate perceptions of the true effect of remedial classes.

Although there are many suggestions which could be made concerning the need to try and control for other factors that might impact how well a student does in a course or how well a student is perceived as doing in a course, another concern is that some, if not all, of these tests taken at the end of a course do not include students who started but did not complete the remedial class. It was said that the College Algebra comparison tests only used remedial students who successfully completed the remedial course. No specifics were given on the students taking the retention test, although it is unlikely that students who never completed the class were asked to come back to take a follow-up test, and finally the report does not indicate for certain if all of the students who did not successfully complete the remedial class even
showed up for the posttest at the end of the semester. It is possible that students who withdrew earlier, or knew they were not going to pass the class, did not take the posttest. The end result is that none of the follow-up tests is going to give an accurate picture of how effective the remedial class is, since 26% of the students who took the remedial class never finished it in the first place. Therefore the quarter of the population for whom the remedial course did not prepare them for later classes, do not have the opportunity to be represented in the final results, and only the better students are left to be evaluated. For example, it is not likely that a higher percentage of remedial students would have passed the College Algebra class than their non-remedial peers, if the portion of the sample representing the 26% of students who do not pass their remedial courses were included in this final evaluation.

1.7.2 Richard Sawyer and Jeff Schiel -2000

Posttesting Students to Assess the Effectiveness of Remedial Instruction in College was part of the ACT Research Report Series in 2000. This example is similar to the last one, except that it includes a larger sample of schools, it applies to all three subjects of remedial education, and the authors readily caution the reader to not put too much weight on the results because of potential bias. Pre and posttest COMPASS test scores, used to determine if a student should be placed in remedial classes, were available for 9 two-year and 10 four-year higher education institutions in one state. Students who were planning to enroll in their first year of college at one of the schools mentioned above, and who had below certain screening ACT or SAT scores on their admission application, were given a COMPASS test to determine if remedial courses were needed. If students fell below a certain cutoff score they were not permitted to enroll in the

10 For this section, all information is taken from Richard Sawyer and Jeff Schiel’s paper Posttesting Students to Assess the Effectiveness of Remedial Instruction in College, unless otherwise indicated.
“standard” college level math, writing, or reading course. Many of these students took the remedial courses in these areas. After completing the remedial courses, they were required to yet again take the COMPASS test and score the minimum cutoff before being eligible to sign up for the standard course in that respective department(s). Thus, posttests which evaluate the same material as the pretest were always issued after a student completed the remedial course.

These posttests provided an opportunity to give some insight as to whether remedial courses are beneficial, by looking at the percent of students who are determined “ready” for basic courses at the end of the remedial class. While this is a starting point, and unlike some reports which only look at the effects of students at one school, the authors readily admit that to truly test the impact these courses have, more information is needed. Sawyer and Schiel stress that ideally there would be a control group of students who also take the COMPASS test at the same time as these groups of students, and then the changes would be compared to identify if there were any significant differences in the changes of test results, between the two groups. These students would also be attending the same school that the students taking remedial courses are attending, and ideally this control group would be other students in need of remediation who do not take the remedial course. However, the “exit testing” that exists should be taken advantage of to the extent that it is available, as Sawyer and Schiel do here.

Of the 6738 students in this sample (some counted –and evaluated – twice if in multiple classes), the “success” measurement is if students show they are prepared for the standard course. This may not fit a typical definition of “success” by many standards, but McCabe (2000) argued that finishing a remedial course is determined a “success” because of how it can benefit individuals. “The majority of remedial education students gain skills and go directly to work or
proceed to occupational certificates and degrees. This is a constructive result for society and is completely missed in current outcome evaluations” (p.42). Additionally, no set percent is defined a “success” in terms of this study. The resulting percent is simply how “successful” the remedial course was determined to be, i.e. what percent of the remedial students are now ready for the standard course?

For the summary and analysis below “K” equals the cutoff score of the compass test that a student must achieve to be determined eligible for standard courses. The top number in each section is the average percentage of students falling into that designated category. The parenthetical numbers below are the standard deviations.
The results of the posttests are listed below. All of the tests were run individually for each field (math, reading, and writing). Below is the percent of

1) Students who actually completed the remedial course
2) Students who completed the remedial course and scored above the cutoff on the posttest, out of the students who originally signed up for the course; and
3) The percent of students who scored above the cutoff on the posttest out of the students who completed the course.

<table>
<thead>
<tr>
<th></th>
<th>Algebra</th>
<th>Reading</th>
<th>Writing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of students who</td>
<td>22</td>
<td>45</td>
<td>27</td>
</tr>
<tr>
<td>completed the remedial course</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage of students who</td>
<td>21</td>
<td>32</td>
<td>24</td>
</tr>
<tr>
<td>completed the remedial course</td>
<td>(17)</td>
<td>(13)</td>
<td>(6)</td>
</tr>
<tr>
<td>and scored ( \geq K ) on</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>posttest</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage of remedial course</td>
<td>97</td>
<td>71</td>
<td>90</td>
</tr>
<tr>
<td>completers who scored ( \geq K )</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>on posttest</td>
<td>(17)</td>
<td>(9)</td>
<td>(7)</td>
</tr>
</tbody>
</table>

The only one of these percentages that was not statistically significant was the second math group, “percent of students who completed the remedial course and who scored above the cutoff, out of students who enrolled in the remedial course.”

Obviously what is called successful and what is not is individually determined by how high remedial passing rates and posttesting passing rates should be. If helping one student to further succeed in school is the goal, regardless of cost, then all were successes in the framework of this study; if a certain passing percentage is needed to make the program cost
effective, then perhaps some were not successful. Although this report may be viewed as a beneficial rarity in the realm of developmental education, because of the monitoring of exit scores and because of the sample size, most of the same concerns mentioned in the previous study apply to this one as well. In the end, there are too many other factors which are being ignored and consequently there is likely a misleading perception as to how effective remedial education actually is.

1.7.3 Leona Aiken, Stephen G. West, David E. Schwalm, James L. Carroll, and Shenghwa Hsiung - 1998

A study on the effects of a semester-long remedial English class was performed at a large university in the United States. Four groups of student were evaluated: students who were deemed in need of remediation and then randomly assigned to either a remedial course or a standard English course, students deemed in need of remediation who had no option but to take the remedial course, students who did not need remediation and took the standard English course in the fall semester, and students who did not need remediation but simply did not enroll in the standard course until the spring semester.

The two questions of interest, as they pertain to the remedial student, were:

1) Does the remedial course or the standard freshman composition course lead to better writing skills at the end of just one semester of composition training?

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11 All information in this section is from “Comparison of a Randomized and Two Quasi-Experimental Designs in a Single Outcome Evaluation” unless stated otherwise.
12 The reason these students were ineligible for the random assignment is because they were not available at the time of assignment. Either they did not register for classes until later or they simply were not able to be contacted to let them know of the possibility. As for remedial education cut-off scores, they matched the students who were eligible for random assignment.
13 Most students determined in need of remedial education took their remedial course in the fall, followed by their standard English course in the spring.
2) Does the sequence of remedial writing in the fall semester followed by standard freshman composition in the spring semester lead to improved writing relative to the standard freshman composition class alone?\(^{14}\)

The methodologies were:

A) Randomized experiment

This involved comparing matched students – students determined to be in need of remedial English – who by lottery chance either took remedial English in the fall, followed by the standard course in the spring (remediation group), or they were exempted from remedial English and placed directly into the standard course (nonremediation group).

B) Nonequivalent control group design

Students participating in this portion of the experiment met the same profile as the students in A) who were randomly assigned to remediation or not, except that none of these students even had the possibility of exemption from the remedial course (due to timing or communication barriers). This way, if there was some unobserved difference about the group of students in A) from those in B), then this B) group should show a different difference from the nonremediation group than the difference between the remediation and nonremediation groups. This group of students was called the “accretion” group.

C) Regression discontinuity design

This estimated students’ performances at the end of the standard English course, based on their 1) ACT or SAT, 2) score on the pretests, and 3) whether or not they took the remedial course. Based on running this regression, effectiveness of a remedial course was estimated.

\(^{14}\) P.211
Method of testing:

Students were tested in two ways: one was writing samples and the other was a 50 question multiple choice test titled The Test of Standard Written English (TSWE). The judges of the writing samples were seven doctoral students in English who had all taught writing before and who were trained in what/how to evaluate the writing samples and how to score them. Throughout the grading processes writing samples were evaluated at different times throughout the day and by multiple people, to ensure that no one’s grading was too far off from the standard. Samples were graded on a six-point scale and if any two judges were more than 1 point off from each other, tests had to be judged by one of the two experienced adjudicators.

Naturally some students dropped out of the program throughout time: either they did not enroll in the course(s) they were supposed to or they did not complete the course due to withdrawing, failing, or receiving an incomplete. While this could obviously bias end results, there was no indicator that there was a difference in patterns of attrition when comparing the different groups being evaluated.

Results:

For all of the comparison tests, writing samples and TSWE tests were evaluated. In pretest results there was no significant difference between students in the remediation group from students in the accretion group for either of the tests. When comparing each of the above groups to the nonremediation group, there was not a significant difference with either for the writing samples, but the accretion group did perform worse at a significantly acceptable level,
than the nonremediation group on the TSWE; there was no noticeable difference between the remediation and nonremediation groups on the TSWE.

1) Do students show gains from the first semester course?

When reviewing the three experimental groups at the end of the first semester, (remediation, nonremediation, and accretion), all show a significant change from pretest to posttest for the TSWE tests. However, only the nonremediation group shows a significant change (improvement) in the writing samples. (Thus, those in need of remediation who did not take the remedial courses showed improvement in their writing samples, while those who took the remedial class did not.)

2) How do students determined to be in need of remedial course, versus when they take the standard course, at the end of their first semester?

All students showed significant improvement with the TSWE skills, but only the nonremediation group showed a significant improvement with their writing skills.

3) Do students show gains at the end of the standard freshman composition (regular English course)?

When taking the regular freshman level course, the remediation and accretion groups (spring) and the regular and nonremediation groups (fall) all showed improvements, however the accretion groups significance level only reached a p-value of .13. All other groups showed significant improvements of p < .05.

4) How do students receiving remediation versus no remediation compare at the end of standard freshman composition?
For the TSWE tests, both students in the remediation and accretion groups showed significant positive improvements over the nonremedial group. However, for the writing samples the improvements were small and insignificant.

When reviewing the regression discontinuity design, the English measure at the end of the course (TSWE results or writing sample scores) was regressed on the admissions test score, the score on the same writing test at the beginning of the evaluation, and a dummy variable indicating if students took the remedial English class. Separate regressions were run with SAT scores and ACT scores; in all, four regressions were run. The remedial course showed a positive effect, but only one of the four regressions was significant. Although all coefficients were positive, one was only .01 (SAT group with the writing sample score as the dependent variable), and the only significant regression involved ACT scores with the TSWE tests.

5) What is the pattern of gain of students taking remedial writing during the two-course sequence?

Students significantly gain TSWE skills over both semesters, however they only gain moderate growth in writing, during the spring semester (second course, standard course).

When looking at the students who did not need a remedial course, but took the regular composition course in the spring anyway, and comparing them to the other students who were not in remediation and took the course in the fall, there seemed to be no significant difference in admissions test scores or in differences at the end of the standard course with writing samples or TSWE scores. Therefore there seems to be no significant 1) difference in the type of student who enrolls in the English spring class instead of the fall one or 2) impact of simply having been in school one semester before taking the English course, on the performance in English.
Conclusion:

Although the different methods of analyses yielded different strengths in the results, in the end being in the two-semester course has a large positive effect on TSWE scores, while only moderate gains on writing samples are observed. One should not automatically assume that other schools will follow this behavior, however, since the sample was only taken from this one school.

1.7.4 Bettinger and Long – 2007b

Eric Bettinger and Bridget Terry Long looked at similar students who attended different colleges in Ohio, to see if those who received remedial education fared better, worse, or unnoticeably different from their “matched” counterparts in regards to graduation rates, persistence, and transferring from two-year to four-year institutions to complete a bachelor’s degree. The students were from the entering freshman class of 1998, and this cohort was followed until 2004 in order to capture six-year graduation rates; the total sample was approximately 28,000 students. The authors used an instrumental variables approach which attempts to exploit the fact that many students choose to attend schools close to home and that individual institutions in Ohio have independent jurisdiction over their remedial education policies. In other words, two different institutions offering remedial education may have separate policies such that the exact same student is required to take remedial classes at one school, whereas at the other the student is above the cutoff point for having to take remedial classes. Concerning the other crucial component to this experiment, distance from home,

15 Unless otherwise indicated, all information in this section is from Addressing the Needs of Under-Prepared Students in Higher Education: Does College Remediation Work? by Bettinger and Long.
previous research has shown the “proximity factor” to be reliable in showing that students are more likely to choose one college over another based on its proximity to their home. In Ohio (where Bettinger and Long’s work takes place) the median distance between students’ homes and where they attend school is 26 miles. Additionally, 60% of students live within 50 miles of their home (p.10). Using the combination of students attending schools close to home and institutions setting their own remedial standards, provides an exogenous predictor of a student being assigned to a remedial course, hence allowing one to examine the results of a student who received remediation, versus one who did not, and thus examining their outcomes for any significant differences. The outcomes of interest were graduation rates, persistence, and transferring from two-year to four-year institutions to complete a bachelor’s degree. Concerning the last outcome, however, only students at two-year colleges who indicated, by the time of enrollment, that they planned on pursuing a bachelor’s degree, were included in the sample.

To further solidify that “matched students” received different remedial treatments, the specific effects on “marginal” students were taken into account. “Marginal students” means students on the margin of receiving remedial education or not, thus the sample excluded students who were highly likely to receive remediation at any institution and students who were highly unlikely to receive remediation at any institution.

Bettinger and Long performed additional tests, reviewed other statistics, and observed general trends to attempt to ensure that their experiment really was capturing the effects of remediation and that the results could be fairly easily applicable to the nation as a whole. Upon review they were able to reject the hypothesis that institutional remediation rules are similar across schools; they found that there was not a noticeable relation between the caliber of
students living nearby schools (before going to college) and the caliber of the schools themselves; and the general profiles of the student bodies in Ohio were fairly representative of the national student body. Additionally, when designing their models, they included numerous control variables to prevent bias in the predicted effect of remediation.

The main result found was that students do benefit from receiving remedial education. When comparing similar students, those who took remedial courses were about 11% less likely to drop out and 10% more likely to graduate in the six-year timeframe. When considering the more narrowly grouped marginal students, those who took remedial English classes were 18% less likely to drop out, and those in math remediation were 36% less likely to drop out and 7% more likely to graduate within six years, although this 7% was not at a traditionally accepted significance level.

Bettinger and Long took two additional looks at remediation on student outcomes by reviewing the effects of remediation by student ability and the effects of remediation on student interest. For the former they ran their same regressions while including an interaction variable between remediation and SAT scores. Interestingly, the remedial*ACT interaction term indicated that the higher the ACT score, the less effective remediation is on students when reviewed with English remediation; with math, however, the impact remained positive as ACT scores increased. For effects of remediation on student interest they interacted the remedial dummy variable with a dummy variable indicating the students’ college major of interest as a math-related or English-related major (based on major choices prior to taking the ACT). Again different results were found with math and English remediation. When students interested in an English-related field were placed into English remediation, they were more likely to change
their major than their counterparts who also indicated an interest in English but were not placed into remediation. Math remediation had the opposite effect on students interested in a math-related discipline; they were more likely to persist with their original choice of study.

1.8 SUMMARY OF LITERATURE

The need for further education is necessary for a number of employment opportunities now and in the future. For many, this additional education involves access to college courses. However, due to a variety of possible reasons, only one of which is a student’s personal lack of motivation, many are not prepared for basic college courses. Therefore, for the benefit to individuals as well as for the nation’s ability to meet its demand for skilled labor, there needs to be a way to give individuals the education they require. There is much debate outlining how this should be done, where, and by whom. A couple main routes to the debates are over effective pedagogical approaches and over cost. While there are many opinions as to how this should be done (who, where, level of involvement), one of the main areas of contention is whether it has a place in higher education, especially four-year institutions. Over the years access to higher education has increased and it appears that consequently the academic needs, even very fundamental needs, of students have grown as well. Four-year institutions have their own definitions of success, a few of which are certain measures of completion, such as retention and graduation rates. While some argue that students benefit from remediation even if they do not graduate, or even if they do not matriculate to the second year of college, these are typical higher education definitions of success, and in order to determine if remedial education has a place in higher education, these questions must therefore be answered. One strong observation is that the degree of remedial involvement varies immensely across institutions: from fully involved developmental programs to just one or two remedial courses with nothing else
available. Therefore, questions that look at the effect of remedial education, look at the effect of some measure that falls between very involved and hardly acknowledged. Previous analyses in the effects of remediation have yielded different results. Much of this is because of the measures used and the effectiveness of the methodologies employed. However, some of the differences could also stem from the different approaches taken to remediation at various institutions. In the end, a summary of the posed questions and debates is: 1) do students benefit from remediation and if so where do they benefit (community colleges, four-year institutions, high school, separate learning centers, etc) and 2) all of the financial questions regarding who bears the cost. It seems most logical to answer the first question before the second, so no effort is wasted on how to spend money if the remedial courses are not beneficial to students. While addressing the questions of if and where students benefit from remedial education, it behooves one to start asking these questions piece by piece. The following research starts to do this by considering the first-year retention rates and six-year graduation rates of public four-year institutions in the United States with student populations of 10,000 or more.
CHAPTER 2

DATA AND METHODOLOGY

2.1 DATA

2.1.1 Data retrieval

The following empirical analyses use data from two databases: the Integrated Postsecondary Education Data System (IPEDS) within the National Center for Education Statistics (NCES)\(^{16}\) and the Education Trust’s College Results Online.\(^{17}\) The data retrieved from the first Web site comes from a survey administered by IPEDS with compulsory response requirements for all Title-IV eligible institutions. For anyone who fails to reply, the Federal Student Aid office responds with an appropriate disciplinary course-of-action (NCES, 2008). The data found on the Education Trust’s College Results Online is reported from the U.S. Department of Education’s Graduation Rate Survey.

The second database, The Education Trust’s College Results Online, was used for three reasons. First, while the NCES database mentioned above had numerous variables from which to choose, the descriptive specifics of each variable were lacking in many cases. While more details are appearing in data sets for later years, data for the years of interest, 1992 and 2000, miss some key components that could be very beneficial. For example survey results on the NCES Web site simply state whether test scores (like SAT or ACT) are required by the school or not; the Education Trust posts actual school averages. Unfortunately, the first year available on

\(^{16}\) [http://www.nces.ed.gov/ipeds]

\(^{17}\) [http://www.collegeresults.org]
the Education Trust is 2002. (The years are currently 2002-2005.) For the cross-sectional data for 2000, the information from the Education Trust’s 2002 data was added, being treated as part of the 2000 data. The chances of components like test scores, percent of students receiving financial aid, and percent of the student body belonging to a certain ethnicity, are not likely to change much. It is certainly arguable that the amount by which these variables could change is minor when considering the benefit of including this information in with the variables concerning the characteristics of the school.

Second, The Education Trust was used because it has matched institutions with peer schools, based on eleven weighted variables, which have been found to impact graduation rates. 18 For these peer comparisons, the difference between an institution’s first-year retention rate, or six-year graduation rate, and the mean, or median, rate for the group of peer institutions, is the dependent variable. Since remedial policies were not one of the factors used to determine peer institutions, including it as a dummy variable will help illustrate if the presence of remediation, or not, impacts how much better or worse an institution does compared to its peers regarding success rates as measured by graduation and retention.

18 Variables chosen, and their respective weights (points) out of 1000, are as follows:

- Estimated median SAT – 249
- Admissions selectivity, per Barron’s Profile of American Colleges -102
- Carnegie Classification – 60
- Percent of undergraduates receiving Pell grants – 164
- Sector (Public vs. Private) – 116
- Number of full-time equivalent undergraduates – 35
- Student-related expenditures (Full-time equivalent students) – 29
- Percent of FTE undergraduate students age 25 and over – 53
- Status as a Historically Black College or University – 71
- Percent of undergraduates who are enrolled part-time – 75
Most of the empirical analyses are Ordinary Least Squares regressions using the information for the year 2000 (2002). The final model uses a fixed effects approach to identify if changes in remedial policies seem to impact changes in 6-year graduation rates. The explanatory variables are from the years 1992 and 2000, and the graduation rates are from 1998 and 2006. The data from 1992 came almost exclusively from the IPEDS Web site. IPEDS, however, did not include graduation rates back in 1998 (the six-year graduation mark for the 1992 cohort), however the Education Trust did have a database with past graduation rates for comparison purposes; the only Education Trust information used, regarding the 1992 cohort, was therefore the 1998 six-year graduation rate.

From these databases title-IV eligible, public institutions in the United States, offering a minimum of 4-year degree programs, with a student body of 10,000 or more were selected for these analyses. Once the data which were found in both databases were merged and observations with missing variables were ignored, the number of institutions which made up the sample size was 221. Almost all of the models only use cross-sectional data for the entering freshman class of 2000 (plus variables from 2002 treated as 2000 variables) and the graduation rate for 2006. For the fixed effects model 2000 data is used again and is combined with matching variables for 1992. If the variables used with the OLS models were not available in 1992, then they were removed from the data and when possible a similar variable was used in its place. All variables are listed below.

2.1.2 The OLS variables

The main variable of interest is remedial education. Another term frequently analyzed is an interaction term with remedial education and SAT median score for each institution. Since
students determined in need of remedial education are less likely to graduate in the first place, other control variables which capture other contributors to retention and graduation rates, and may be partially collinear with remediation, are included in the model to control for these other effects. This will help to more accurately isolate the effects of remediation to its estimated coefficient.

For the Ordinary Least Squares Regressions the dependent variables are:

- A school’s six-year graduation rate
- The difference between a specific school’s graduation rate and the average graduation rate of it and its peers. 19
- The difference between a specific school’s graduation rate and the median rate of it and its peers.
- A school’s first-year retention rate.
- The difference between a specific school’s first-year retention rate and the average first-year retention rate of it and its peers. 20
- The difference between a specific school’s first-year retention rate and the median retention rate of it and its peers.

Control variables are:
- In-state tuition
- Dummy variable for if ROTC programs are offered
- National athletic association membership
- Percent of students receiving financial aid
- Percent of students receiving federal grant aid
- Percent of students taking out student loans
- Locale (rural, urban, etc.)
- Dummy variable indicating if school was a Historically Black College or University
- Hispanic Serving Institution
- Percent admitted
- Median SAT score
- Dummy variable indicating if no SAT scores were reported for the institution (1 = scores were reported)
- Full-time equivalent student body
- Percent underrepresented minority students
- SAT score * Remedial interaction term

19 There are generally 15 peer institutions, so 16 schools altogether. However, if The Education Trust determined that there were not 15 similar institutions, then the maximum number of peer institutions that could be identified was used.
20 See previous footnote
## Table 1 Table of Means

<table>
<thead>
<tr>
<th>Variable</th>
<th>All Institutions</th>
<th>Institutions With Remedial Programs</th>
<th>Institutions Without Remedial Programs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
<td>Std Dev</td>
</tr>
<tr>
<td>In-State Tuition</td>
<td>246</td>
<td>2504.49</td>
<td>1406.14</td>
</tr>
<tr>
<td>Remediation</td>
<td>248</td>
<td>0.8427</td>
<td>0.3648</td>
</tr>
<tr>
<td>School Offers ROTC program(s)</td>
<td>248</td>
<td>0.9677</td>
<td>0.1770</td>
</tr>
<tr>
<td>Percent of Students Receiving Federal Grant Aid</td>
<td>247</td>
<td>38.9312</td>
<td>17.3863</td>
</tr>
<tr>
<td>Percent of Students Taking Out Student Loans</td>
<td>237</td>
<td>2.8608</td>
<td>1.6003</td>
</tr>
<tr>
<td>Locale (urban, rural, etc.)</td>
<td>237</td>
<td>0.0127</td>
<td>0.1120</td>
</tr>
<tr>
<td>Historically Black College or University</td>
<td>237</td>
<td>0.0802</td>
<td>0.2721</td>
</tr>
<tr>
<td>Hispanic Serving Institution</td>
<td>237</td>
<td>70.7157</td>
<td>15.6820</td>
</tr>
<tr>
<td>Percent Admitted</td>
<td>238</td>
<td>0.9286</td>
<td>0.2581</td>
</tr>
<tr>
<td>School Submitted SAT Scores</td>
<td>237</td>
<td>882.3207</td>
<td>393.9714</td>
</tr>
<tr>
<td>SAT*Remedial Interaction Term</td>
<td>237</td>
<td>1059.2400</td>
<td>88.6574</td>
</tr>
<tr>
<td>Median SAT</td>
<td>237</td>
<td>13921.5700</td>
<td>6492.3500</td>
</tr>
<tr>
<td>Full-Time Equivalent Student Body</td>
<td>237</td>
<td>18.2797</td>
<td>17.1471</td>
</tr>
<tr>
<td>Percent Underrepresented Minority Students</td>
<td>237</td>
<td>18.2797</td>
<td>17.1471</td>
</tr>
</tbody>
</table>
2.1.3 The Fixed Effects Variables:

The main variable of interest is the change in remediation.

The dependent variable is the difference between graduation rates in the year 2006 and the year 1998.

Other control variables are changes in the following:
- In-state tuition and fees
- Dummy variable for if ROTC programs are offered
- Scholarship and fellowship amount per capita
- Pell Grant amount per capita
- Percent Hispanic students
- If SAT is required for admission
- Student population
- Percent of underrepresented minority students

2.2 METHODOLOGY

2.2.1 Models

Most of the models are Ordinary Least Squares regressions involving cross-sectional data from 2000 (including the 2002 variables used as 2000 data). Although there are a number of control variables, as outlined, there is still the possibility that unobservable variables which impact graduation rates are inaccurately being attributed to the explanatory variables (of concern being remediation). For example, SAT score is intended to model the academic ability of an institution’s student body; however the two are not perfectly identical. Since academic abilities are not likely to change much over time, and since ability is probably correlated with remediation, the fixed effects model will remove the unchanging ability from the model, thus helping to fine-tune the weight given to remediation.
For the OLS regressions, the first three equations use the first-year retention rates as the dependent variable. The first equation simply regresses first-year retention on the remedial education dummy variable, for illustration purposes. The second equation includes other control variables (listed above), and the third equation includes all variables from the previous equation, plus an interaction term for the remedial education dummy variable and the median SAT score. Institutions vary in the caliber of their student body, with some serving a low profile of students while others target the upper-echelon of students pursuing postsecondary education. Student success is an obvious goal of all institutions; however the methods in which this is pursued will vary based on the student body. While many of the means by which these institutions vary in their involvement with their students are unobservable or are simply (endogenous) results of the natural operations and interactions of the institution which have developed over time, the SAT score is one way of identifying different calibers of student bodies, thus helping to capture the effects of remediation as they pertain to students’ academic abilities. The goal of the SAT*remedial interaction term is to determine if the effects of remedial education vary in their benefit (or lack thereof) to different calibers of institutions, by affecting the dependent variable differently for the varying student bodies, as reflected by SAT. This changes the model to a non-linear predictor of graduation rates; thus when the effects of remediation are isolated growth still occurs, as a result of the SAT score.

This process of regressing the dependent variable on 1st-just the variable of interest, 2nd-remedial education plus control variables, and 3rd-all of the previous variables plus an interaction term, is repeated for all OLS regressions. In all, this series of three is repeated five more times.
The next three regressions use the difference between each individual institution’s first-year retention rate and the mean value of the first-year retention rate of that school and its 15 peer institutions (as determined by the Education Trust), as the explained variable. The following three models follow the exact same principle, except that the dependent variable uses the peer median first-year retention rate, instead of the mean.

The second half of the OLS regressions follow the exact same pattern as outlined above, only in place of using first-year retention rates, graduation rates are used. The first three regressions use the graduation rate itself as the regressand; the next three compare the graduation rate to peer mean values; and the final three use the difference from peer median graduation rate values.

Finally, a fixed effects model is used to isolate changes over time, thus removing unobservables that are not changing, and therefore not causing any growth in graduation, but which might otherwise be inaccurately giving additional weight to the explanatory variables in how they affect graduation in the regular OLS models. The changes in explanatory variables are measured over the 1992-2000 range, and the change in graduation rates are measured in the 1998-2006 range. This will observe if there is any noticeable difference in the effect of remediation on graduation rates for schools that changed their remedial policies.

2.3 POTENTIAL PROBLEMS

2.3.1 Missing SAT scores

There were 19 schools which did not have SAT scores reported on the Education Trust’s Web site. It is not known whether this is something which the schools never submitted or if The Education Trust did not record it for another reason. For these missing observations, the
mean SAT score of the sample was entered as a default value. In case there was some consistent reason for which these values were missing, a dummy variable was included indicating if the school had a reported score.

2.3.2 Schools not Students
While the information contained in this report can help give a general overview as to if students benefit from remediation or not, it is important to recall that this is a much more summarizing approach to if students benefit; the question really being addressed is if a school’s overall student body benefits from having remedial courses at the school. The data used does not include individual information for students, and therefore this is not intended to be able to say if student x benefits more from remediation than student y. The results, rather, should help schools determine if their students are at the type of institution where remediation has positive effects. The end results will still be based on school averages as all of the variables used are reported summaries of the schools’ profiles. So, while the root question of interest to many is “does remediation increase students’ chances of retention (graduation)?” the answer is still given as far as the schools’ students.

2.3.3 Fewer than 15 peer institutions
When the Education Trust determined peer institutions, they found the most similar schools according to their criteria\textsuperscript{21}, and then they did a manual check to make sure the schools were not very different types based on more qualitative information.\textsuperscript{22} Through these procedures there were a few institutions which did not seem “matchable” to fifteen other schools. In these cases, the most peer institutions that the Education Trust felt were acceptable

\textsuperscript{21} See section 2.1.1
\textsuperscript{22} For an extreme example, the Education Trust would do a double-check to make sure an engineering school and a fashion school were not matched to each other.
matches were listed. While this did not happen with many schools, and differences from peer institutions were calculated in the same manner regardless (differences from peer mean and median), the institutions that typically did not have the entire fifteen peers were more noticeably the high caliber universities. This did not happen often, and when it did occur there were sometimes just 13 or 14 peers listed. Still, if there is a correlation between very good schools and fewer peers, then these schools may show less deviation from the mean, since there are not as many schools to be separated by, therefore under or overestimating how a particular institution compares to its peers.

2.3.4 Very few schools changed remedial policies

While a fixed effects model is a good approach to try and capture the effect of a variable by controlling for unobservable characteristics that are constant over time, it will by default remove anything that is constant over time. Unfortunately with the case of remedial policies over the eight years in this sample, very few schools changed remedial policies. In the end only 14 of the reviewed schools changed their remedial policies. 10 of the schools dropped remediation while four added programs. With only 14 schools from which to make estimation on the effects of remediation, one must interpret the results with caution and not rely heavily on the model’s prediction of the effectiveness of remediation.

2.3.5 Using two different databases for “like variables” graduation rates

Even though the Education Trust did not have annual data recorded prior to 2002 (and not after 2005), they did have historical six-year graduation rates for comparison purposes, starting in the late 1990s. Since the NCES IPEDS database did not have graduation rates available before the year 2003, the six-year graduation rates for 1998 (1992 cohort) and 2006 (2000 cohort) were taken from different databases. These rates should have been measured in
a consistent manner, but this is still mentioned in case of any reporting differences. However, even if the rates were somehow recorded or reported differently, all of the 2006 rates came from the same database and all of the 1998 rates came from the same database, so realistically any differences between the two years are still likely to be “consistent differences”.

2.3.6 If SAT is “required” for admission

In the NCES IPEDS database, while similar ideas are tracked from year to year, and while some of the information is reviewed in exactly the same way each year, other similar variables may change slightly. This appears to be for the purpose of gathering more specific details related to the variable in question, but when comparing institutions over time, this can cause some difficulties. For example, in 1992, schools were asked if they required the SAT or ACT for admission purposes, and there were two possible answers: yes and null (which was used as no’s). In 2000 the same question was asked, but the possible answers were: required, recommended, neither required nor recommended, item not applicable (seems to be automatically reported for all “open admission” schools), and a null option. For comparison purposes between two dummy variables for the fixed effects model the required and recommended were grouped into a “required” school and the others into a non-required group. In the OLS regressions these five categories were also regrouped into just the author’s two options as outlined above.

2.3.7 Limitations with remedial reporting

While the idea behind the following analyses is to help institutions determine if it is beneficial to offer remedial programs, it should be noted that much of the debate in remedial/developmental education concerns how courses are taught and what additional services are available for remedial students. Therefore, to truly capture the effects of
remediation, it should be reported on a scale, and preferably multiple scales, rather than one dummy variable indicating if it exists or not. If some institutions simply offer a class or two, while other institutions offer courses in very structured developmental programs with additional advising and tutoring assistance available, then whether or not remedial courses are offered may not really indicate if they are helpful to students. Ideally it would be very beneficial to have a “developmental education scale,” in essence indicating 1) how integrated or separate remedial courses are from other courses on campus, 2) if additional services are available to students in remediation (tutoring, and other recommended ideas such as assistance with time management and general study skills), and 3) the training and planning involved with remedial course, or developmental education, preparation. This would give much more helpful information to schools trying to determine how to spend their remedial education funds and if part of their remedial programs should be expanded or reduced, without simply reducing an answer to “yes” remedial education should exist or “no” it should not.
CHAPTER 3
EMPIRICAL ANALYSIS

3.1 OVERVIEW
If one considers remediation as the only variable impacting graduation or first-year retention, the result appears as though remedial classes have a significant, negative effect on either of the dependent variables. However, students who are in need of remediation are, by definition, academically less prepared for college-level coursework than their peers. Therefore, one should acknowledge the strong likelihood that students in need of remediation are less likely to graduate in the first place. The first, fourth, and seventh columns of results in tables 2 and 3 show the implied relationship between just the variable of interest and dependent variable. These are mainly used for illustration purposes, and the following summaries pertain to the more interesting cases of regressing the dependent variable on the variable of interest, plus other control variables. Below is a summary of the results found when trying to hone in on the effects of remediation itself.

3.2 FIRST-YEAR RETENTION RATES

See Table 2 “Estimated Effects on First-Year Retention Rates” below.
### Table 2: Estimated Effects on First-Year Retention Rates

<table>
<thead>
<tr>
<th>Variable</th>
<th>First-Year Retention Rate</th>
<th>Difference between First-Year Retention Rate and Average Peer First-Year Retention Rate</th>
<th>Difference between First-Year Retention Rate and Median Peer First-Year Retention Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>Estimated coefficient followed by t value</td>
<td>Estimated coefficient followed by t value</td>
<td>Estimated coefficient followed by t value</td>
</tr>
<tr>
<td>Remediation</td>
<td>-2.73**</td>
<td>-0.1842</td>
<td>7.345</td>
</tr>
<tr>
<td>In-State Tuition (In 1000s)</td>
<td>-1.87</td>
<td>-0.21</td>
<td>0.760</td>
</tr>
<tr>
<td>School Offers ROTC program(s)</td>
<td>-1.95*</td>
<td>-1.968*</td>
<td>-2.200</td>
</tr>
<tr>
<td>National Athletic Association Membership</td>
<td>3.000</td>
<td>2.980</td>
<td>3.780</td>
</tr>
<tr>
<td>Percent of Students Receiving Financial Aid</td>
<td>-6.70E-03</td>
<td>-4.01E-03</td>
<td>-1.31E-02</td>
</tr>
<tr>
<td>Percent of Students Receiving Federal Grant Aid</td>
<td>-5.57E-02</td>
<td>-5.43E-02</td>
<td>-7.93E-03</td>
</tr>
<tr>
<td>Percent of Students Taking Out Student Loans</td>
<td>4.40E-03</td>
<td>1.99E-03</td>
<td>-5.08E-03</td>
</tr>
<tr>
<td>Locale (urban, rural, etc.)</td>
<td>0.19</td>
<td>8.00E-02</td>
<td>-2.50E-01</td>
</tr>
<tr>
<td>Historically Black College or University</td>
<td>-0.058</td>
<td>-0.081</td>
<td>0.166</td>
</tr>
<tr>
<td>Hispanic Serving Institution</td>
<td>2.870</td>
<td>2.790</td>
<td>2.280</td>
</tr>
<tr>
<td>Percent Admitted</td>
<td>-0.120*</td>
<td>-0.119*</td>
<td>-0.058*</td>
</tr>
<tr>
<td>Median SAT</td>
<td>4.83E-02</td>
<td>5.38E-02*</td>
<td>1.03E-03</td>
</tr>
<tr>
<td>School Submitted SAT Scores</td>
<td>16.476*</td>
<td>16.325*</td>
<td>6.597*</td>
</tr>
<tr>
<td>Full-Time Equivalent Student Body (In 1000s)</td>
<td>5.830</td>
<td>5.760</td>
<td>2.650</td>
</tr>
<tr>
<td>Percent Underrepresented Minority Students</td>
<td>-0.020</td>
<td>-0.018</td>
<td>0.026</td>
</tr>
<tr>
<td>SAT*Remedial Interaction Term</td>
<td>-0.490</td>
<td>-0.440</td>
<td>0.730</td>
</tr>
<tr>
<td>R-Squared</td>
<td>0.0156</td>
<td>0.7264</td>
<td>0.00000</td>
</tr>
</tbody>
</table>

* = 5% significance ** = 10% significance
3.2.1 First-year retention rates

When regressing the dependent variable, first-year retention, on only remediation, remediation appears to have a negative effect, significant at the 10% level. When including a variety of control variables in the model, the coefficient for remediation is still negative, but it is much smaller and very insignificant. When including the SAT*remediation interaction term, remediation becomes positive and more significant independently (although still far from any acceptable level of significance), but the more important value to consider is the joint significance of remediation and the remediation*SAT interaction term. The measure of joint significance should be used in place of the independent t tests since 1) remediation is the topic of interest and it is part of both variables and 2) the only reason the coefficient on remediation changed so drastically between the 2\textsuperscript{nd} and 3\textsuperscript{rd} column of results in Table 2 was because the interaction variable was added. The coefficient on remediation changes from predicting a .2 percentage point decrease in first-year remediation to a predicted 7.3 percentage point increase which declines at a very slow pace as SAT scores rise; however the p-value for their joint significance is .72. Neither the measure of joint significance, nor the significance value of remediation in the model without the interaction term, give any indicator that remediation is a good predictor of first-year retention.

3.2.2 Difference in first-year retention from peers

When including control variables, the estimated effect of remediation on differences between an institution’s retention rate and the average of its peers is positive but very small and extremely insignificant, thus suggesting the same idea as the previous model, that remediation is not a good predictor of retention. When including the interaction term the t value for remediation alone shows a vast improvement, although it is still not significant by any
acceptable measure, and the more important measure, the joint-significance value, is very weak with a p-value of nearly .5.

When reviewing the difference from the peer median rate, rather than the mean, prior to including the interaction term, results are nearly identical. However, once the interaction term is included the joint-significance is better than with the mean values, but even this p-value is only .32. Of the first-year retention models, this one shows the most significance, and if one were to consider the ceteris paribus effect of remediation, the result would be that students who scored 1320\(^{23}\) or below on the SAT would benefit from remediation. However the significance values of this model, and the significance values of all the first-year retention models, suggest that remediation does not have any notable impact on schools’ first-year retention rates; hence there is little credibility to the prediction above for having remedial classes at institutions with SAT profiles of <= 1320.

3.3 SIX-YEAR GRADUATION RATES

See Table 3 “Estimated Effects on Six-Year Graduation Rates” below.

\(^{23}\) the estimated effect receiving remediation has on the difference from the median first-year retention rates of peer institutions = 13.20 \( - .01 \times \text{SAT} \)
<table>
<thead>
<tr>
<th>Variable</th>
<th>6-Year Graduation Rate</th>
<th>Difference between 6-Year Graduation Rate and Average Peer Graduation Rate</th>
<th>Difference between 6-Year Graduation Rate and Median Peer Graduation Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interception</td>
<td>Estimated coefficient followed by t value</td>
<td>Estimated coefficient followed by t value</td>
<td>Estimated coefficient followed by t value</td>
</tr>
<tr>
<td></td>
<td>57.864* -79.964*  -98.503*</td>
<td>1.136 -11.396 -10.23</td>
<td>-0.0135 0.334 -10.622</td>
</tr>
<tr>
<td></td>
<td>23.35 -7.22 -6.24</td>
<td>1.08 -1.12 -0.98</td>
<td>-0.02 0.04 -0.98</td>
</tr>
<tr>
<td>In-State Tuition (in 1000s)</td>
<td>4.296-01 4.726-01</td>
<td>N/A 2.925-01 3.156-01</td>
<td>N/A 2.996-01 3.256-01</td>
</tr>
<tr>
<td>School Offers ROTC program(s)</td>
<td>-1.65 -1.698</td>
<td>N/A -2.401* -2.423*</td>
<td>N/A -2.610* -2.636*</td>
</tr>
<tr>
<td>National Athletic Association Membership</td>
<td>N/A 3.253 3.098</td>
<td>N/A 2.346 2.263</td>
<td>N/A 1.949 1.853</td>
</tr>
<tr>
<td>Percent of Students Receiving Financial Aid</td>
<td>N/A -0.0759* -0.0678**</td>
<td>N/A -0.0400 -0.0356</td>
<td>N/A -0.0523 -0.0473</td>
</tr>
<tr>
<td>Percent of Students Receiving Federal Grant Aid</td>
<td>N/A -0.0918** -0.0874**</td>
<td>N/A -0.0229 -0.02054</td>
<td>N/A -0.0212 -0.0185</td>
</tr>
<tr>
<td>Percent of Students Taking Out Student Loans</td>
<td>N/A 0.1277* 0.1204*</td>
<td>N/A 0.0399 0.03597</td>
<td>N/A 0.0434 0.0389</td>
</tr>
<tr>
<td>Locale (urban, rural, etc.)</td>
<td>N/A 1.382* 1.312*</td>
<td>N/A 1.181* 1.1431*</td>
<td>N/A 1.189* 1.145*</td>
</tr>
<tr>
<td>Historically Black College or University</td>
<td>N/A 13.965* 13.031*</td>
<td>N/A 11.116** 10.617**</td>
<td>N/A 10.146** 9.569</td>
</tr>
<tr>
<td>Hispanic Serving Institution</td>
<td>N/A 8.650* 8.093*</td>
<td>N/A 3.359 3.062</td>
<td>N/A 3.919** 3.575</td>
</tr>
<tr>
<td>Percent Admitted</td>
<td>N/A -0.1563* -0.1516*</td>
<td>N/A -0.0775* -0.0752*</td>
<td>N/A -0.0753* -0.0723*</td>
</tr>
<tr>
<td>Median SAT</td>
<td>N/A 0.1097* 0.1263*</td>
<td>N/A 0.0102 0.0190</td>
<td>N/A 0.0083 0.0185</td>
</tr>
<tr>
<td>School Submitted SAT Scores</td>
<td>N/A 20.279* 19.820*</td>
<td>N/A 4.377 4.132</td>
<td>N/A 5.767 5.483</td>
</tr>
<tr>
<td>Full-Time Equivalent Student Body (in 1000s)</td>
<td>N/A 0.4639* 0.4661*</td>
<td>N/A 0.0556 0.0568</td>
<td>N/A 0.0623 0.0637</td>
</tr>
<tr>
<td>Percent Underrepresented Minority Students</td>
<td>N/A -0.1234* -0.1172*</td>
<td>N/A -0.0294 -0.0261</td>
<td>N/A -0.0353 -0.0315</td>
</tr>
<tr>
<td>SAT*Remedial Interaction Term</td>
<td>N/A N/A -0.0207</td>
<td>N/A N/A -0.0111</td>
<td>N/A N/A -0.0128</td>
</tr>
<tr>
<td>R-Squared</td>
<td>0.8821 0.8343</td>
<td>0.2118 0.2152</td>
<td>0.199 0.2036</td>
</tr>
</tbody>
</table>

* = 5% significance  ** = 10% significance
In the first column of results of Table 3 the result of simply regressing 6-year graduation rates on remediation is shown, and it predicts the negatively biased result that remediation “causes” a large decline in graduation rates. When including controls for other characteristics of the school: the academic profile of the incoming freshman class, the general income need of the school's students, a few additional student services and opportunities, and a few indicators about the racial diversity on campus, the effects of remediation still appear negative, but the effects are reduced. When including an interaction term between remediation and SAT scores, the variable of interest becomes positive - although the negative coefficient for the interaction term means that remediation becomes less effective as schools’ academic profiles (SAT scores) increase.

3.3.1 Six-year graduation rates with controls

The SAT*Remedial interaction term is used to determine if remedial education changes in its effectiveness when used with different academic levels of student bodies. This term is first used in the third column. Now, observe the change to the variable of interest when including the relationship between it and SAT scores. The effect of remedial education changes from a small negative impact to a large positive impact and graduation rates are predicted to be 20.5 percentage points higher as a result of remediation, rather than 2.25 percentage points lower. However, this coefficient now no longer stands alone; remediation does not have a purely linear effect on graduation rates and needs to be considered in conjunction with how remediation affects different student bodies based on their inbound ability level. The remediation*SAT score interaction term is negative, meaning that remediation becomes less effective the better the students are academically, until it is actually detrimental to their success. Additionally, when considering remediation alone, it is no longer significant at the 10% level (although it is at 15%). However, when testing for joint significance with remedial education and the interaction term (of remediation and SAT scores), they are found to be jointly significant within the 10%
level \((p\text{-}value=.059)\). The declining benefits offered by remediation show that the highest SAT value where there is still any positive effect from remediation is 990.\(^{24}\) This is only 25% of the schools in this sample, after adding in the default score of 1059 for schools which did not submit SAT scores. One should also consider that this estimate may be biased upwards, since schools which do not report SAT scores may do so intentionally to not show their low average, therefore submitting the sample mean score may result in a high estimate for the 990 - the highest score shown to benefit from remediation. The dummy variable for submitting SAT scores should help alleviate this, but one should still be cautious that estimating that remediation helps 25% of the student sample may be overestimating.

3.3.2 Differences in six-year graduation rates from peers

When including control variables, the estimated effect of remediation on differences between an institution’s graduation rate and the average of its peers is negative, predicts a nearly 3 percentage point decrease in graduation rates, significant at the 5% level. However, when including an interaction term for SAT and remediation, the coefficient for remediation changes to a positive and larger absolute value term, predicting a 9.2 percentage point increase in graduation rates above peers, which decreases as SAT scores increase. The remediation and remediation*SAT joint-significance level is within 5% \((p\text{-}value=.0325)\). The results suggest that remediation only helps to improve graduation rates above those of its peers for SAT scores below 835.\(^{25}\) Using the median peer rate in place of the mean, the general results were similar, but the highest SAT scores which are shown to benefit from remedial education are 872.\(^{26}\) Both estimates are less than 1% of the sample. However, one should also consider the possibility that since SAT scores were not only one of the 11 variables used to determine peer institutions in the

\(^{24}\) All else equal, the effect that receiving remediation has on graduation rates = 20.5 - .0207*SAT.

\(^{25}\) All else equal, the effect that having remedial courses on campus has on a school and its difference in the mean graduation rates of peer institutions = 9.2292 - 0.01106*SAT.

\(^{26}\) All else equal, the effect that having remedial courses on campus has on a school and its difference in the median graduation rates of peer institutions = 11.1751 - 0.01281*SAT.
first place, but they were the variable given the highest weight (24.9%), the differences in graduation rates due to SAT scores are likely to be biased toward zero, since peer institutions are inherently going to be close together in terms of standardized tests.

3.4 FIXED EFFECTS

As mentioned previously, the variables used in this model slightly differ from some of the variables in the other models, because of the data available for the 1992-2000 timeframe. This equation regresses the change in graduation rates on changes in other explanatory variables over time – of interest being the change in the existence of remedial courses on campus. The first column again just shows the result of regressing the dependent variable on only the variable of interest. When including other control variables, the second column shows the coefficient for change in remediation policy to be insignificant. In fact, when regressing “change in graduation” on all of the variables except for remedial change (not shown in table), the p-value for the model decreases and the adjusted R-squared value increases.²⁷

²⁷ The p-value decreases by .0088, and the adjusted R-squared increases by .0013. Tests available from author on request.
## Table 4 Fixed Effects Model for Change in Graduation Rates Between 1998 and 2006

<table>
<thead>
<tr>
<th>Change in Variables Below Between 1992 and 2000:</th>
<th>Estimated coefficient followed by t value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>6.199*</td>
</tr>
<tr>
<td></td>
<td>16.81</td>
</tr>
<tr>
<td>Remediation</td>
<td>-1.0830</td>
</tr>
<tr>
<td></td>
<td>-0.82</td>
</tr>
<tr>
<td>In-State Tuition and Fees (In 1000s)</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>ROTC available</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Amount of Scholarships and Fellowships per Capita</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Amount of Pell Grant per Capita</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Percent Hispanic Students</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>SAT Required for Admission</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Student Population (In 1000s)</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Percent of Underrepresented Minority Students</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>R-Squared</td>
<td>0.003</td>
</tr>
</tbody>
</table>

* = 5% significance  ** = 10% significance
The original intention behind the use of the fixed effects model was to see if changes in remediation could explain changes in graduation rates. Ideally this would be reflected by schools which added remedial policies experiencing an increase in graduation rates that were more noticeable than any increase observed in schools which did not change their remedial policies. However, what is actually observed is that 1) only a few schools changed their policies at all and 2) more than 75% of the changes were actually schools removing their remedial policies. However, even though the model is weak in general, as well as when considering the effects of remediation, and the desired changes over time did not occur, there are still some interesting angles to consider from these results; although all possible explanations will need to be further tested before any substantial weight can be given to them. One angle to note is that this model further supports the previously discovered result that remediation benefits only lower-caliber schools, or rather, that it is a disadvantage to better schools. It is likely schools with better students are dropping their remedial programs, and therefore the “effect of dropping remediation” is just an endogenous effect of the school to begin with, rather than a different cause for change in institutional policy (e.g. a change in administration or budget cuts), which would allow for a more random assignment of remedial changes.

Another possibility is that if schools are dropping their remedial policies, perhaps they are referring students in need of remediation elsewhere, thereby only admitting a higher caliber student to begin with. This would really be an effect of the effort/desire of a school to change their student body profile, thus biasing the remediation coefficient, because remediation is then really just an endogenous effect of the school’s actions to change its image.

28 These are “more random” causes, because they are not likely to be as closely correlated with the academic caliber of the student body.
Finally, it could simply be that since the number of schools that changed remedial policies is such a small portion of the entire sample, that if even a slightly unbalanced portion of good schools dropped remedial policies (when in reality both high-end and low-end schools may be dropping - or adding - remedial programs), this could significantly bias the “change in remediation” coefficient downwards.
CHAPTER 4

CONCLUSION

4.1 RESULTS

With all of the debates surrounding remedial education and all of the small-scale studies used to argue different angles, one needs to consider the larger picture. Many have suggested that remedial education does not belong at four-year institutions. However, when considering four-year schools with populations of 10,000 or more students, remedial education does seem to have a positive impact on improving six-year graduation rates, but only for schools with a low academic profile, specifically schools are not found to benefit from remediation if their average SAT scores are above 990. Interestingly, although remediation does show a positive impact on graduation rates for certain schools, it does not show any impact on first-year retention rates. Although the fixed effects model proved to be a weak predictor of changes in graduation rates overall, as well as a weak predictor of the effect of a change in remedial policies on graduation rate changes, the results could be interpreted as supporting the significant findings concerning the OLS regressions stating that remediation only benefits schools with a relatively high proportion of academically struggling students. In other words, if a school is not in this category, which only a maximum of 25% of the sample is, then it is
not surprising that as schools are removing their remedial programs their graduation rates are increasing.

While the goal of this paper was never to answer all of the questions regarding remediation, it was to take a step toward this. From the results found with the OLS regressions with graduation and first-year retention rates, some specific questions can follow. First of all, if the end goal of remediation is to educate Americans for the labor force, then one the questions following this research should be: is a bachelor’s degree necessary for these labor demands, or would one or two years of college suffice? If the latter is true, then perhaps money does not need to be spent on four-year colleges’ remedial programs at all, again if the end goal of remediation is just to meet the demand for skilled labor. If one or two years of college will suffice, then an additional question to consider will be if this could not be better accomplished at community colleges, where two-year programs are traditional. If this is found to be a good alternative, then the tests for effectiveness of remediation can no longer apply to this student body, since the results found in this paper only came from a sample of four-year institutions. In the case of reviewing the effects of remediation on community colleges, a database with more detailed information about the remedial classes (developmental programs) themselves would have to be used, since nearly all (98%) community colleges have remedial programs.
If the goal of postsecondary education in the United States is not just to prepare a better labor force, but also to extend the opportunity for education to all Americans, as has been a growing trend since the 1800s, then future studies should evaluate the breadth and depth of developmental programs to find out what suggested approaches truly are beneficial. Funding can then be directed to the programs that best predict successful degree completion, or whatever the measure of success chosen is, for the particular type of student bodies with which they seem most effective.

The road toward deciding how to use remedial education and where it should be used will be a long one, but it is through steps like those taken in this paper that can allow for a more efficient allocation of funds to help further the goals of education today. Additionally, as time moves on trends in education will change, and the ways in which remediation are effective today may not apply in the not too distant future. For example, as technology increases and online schools are used more, completely different sets of data and controls may need to be used, since a college’s environment will likely have a much less profound impact on students. In sum, the answer to how best to use remediation is an ongoing process, where answers lead to new questions, and old questions have to be re-asked in the face of a changing student body in the United States, but the results from this paper do lead to some distinct next questions which should be addressed. As long as the goals of remediation are clearly stated and a desire to continue to research these questions and act upon the results is carried out,
then remedial goals should have better success at being more efficiently met in the future.
BIBLIOGRAPHY


