Chapter 3

Enrollments in Four-Year Colleges and Universities

Data Highlights

The total number of bachelors degrees granted through the nation's mathematics departments did not change substantially between 1994–95 and 1999–2000 and remained below the levels of 1989–1990. Of the mathematical sciences bachelors degrees, only mathematics education increased substantially during the 1990s; others declined, often by large percentages. The number of undergraduate computer science degrees granted by U.S. mathematics departments rose from 1995 levels, but remained far below the levels of 1990. The percentage of mathematics bachelors degrees awarded to women held steady at the 42–43% range throughout the 1990s.

Overall fall enrollments in four-year mathematics departments rebounded from lows reached in 1995, and almost returned to the levels of fall 1990. Combined Fall 2000 enrollments in mainstream Calculus I and II were essentially the same as they were in 1995, and were down from the levels of 1990. Advanced mathematics course enrollments grew from 1995 levels, but remained below where they were in fall 1990. Computer science enrollments in mathematics departments climbed 24% from their 1995 lows, but still remained less than 69% of their 1990 levels (Table E.2).

Overall enrollments in statistics departments continued their decade-long rise and increased about 14% from 1995 levels, reaching a point that was about 70% above 1990 levels. At the same time, the national statistics department faculty decreased markedly from 1995 levels — see Chapter 4 — with the inevitable result that average section sizes in statistics departments grew (Table E.11).

There was a clear staffing shift between 1995 and 2000 in both mathematics and statistics departments. The percentage of students taught by tenured and tenure-eligible faculty was down, often markedly, in every course category except remedial courses where it rose marginally. The percentages of enrollments taught by "other full time faculty" (i.e., full time faculty who are not tenured and not tenure-eligible) and by part-time faculty were up noticeably. The percentage of enrollment taught by graduate student teaching assistants declined, often to a major degree.

Notes on the Tables

There are eighteen tables in this chapter. The early tables present data on degrees granted and enrollments in different kinds of courses in various types of departments. Tables E.3 through E.9 focus on the question "Who teaches undergraduates?" as measured by percentages of enrollments. The final tables in the chapter present data on numbers of sections, rather than percentages of enrollment, another way to investigate the teaching effort of mathematics and statistics departments in the undergraduate mathematical and computer sciences. For a list of the courses in course categories (such as remedial, introductory, and calculus level) that are used in this chapter, see Appendix I.

In the CBMS2000 questionnaires, departments were asked to subdivide their fall 2000 sections based upon the nature of the instructor. Four instructor categories were used — tenured and tenure-eligible, other full time (e.g., non-tenure track full-time instructors, one year visitors, and postdocs), part-time faculty, and graduate teaching assistants. Because some departments did not give complete data on who taught the department's courses, many of the tables in this chapter have a category labeled "Unknown Instructor" that sometimes is of double digit size. This makes some historical comparisons problematic.

More detailed enrollment information on first-year calculus courses of various kinds and on first-year elementary statistics can be found in Chapter 5.

TABLE E.1: Number of Mathematical Sciences Bachelors Degrees

This table is an elaboration of Table SE.4 in Chapter 1.

A. Total Number of Majors

The total number of bachelors degrees granted by mathematics departments between July 1, 1999 and June 30, 2000 (22,220 with SE = 2165) was roughly the same as the number awarded between July 1, 1994 and June 30, 1995 (22,334, as reported in Table E.1 of [CBMS1995]). However, individual components of that total changed. For example, the number of bachelors degrees awarded by mathematics departments in computer science was up by 21% from 1995 levels and the number of bachelors degrees in statistics was down by almost 50% between 1995 and 2000. (That 50% decline seems anomalous, but it is what CBMS2000 data show.) Mathematics education bachelors degrees were up slightly from 1995 levels. Statistics departments also experienced a large decline, of about 30%, from the number of statistics bachelors degrees awarded in 1995.

Compared to findings of the 1990 CBMS survey (Tables E.5 and E.6 in [CBMS1990]), CBMS2000 data show a roughly 5% decline in the number of bachelors degrees awarded by mathematics departments over the decade. That 5% decline includes a 35% drop in the number of computer science degrees, partially offset by an increase of about 3% in the number of mathematical sciences bachelors degrees. Within the mathematical sciences degree category, mathematics education was the only degree that was given in greater numbers in 2000 than in 1990, the increase being about 60% with most of the growth occurring during the first half of the decade. Other mathematical sciences degrees awarded by mathematics departments declined, dropping 8% in the mathematics major and 25% in the statistics major. Statistics departments, by contrast, saw a 16% increase in the number of bachelors degrees that they awarded between 1990 and 2000 ([CBMS1990, p.30]).
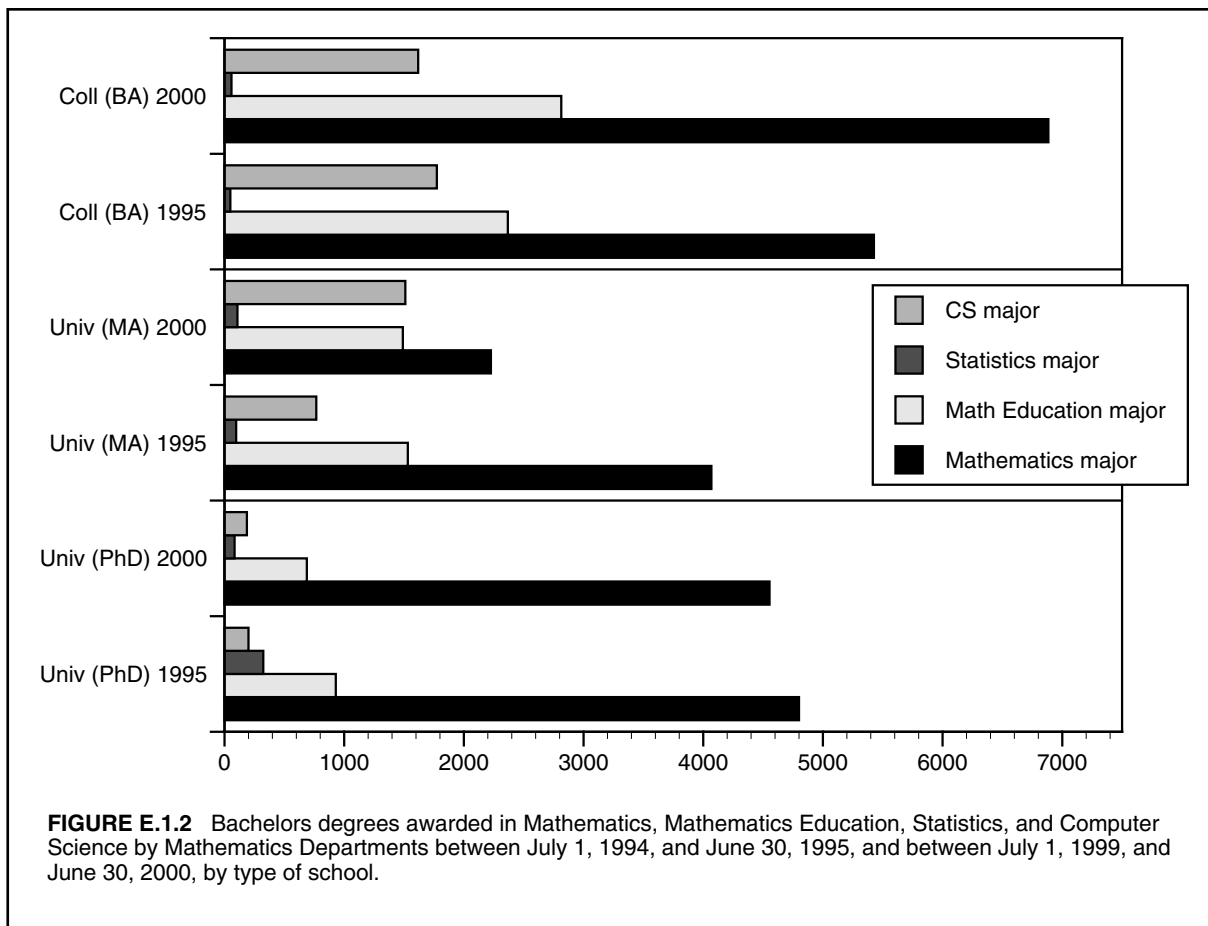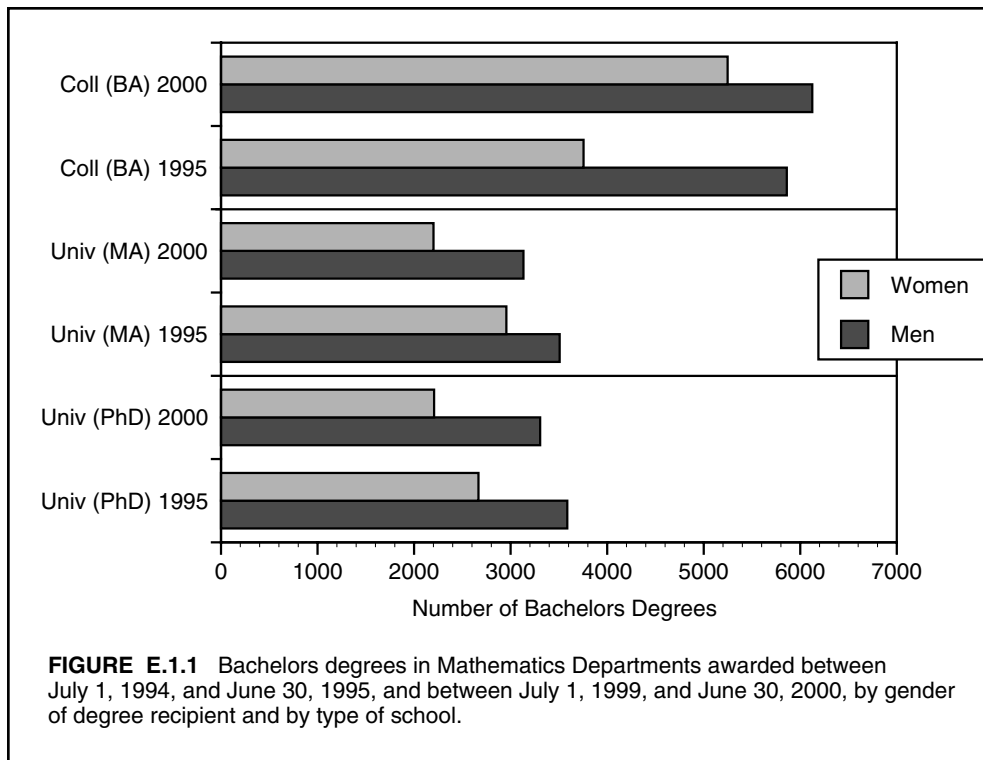
B. Bachelors Degrees Granted to Women

The CBMS2000 survey did not detect any major changes between 1995 and 2000 in the percentage of bachelors degrees awarded to women by mathematics departments. The 43% figure found by CBMS2000 is very close to the 42% figure in CBMS1995. However, there did appear to be gender shifts within some components of the overall degrees awarded. For example, in 1995, 49% of mathematics education bachelors degrees went to women, while in 2000 the percentage was 59%. The same rise (from 49% to 59% female) also occurred among statistics bachelors degrees awarded by mathematics departments, and the percentage of women among computer science majors in mathematics departments increased from 22% in 1995 to 24% in 2000. In the much larger group of mathematics majors, the period from 1995 to 2000 saw a slight decline in the percentage of bachelors degrees granted to women. On the other hand, statistics departments experienced an increase from 38% to 43% in the percentage of bachelors degrees awarded to women during the same five year period.

If one compares CBMS2000 data to the findings of the CBMS survey in 1990, one sees essentially no change in the percentage of bachelors degrees awarded to women. However, definite gender shifts occurred in some majors offered by mathematics departments. For example, over the decade both mathematics education and computer science experienced declines of at least five percentage points in the percentage of degrees awarded to women, while the percentage of statistics degrees awarded (by mathematics departments) to women rose sharply, from 32% to 59%. During the decade of the 1990s, the percentage of bachelors degrees awarded to women by statistics departments rose by five percentage points, holding steady at 38% from 1990 to 1995, and then increasing to 43% in 2000.

TABLE E.1 Bachelors degrees in Mathematics, Mathematics Education, Statistics, and Computer Science in Mathematics Departments and in Statistics Departments awarded between July 1, 1999, and June 30, 2000, by gender of degree recipient and type of school.

Bachelors degrees in Math and Stat Depts	Mathematics Departments				Statistics Departments			Total Math & Stat Depts
	Univ (PhD)	Univ (MA)	Coll (BA)	Total Math Depts	Univ (PhD)	Univ (MA)	Total Stat Depts	
Mathematics majors (including Act Sci, Oper Res, and joint degrees)								
Men	2851	1340	3742	**7933**				**7933**
Women	1703	886	3142	**5731**				**5731**
	(37%)	(40%)	(46%)	**(42%)**				**(42%)**
Total Math degrees	**4554**	**2226**	**6884**	**13664**				**13664**
Mathematics Education majors								
Men	274	562	1187	**2023**				**2023**
Women	414	928	1626	**2968**				**2968**
	(60%)	(62%)	(58%)	**(59%)**				**(59%)**
Total Math Ed degrees	**688**	**1490**	**2813**	**4991**				**4991**
Statistics majors								
Men	36	43	24	**103**	161	62	**223**	**326**
Women	48	65	34	**147**	139	32	**171**	**318**
	(57%)	(60%)	(59%)	**(59%)**	(46%)	(34%)	**(43%)**	**(49%)**
Total Stat degrees	**84**	**108**	**58**	**250**	**300**	**94**	**394**	**644**
Computer Science majors								
Men	146	1189	1172	**2507**				**2507**
Women	41	322	445	**808**				**808**
	(22%)	(21%)	(28%)	**(24%)**				**(24%)**
Total CS degrees	**187**	**1511**	**1617**	**3315**				**3315**
Total degrees - Men	**3307**	**3134**	**6125**	**12566**	**161**	**62**	**223**	**12789**
Total degrees - Women	**2206**	**2201**	**5247**	**9654**	**139**	**32**	**171**	**9825**
	(40%)	**(41%)**	**(46%)**	**(43%)**	**(46%)**	**(34%)**	**(43%)**	**(43%)**
Total all degrees	**5513**	**5335**	**11372**	**22220**	**300**	**94**	**394**	**22614**

FIGURE E.1.1 Bachelors degrees in Mathematics Departments awarded between July 1, 1994, and June 30, 1995, and between July 1, 1999, and June 30, 2000, by gender of degree recipient and by type of school.

FIGURE E.1.2 Bachelors degrees awarded in Mathematics, Mathematics Education, Statistics, and Computer Science by Mathematics Departments between July 1, 1994, and June 30, 1995, and between July 1, 1999, and June 30, 2000, by type of school.

TABLE E.2: Fall Enrollments in Mathematics, Statistics, and Computer Science Courses

By fall 2000, overall mathematical sciences fall enrollments in mathematics departments rebounded by about 11% from their 1995 lows, almost reaching fall 1990 levels. Overall enrollments in statistics departments continued their decade-long rise, although at a slower pace than between 1990 and 1995.

As in previous CBMS studies, the mathematical sciences curriculum was divided into various levels and sub-disciplines. Mathematics was divided into remedial level, introductory level (including pre-calculus), calculus level, and advanced mathematics. Statistics was divided into elementary level and upper level. Computer science was divided into lower, middle, and upper levels. For a complete listing of the levels and the courses within them, see Appendix I.

Enrollment growth in the mathematical sciences was not uniform. Remedial level fall term enrollments were down 1% between fall 1995 and fall 2000 and were down about 16% compared to fall 1990. Only in bachelors-level departments did remedial level enrollments increase after 1995, and in fall 2000 they slightly exceeded their fall 1990 level. Introductory level enrollments, which include the Liberal Arts Mathematics course as well as pre-calculus courses, rose by about 18% between fall 1995 and fall 2000, and by about 22% compared to fall 1990. Calculus level enrollments rose from their 1995 lows, but remained about 12% below their 1990 levels. The calculus level increase between fall 1995 and fall 2000 occurred in doctoral and masters departments while calculus level enrollments in bachelors departments dropped 9% from 1995 levels.

Advanced mathematics enrollments grew from their fall 1995 lows, but fell short of 1990 levels by about 14%. Only in bachelors-level departments did advanced mathematics enrollments rise to a level that exceeded both 1990 and 1995.
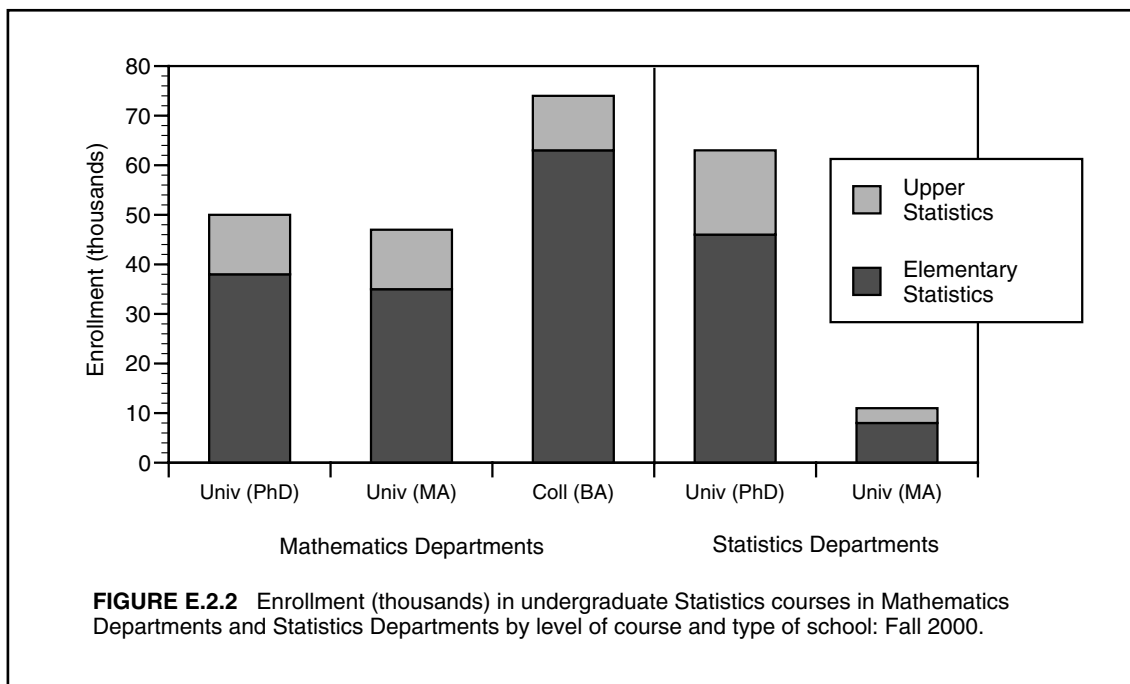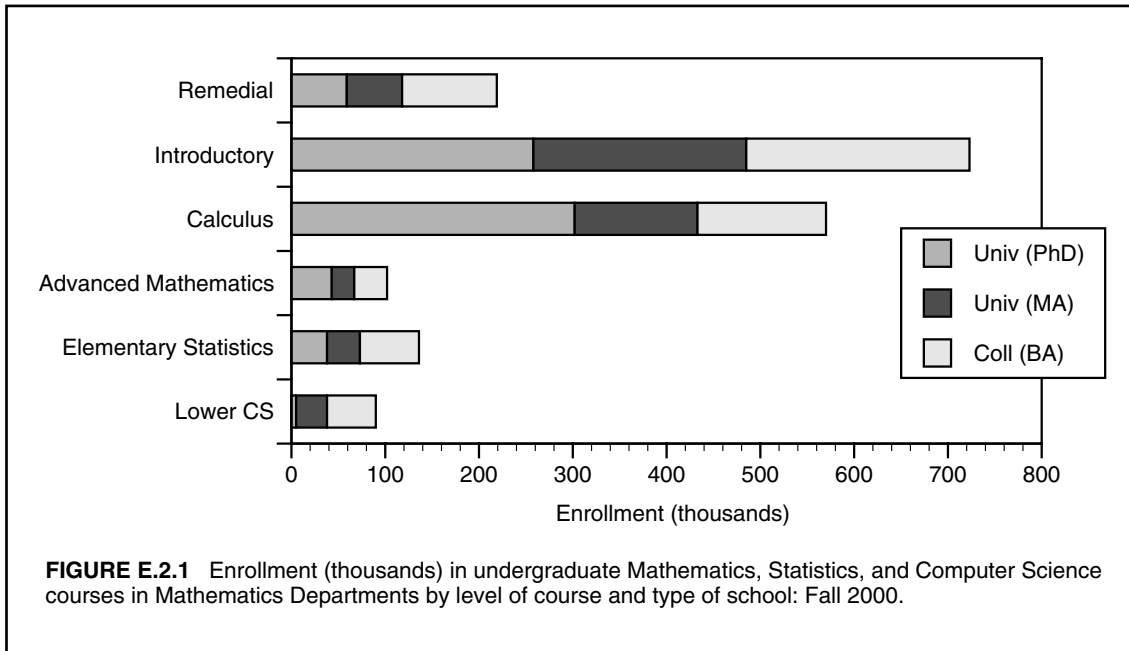
Statistics enrollments in mathematics departments grew 19% compared to fall 1995, and exceeded their fall 1990 levels by 37%. Statistics enrollments in statistics departments rose almost 14% above 1995 levels and exceeded 1990 levels by about 68%. Combined statistics course enrollments for both mathematics and statistics departments climbed about 18% from 1995 totals, and by about 45% from 1990 levels. As was the case in 1995, almost 70% of all undergraduate statistics enrollments were in mathematics departments.

Computer science enrollments in mathematics departments were primarily in bachelors- and masters-level departments. They climbed 24% from fall 1995 levels, but still remained less than 70% of their 1990 levels.

Enrollment histories for individual courses are given in Appendix I. Of special interest for predicting upper division mathematics enrollments and the number of bachelors degrees in mathematics and statistics are the enrollment histories of mainstream Calculus I, II, and III. (The word "mainstream" means "can serve as a prerequisite for upper division mathematical sciences courses.") In 1990, mainstream Calculus I and II had fall term enrollments of 201,000 and 88,000, respectively. By 1995, the figures had dropped to 192,000 and 83,000. Fall 2000 enrollments in mainstream Calculus I remained at 192,000, and mainstream Calculus II fall enrollments rose slightly, to 87,000. It is interesting to note that fall term enrollments in mainstream Calculus II were steadier than Calculus I enrollments between fall 1990 and fall 2000. This may be evidence of a larger number of entering freshmen having a good knowledge of Calculus I from their high school educations. Finally, fall enrollments in Calculus III (and Calculus IV in departments not using the semester system) rose by almost 18% since fall 1995, to about 73,000.

TABLE E.2 Enrollment (in thousands) in undergraduate Mathematics, Statistics, and Computer Science courses in Mathematics Departments and in Statistics Departments by level of course and type of school: Fall 2000. Also full-time faculty: Fall 2000. (Numbers in parentheses are (1990,1995) enrollments.)

	Fall 2000 (1990,1995) enrollments (1000s)						
	Mathematics Departments				Statistics Departments		
	Univ (PhD)	Univ (MA)	Coll (BA)	**Total Math Depts**	Univ (PhD)	Univ (MA)	**Total Stat Depts**
Number of full-time faculty 2000	6702	5002	7303	**19007**	875	146	**1021**
Mathematics courses							
Remedial	59 (68,60)	59 (93,84)	101 (100,78)	**219 (261,222)**			
Introductory (incl. Precalc)	258 (205,222)	227 (202,193)	238 (185,198)	**723 (592,613)**			
Calculus	302 (337,264)	131 (122,124)	137 (188,150)	**570 (647,538)**			
Advanced Mathematics	43 (58,41)	24 (29,25)	35 (32,30)	**102 (119,96)**			
Total Math courses	**662 (668,587)**	**441 (446,426)**	**511 (505,456)**	1614 **(1619,1469)**			
Statistics courses							
Elementary Statistics	38 (14,23)	35 (27,35)	63 (46,57)	**136 (87,115)**	46 (25,46)	8 (5,3)	**54 (30,49)**
Upper Statistics	12 (18,10)	12 (12,7)	11 (8,11)	**35 (38,28)**	17 (14,16)	3 (0,0)	**20 (14,16)**
Total Stat courses	**50 (32,33)**	**47 (39,42)**	**74 (54,68)**	171 **(125,143)**	**63 (39,62)**	**11 (5,3)**	74 **(44,65)**
CS courses							
Lower CS	5 (9,4)	33 (42,18)	52 (83,52)	**90 (134,74)**	0 (0,0)	1 (0,1)	**1 (0,1)**
Middle CS	1 (1,0)	7 (4,3)	9 (7,10)	**17 (12,13)**			
Upper CS	2 (6,2)	6 (12,4)	8 (16,6)	**16 (34,12)**			
Total CS courses	**8 (16,6)**	**46 (58,25)**	**69 (106,68)**	123 **(180,99)**	**0 (0,0)**	**1 (0,1)**	1 **(0,1)**
Total all courses	**720 (716,626)**	**534 (543,493)**	**654 (665,592)**	1908 **(1924,1711)**	**63 (39,62)**	**12 (5,4)**	75 **(44,66)**

FIGURE E.2.1 Enrollment (thousands) in undergraduate Mathematics, Statistics, and Computer Science courses in Mathematics Departments by level of course and type of school: Fall 2000.

FIGURE E.2.2 Enrollment (thousands) in undergraduate Statistics courses in Mathematics Departments and Statistics Departments by level of course and type of school: Fall 2000.

TABLES E.3–E.9: Who Teaches Undergraduates in Four-Year Colleges and Universities?

The tables in this section are elaborations of Tables SFY.17, SFY.18, and SFY.19 in Chapter 1.

Table E.3 is the first of seven tables that describe the percentages of enrollments in lower and middle level courses in mathematics departments and statistics departments that were taught by different types of instructors (tenured/tenure-eligible, other full-time, part-time, and graduate teaching assistants). Table E.3 gives overall enrollment figures and Tables E.4 to E.9 show enrollment percentages in various subcategories of the mathematical sciences and computer science curricula. See Appendix II for a discussion of the methodology used to estimate the percentages of enrollments. As a result of that methodology, figures for standard errors are not available for estimates of percentages of enrollments. Tables E.3 through E.9 deal only with freshman and sophomore courses because, as was the case in CBMS1995, we made the assumption that all upper level courses were taught by tenured and tenure-eligible faculty.

Comparison of Tables E.3 through E.9 with the corresponding tables from CBMS1995 is complicated by the fact that many respondents to the CBMS2000 survey did not identify the instructors of a certain percentage of their sections. In response we created a new category called "Unknown Instructor," and in many cases the unknown instructor percentage was 10% or more. Part of the unknown instructor percentage occurs because many departments taught at least some of their sections by "distance learning,"

a topic discussed in Chapter 2 of this report, and these sections were not categorized by type of instructor. However, the number of sections taught by distance learning does not come close to accounting for the percentage of enrollments listed as having "unknown instructor" in Tables E.3 through E.9.

Tables E.4 through E.9 give details about the percentages of enrollments in the lower and middle parts of the curriculum that were taught by various types of instructors. Like Table E.3, they often have large percentages of "Unknown Instructors" that make direct comparisons with 1995 data problematic. Nevertheless, taken together, Tables E.4 to E.9 point to three common conclusions about changes that occurred between fall 1995 and fall 2000:
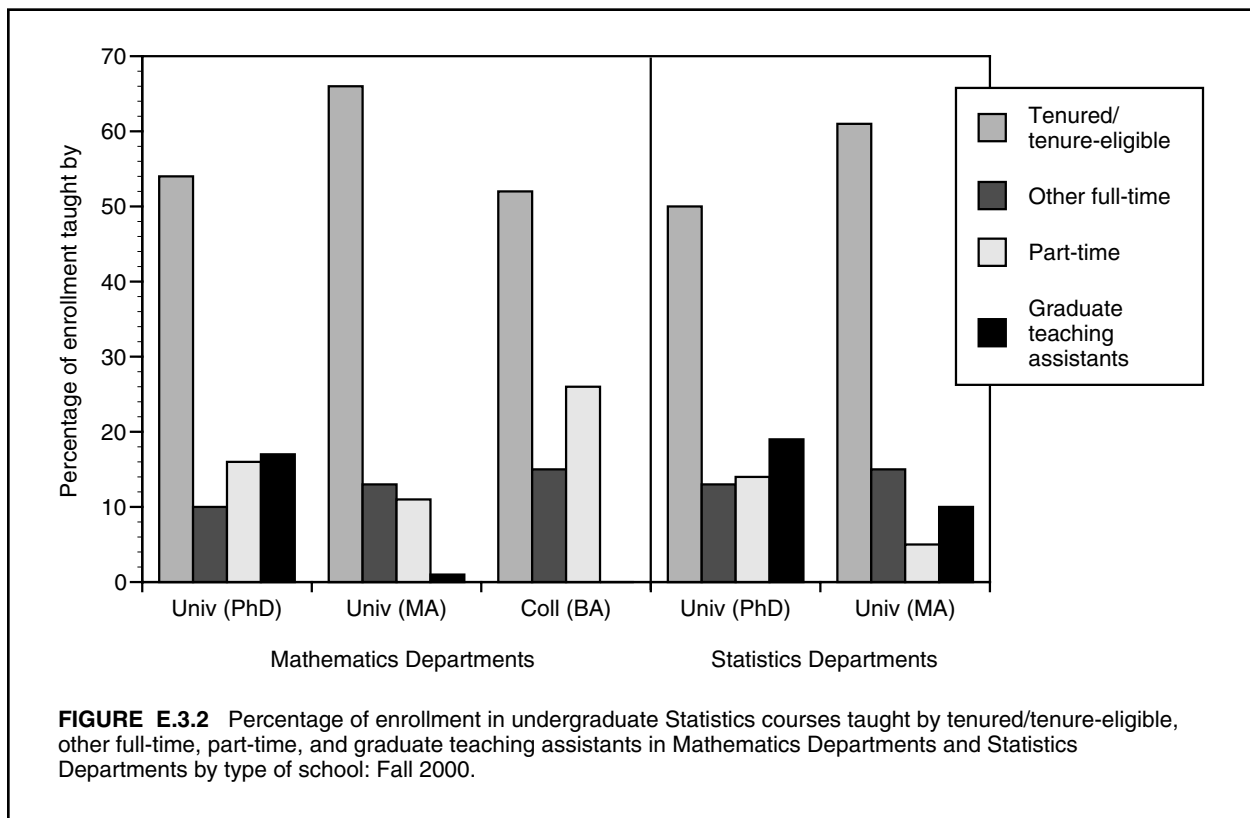
a) the percentage of students taught by tenured and tenure-eligible instructors was down, sometimes markedly;

b) the percentage of enrollment taught by other full-time faculty (visitors, post-docs, etc.) and by part-time faculty was up;

c) the percentage of enrollments taught by graduate teaching assistants was down, often to a pronounced degree.

There are exceptions, but they are minor. For example, Table E.4 reports that the percentage of remedial level enrollments taught by tenured and tenure-eligible faculty rose from 14% to 15% between fall 1995 and fall 2000, and Table E.8 reports that the percentage of lower level computer science enrollments taught by graduate students rose from 0% to 1%.

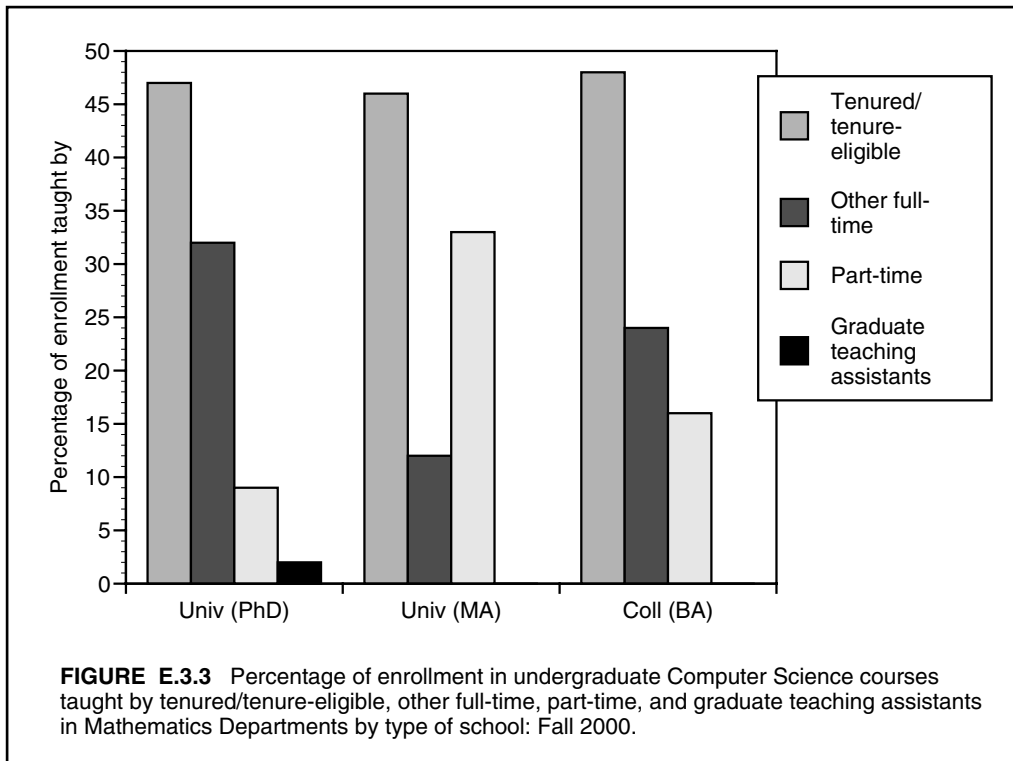**TABLE E.3** Percentage of enrollment in undergraduate Mathematics, Statistics, and Computer Science courses taught by tenured/tenure-eligible (T/TE), other full-time (OFT), part-time (PT), graduate teaching assistants (GTA), and unknown (Ukn) in Mathematics Departments and in Statistics Departments by type of school: Fall 2000 (Fall 1995 figures in parentheses).

	Percentage of Mathematics enrollment taught by					Mathematics enrollment 1000s	Percentage of Statistics enrollment taught by					Statistics enrollment 1000s	Percentage of CS enrollment taught by					CS enrollment 1000s
	T/TE %	OFT %	PT %	GTA %	Ukn %		T/TE %	OFT %	PT %	GTA %	Ukn %		T/TE %	OFT %	PT %	GTA %	Ukn %	
Mathematics Departments																		
Univ (PhD)	38 (39)	19 (14)	19 (13)	21 (33)	3	662 (587)	54 (52)	10 (6)	16 (10)	17 (33)	3	50 (33)	47 (82)	32 (6)	9 (12)	2 (0)	10	8 (6)
Univ (MA)	40 (49)	22 (16)	24 (22)	5 (12)	9	441 (426)	66 (75)	13 (9)	11 (12)	1 (4)	9	47 (42)	46 (63)	12 (17)	33 (19)	0 (1)	9	46 (25)
Coll (BA)	54 (65)	14 (10)	25 (24)	0 (0)	7	511 (456)	52 (77)	15 (5)	26 (19)	0 (0)	7	74 (68)	48 (68)	24 (14)	16 (19)	0 (0)	12	69 (68)
Statistics Departments																		
Univ (PhD)							50 (55)	13 (8)	14 (6)	19 (30)	4	63 (62)						0 (0)
Univ (MA)							61 (63)	15 (21)	5 (15)	10 (0)	9	11 (3)						1 (1)

FIGURE E.3.1 Percentage of enrollment in undergraduate Mathematics courses taught by tenured/tenure-eligible, other full-time, part-time, and graduate teaching assistants in Mathematics Departments by type of school: Fall 2000.

FIGURE E.3.2 Percentage of enrollment in undergraduate Statistics courses taught by tenured/tenure-eligible, other full-time, part-time, and graduate teaching assistants in Mathematics Departments and Statistics Departments by type of school: Fall 2000.

FIGURE E.3.3 Percentage of enrollment in undergraduate Computer Science courses taught by tenured/tenure-eligible, other full-time, part-time, and graduate teaching assistants in Mathematics Departments by type of school: Fall 2000.

TABLE E.4 Percentage of enrollment in Remedial level courses taught in Mathematics Departments by type of instructor and type of school: Fall 2000 (1995 figures in parentheses).

	Percentage of enrollment taught by					
	Tenured/ tenure- eligible %	Other full-time %	Part-time %	Graduate teaching assistants %	Ukn %	Total enrollment 1000s
Mathematics Departments						
Univ (PhD)	3 (1)	13 (12)	43 (33)	32 (54)	9	**59** **(60)**
Univ (MA)	7 (12)	26 (16)	46 (41)	12 (30)	9	**59** **(84)**
Coll (BA)	26 (26)	16 (12)	46 (61)	0 (1)	12	**101** **(78)**
Total	**15** **(14)**	**18** **(14)**	**45** **(46)**	**12** **(26)**	**10**	**219** **(222)**

TABLE E.5 Percentage of enrollment in Introductory level (including precalculus) courses in Mathematics Departments by type of instructor and type of school: Fall 2000 (1995 figures in parentheses).

	Percentage of enrollment taught by					
	Tenured/ tenure- eligible %	Other full-time %	Part-time %	Graduate teaching assistants %	Ukn %	**Total enrollment 1000s**
Mathematics Departments						
Univ (PhD)	17 (18)	25 (17)	24 (16)	31 (49)	3	**258** **(222)**
Univ (MA)	28 (42)	28 (22)	27 (24)	6 (12)	11	**227** **(193)**
Coll (BA)	47 (63)	16 (14)	31 (23)	0 (0)	6	**238** **(198)**
Total	**30** **(40)**	**23** **(18)**	**27** **(21)**	**13** **(22)**	**7**	**723** **(613)**

TABLE E.6 Percentage of enrollment in Calculus level courses taught in Mathematics Departments by type of instructor and type of school: Fall 2000 (1995 figures in parentheses).

	Percentage of enrollment taught by					
	Tenured/ tenure- eligible %	Other full-time %	Part-time %	Graduate teaching assistants %	Ukn %	**Total enrollment 1000s**
Mathematics Departments						
Univ (PhD)	54 (62)	18 (13)	12 (7)	14 (19)	2	**302** **(264)**
Univ (MA)	65 (76)	14 (11)	15 (11)	1 (2)	5	**131** **(124)**
Coll (BA)	75 (81)	13 (7)	7 (12)	0 (0)	5	**137** **(150)**
Total	**61** **(71)**	**16** **(11)**	**12** **(9)**	**8** **(10)**	**3**	**570** **(538)**

TABLE E.7 Percentage of enrollment in Elementary Level Statistics courses taught in Mathematics Departments and Statistics Departments by type of instructor and type of school: Fall 2000 (1995 figures in parentheses).

	Percentage of enrollment taught by					
	Tenured/ tenure- eligible %	Other full-time %	Part-time %	Graduate teaching assistants %	Ukn %	Total enrollment 1000s
Mathematics Departments						
Univ (PhD)	40 (31)	13 (8)	21 (15)	23 (47)	3	**38** **(23)**
Univ (MA)	54 (70)	17 (11)	15 (14)	2 (5)	12	**35** **(35)**
Coll (BA)	44 (72)	17 (4)	31 (23)	0 (0)	8	**63** **(57)**
Total Math Depts	**45** **(63)**	**16** **(7)**	**24** **(19)**	**7** **(11)**	**8**	**136** **(115)**
Statistics Departments						
Univ (PhD)	31 (40)	17 (11)	20 (9)	27 (41)	5	**46** **(46)**
Univ (MA)	46 (63)	20 (21)	7 (15)	14 (0)	13	**8** **(3)**
Total Stat Depts	**33** **(41)**	**18** **(12)**	**18** **(9)**	**25** **(38)**	**6**	**54** **(49)**

TABLE E.8 Percentage of enrollment in Lower Level Computer Science courses taught in Mathematics Departments by type of instructor and type of school: Fall 2000 (1995 figures in parentheses).

	Percentage of enrollment taught by					
	Tenured/ tenure- eligible %	Other full-time %	Part-time %	Graduate teaching assistants %	Ukn %	Total enrollment 1000s
Mathematics Departments						
Univ (PhD)	34 (73)	39 (9)	14 (18)	2 (0)	11	**5** **(4)**
Univ (MA)	39 (54)	15 (20)	39 (24)	0 (2)	7	**33** **(18)**
Coll (BA)	39 (61)	29 (15)	18 (25)	1 (0)	13	**52** **(52)**
Total	**39** **(60)**	**24** **(16)**	**26** **(24)**	**1** **(0)**	**10**	**90** **(74)**

TABLE E.9 Percentage of enrollment in Middle Level Computer Sciences courses taught in Mathematics Departments by type of instructor and type of school: Fall 2000 (Fall 1995 figures in parentheses).

	Percentage of enrollment taught by					
	Tenured/ tenure- eligible %	Other full-time %	Part-time %	Graduate teaching assistants %	Ukn %	Total enrollment 1000s
Mathematics Departments						
Univ (PhD)	29 (na)	56 (na)	0 (na)	0 (na)	15	**1** **(0)**
Univ (MA)	62 (68)	7 (20)	20 (13)	0 (0)	11	**7** **(3)**
Coll (BA)	70 (82)	14 (17)	13 (1)	0 (0)	3	**9** **(10)**
Total	**65** **(79)**	**13** **(18)**	**15** **(4)**	**0** **(0)**	**7**	**17** **(13)**

TABLES E.10–E.12: Measuring Department Effort by Sections Offered

One way to study the national teaching effort in undergraduate mathematical and computer sciences is to look at the percentages of enrollments taught by various kinds of instructors, and that is the approach used in Tables E.3 to E.9. A different way is to study the number and sizes of sections offered, and who is assigned to teach them. Because of varying average section sizes, the two approaches do not give identical percentages. Data on numbers of sections offered, on average section sizes, and on who taught those sections in fall 2000 appear in Tables E.10, E.11, and E.12. These tables may be compared with Tables E.2 and E.3.

A. Changes in Numbers of Sections During the 1990s

The CBMS1995 survey showed that there was a marked decline in the number of fall term sections offered at the remedial level, the calculus level, and in both lower and upper level computer science between 1990 and 1995. The CBMS2000 survey shows that there was a reversal of that trend between fall 1995 and fall 2000. Although fall 2000 figures rose from 1995 levels, they were still below the levels found in fall 1990. For example, while the estimate of the number of remedial sections in fall 2000 exceeds the corresponding estimate in fall 1995, it is only at 90% of its level in fall 1990, and the number of calculus level sections was only 86% of what it was ten years earlier. The numbers of lower and upper level computer science sections rebounded to about 74% and 61% of their 1990 levels, respectively.

The number of sections offered by mathematics departments at the introductory level (which includes Liberal Arts mathematics as well as pre-calculus courses) grew between 1990 and 1995, and continued to grow between 1995 and 2000, although at a slower pace, reaching 120% of its 1990 level by fall 2000.

The number of advanced mathematics sections was down from 1995 levels. Their decade-long history shows 7,650 advanced mathematics sections in fall 1990, then 8,057 in fall 1995, and 7,743 in fall 2000. The number of advanced mathematics sections ended the decade of the 1990s just slightly above where it began.

The number of elementary level statistics sections offered by mathematics departments in fall 2000 was 21% above its fall 1995 level and was 64% above its level ten years earlier. The number of sections of elementary level statistics taught in statistics departments increased by 12% from 1995 to 2000 and in fall 2000 was 84% above its 1990 level. As was the case in 1995, the majority of elementary level statistics sections taught in the U.S. were offered by mathematics departments — almost five times as many as were offered by statistics departments.

Comparison with 1995 data shows a shift in the way that mathematics departments allocated their effort among mathematics, statistics, and computer science, as measured by the number of sections offered in each. Between 1995 and 2000, the percentage of all sections offered in mathematics courses dropped from 82.8% to 80.5%, while the percentage of sections offered in statistics rose from 8.6% to 9.3% and the percentage of sections in computer science rose from 8.6% to 10.2%.

Table E.10 shows that about 11.6% of all sections taught by mathematics departments in fall 2000 were advanced level mathematics, compared to about 13% in 1995. The percentage was not uniform across departments: about 14% of (undergraduate) sections offered by doctoral departments were devoted to advanced mathematics, while the corresponding figure was about 10 % in masters-level departments and 11% in bachelors-level departments. In fall 1995, the corresponding percentages were 15% in doctoral departments, 11% in masters departments, and 13.5% in bachelors departments.

At the other end of the spectrum, about 11.4% of all fall term 2000 sections taught in mathematics departments were devoted to remedial level courses, down slightly from 1995. Once again, the decrease was not uniform across departments. Remedial sections were down slightly in doctoral departments, and markedly in masters departments (from about 15% in fall 1995 to 9% in fall 2000), while in bachelors-level departments, remedial level teaching rose from 11% to 14.5% of all sections offered.

As noted above, the percentage of all mathematics department sections devoted to statistics rose from 8.6% to 9.3% between fall 1995 and fall 2000. The largest percentage increase occurred in Ph.D. mathematics departments, which devoted about 5.9% of their sections to statistics in fall 1995 and about 8.1% in fall 2000. This increase in sections offered is consistent with the enrollment figures in Table E.2, showing that statistics enrollments in mathematics departments rose from 8.36% of all enrollments in fall 1995 to 8.96% in fall 2000.

B. Average Section Size

Within the broad course categories considered in Table E.11, national average section sizes in fall 2000 were not much changed from 1995 levels, except in middle level computer science courses where the average increased substantially. Elementary statistics sections tended to be the largest of all, followed closely by introductory mathematics sections. While there was substantial variation in average section sizes in calculus courses (see also Chapter 5), it is interesting to note that the national average was 32 students per calculus section, only slightly above the level of 30 students per section recommended by professional societies ([MAA Guidelines]).

If one looks at average section sizes by type of course and type of department (see Table E.11), one sees that average section sizes in doctoral mathematics departments increased in almost every category of course (remedial, introductory, etc.) between fall 1995 and fall 2000. In masters-level departments, average section sizes increased in about half of the course categories and decreased in about half, while average section sizes in bachelors-level mathematics departments dropped except in advanced mathematics, upper level statistics, and middle and upper level computer science. Statistics departments saw a substantial rise in average section sizes. That increase was the natural consequence of staffing decreases in statistics departments (see Chapter 4) at the same time that statistics department enrollments increased by 14% between 1995 and 2000.

TABLE E.10 Number of sections of undergraduate Mathematics, Statistics, and Computer Science courses in Mathematics Departments and Statistics Departments by level of course and type of school: Fall 2000 (1995 figures in parentheses).

	Number of sections: Fall 2000 (Fall 1995)						
	Mathematics Departments				Statistics Departments		
	Univ (Phd)	Univ (MA)	Coll (BA)	**Total Math Depts**	Univ (PhD)	Univ (MA)	**Total Stat Depts**
Mathematics courses							
Remedial	1493 (1663)	1772 (2670)	4388 (2913)	**7653 (7246)**			
Introductory (incl. Precalc)	5032 (5258)	6506 (5673)	8987 (7036)	**20525 (17967)**			
Calculus	6768 (6061)	4551 (4280)	6438 (6932)	**17757 (17273)**			
Advanced Mathematics	2392 (2531)	1936 (1886)	3415 (3640)	**7743 (8057)**			
Total Math courses	15685 (15513)	14765 (14509)	23228 (20521)	**53678 (50543)**			
Statistics courses							
Elementary Statistics	827 (551)	1064 (1028)	2372 (1951)	**4263 (3530)**	786 (748)	123 (72)	**909 (810)**
Upper Statistics	580 (446)	638 (482)	728 (768)	**1946 (1696)**	476 (576)	122 (48)	**598 (624)**
Total Stat courses	1407 (997)	1702 (1511)	3100 (2719)	**6209 (5227)**	1262 (1324)	245 (120)	**1507 (1444)**
CS courses							
Lower CS	92 (137)	1553 (796)	2557 (2431)	**4202 (3364)**	4 (7)	12 (30)	**16 (37)**
Middle CS	24 (48)	465 (245)	590 (651)	**1079 (944)**	0 (0)	2 (4)	**2 (4)**
Upper CS	98 (89)	527 (230)	868 (652)	**1493 (971)**	0 (0)	8 (10)	**8 (10)**
Total CS courses	214 (274)	2545 (1271)	4015 (3734)	**6774 (5279)**	4 (7)	22 (44)	**26 (51)**
Total all courses	**17306 (16784)**	**19012 (17291)**	**30343 (26974)**	**66661 (61049)**	**1266 (1391)**	**267 (168)**	**1533 (1559)**

TABLE E.11   Average section size for undergraduate Mathematics, Statistics, and Computer Sciences courses in Mathematics Departments and Statistics Departments by level of course and type of school: Fall 2000 (1995 data in parentheses). Also, all departments' average section sizes from previous CBMS surveys.

| | Average section size Fall 2000 (1995) | | | | | | | | |
| | Mathematics Depts | | | Statistics Depts | | | | | |
	Univ (PhD)	Univ (MA)	Coll (BA)	Univ (PhD)	Univ (MA)	**All Depts 1985**	**All Depts 1990**	**All Depts 1995**	**All Depts 2000**
Mathematics courses									
Remedial	39 (36)	33 (32)	23 (27)			32	31	31	29
Introductory (incl. Precalc)	51 (42)	35 (34)	26 (28)			35	35	34	35
Calculus	45 (44)	29 (29)	21 (22)			34	35	31	32
Advanced Mathematics	18 (16)	12 (14)	10 (8)			19	16	12	13
Statistics courses									
Elementary Statistics	46 (42)	33 (34)	27 (29)	58 (50)	65 (42)	37	37	38	37
Upper Statistics	21 (22)	19 (15)	15 (14)	36 (27)	25 (23)	30	24	19	22
CS courses									
Lower CS	50 (29)	21 (23)	20 (21)	13 (na)	58 (na)	na	24	22	22
Middle CS	39 (na)	16 (12)	16 (15)		90 (na)	na	15	14	22
Upper CS	21 (22)	12 (17)	10 (9)		30 (na)	na	14	12	11

TABLE E.12 Percentage of sections of Mathematics, Statistics, and Computer Science courses taught by tenured/tenure-eligible (T/TE), other full-time (OFT), part-time (PT), graduate teaching assistants (GTAs), and unknown (Ukn) in Mathematics Departments and Statistics Departments by type of school: Fall 2000 (Fall 1995 figures in parentheses).

	Percentage of Mathematics sections taught by					No. of Math sections	Percentage of Statistics sections taught by					No. of Stat sections	Percentage of CS sections taught by					No. of CS sections
	T/TE %	OFT %	PT %	GTAs %	Ukn %		T/TE %	OFT %	PT %	GTAs %	Ukn %		T/TE %	OFT %	PT %	GTAs %	Ukn %	
Math Depts																		
Univ (PhD)	42 (45)	16 (11)	17 (12)	21 (31)	4	15685 (15513)	63 (61)	9 (3)	11 (8)	14 (28)	3	1407 (997)	59 (81)	17 (7)	6 (12)	3 (0)	15	214 (274)
Univ (MA)	48 (54)	19 (15)	22 (20)	5 (10)	6	14765 (14509)	72 (79)	9 (8)	11 (10)	1 (3)	7	1702 (1511)	47 (67)	11 (15)	35 (17)	0 (1)	7	2545 (1271)
Coll (BA)	60 (70)	13 (9)	21 (21)	0 (0)	6	23228 (20521)	59 (82)	13 (3)	22 (16)	0 (0)	6	3100 (2719)	56 (73)	18 (10)	15 (17)	0 (0)	11	4015 (3734)
Total Math Depts	**52 (58)**	**15 (11)**	**20 (18)**	**7 (12)**	**6**	**53678 (50543)**	**63 (77)**	**11 (4)**	**17 (13)**	**4 (6)**	**5**	**6209 (5227)**	**53 (72)**	**15 (11)**	**22 (17)**	**0 (0)**	**10**	**6774 (5279)**
Stat Depts																		
Univ (PhD)	Too few cases in the sample to make reliable estimates						53 (64)	8 (10)	14 (5)	20 (21)	5	1262 (1324)	Too few cases in the sample to make reliable estimates					4 (7)
Univ (MA)							71 (79)	9 (13)	5 (8)	4 (0)	12	245 (120)						22 (44)
Total Stat Depts							**56 (65)**	**8 (10)**	**12 (5)**	**18 (19)**	**6**	**1507 (1444)**						**26 (51)**

TABLES E.13–E.18: Who Teaches Undergraduate Sections?

These six tables are related to Table E.3. They report the numbers of sections (rather than the numbers or percentages of enrollments) in various types of courses (remedial level, introductory level, etc.) taught by different types of instructors in different types of departments.

Table E.13 and Table E.17 contain apparently anomalous data suggesting that the bachelors-level mathematics departments in the U.S. used graduate teaching assistants to staff about one half of one percent of their fall 2000 sections in remedial level and lower level computer science courses. Similar data appeared in Table E.13 of the report of the CBMS1995 survey. We know that in fall 2000 there were bachelors-level mathematics departments in the U.S. that borrowed graduate teaching assistants from other departments or interdisciplinary graduate programs on their campuses, and that is one possible explanation of this strange data.

There were clear differences between the ways that different types of departments staffed their sections in fall 2000. Doctoral mathematics departments covered about 16% of their remedial level sections using full-time faculty (tenured, tenure-eligible, and other full-time) while bachelors-level departments taught 48% of their remedial sections with such full-time faculty. At the calculus level, Ph.D. departments covered about 69% of their sections using full-time faculty (tenured, tenure-eligible, or other full-time), while bachelors departments covered 88% of their sections using such faculty. Masters-level departments were typically between the Ph.D. and bachelors departments in terms of these percentages.

All departments except the doctoral statistics departments staffed at least fifty percent of their elementary statistics sections using full-time faculty (tenured, tenure-eligible, and other full-time) in fall 2000 while doctoral statistics departments covered 38% of elementary statistics sections using such faculty. This was a reversal of the situation in 1995 when doctoral mathematics departments staffed 35% of elementary level statistics sections using full-time faculty and doctoral statistics departments used full-time faculty to teach 54% of such sections.

As was the case in 1995, the vast majority of computer science sections offered by mathematics departments were taught in bachelors- and masters-level departments. Doctoral mathematics departments taught about 2% of the roughly 4200 sections of lower level computer science offered by U.S. mathematics departments in fall 2000, down from about 4% in fall 1995. In masters-level departments, 49% of lower level computer science courses were taught by full-time

faculty in fall 2000, while in bachelors departments the percentage was 67%.

For most types of courses, the overall number of sections offered grew roughly in proportion to enrollment increases noted in Table E.2. The remedial level was an exception. Table E.13 shows that the overall number of remedial sections increased by about 5% between fall 1995 and fall 2000, even though Table E.2 shows a decrease of about 1.3% in remedial level enrollments during that same period.

Tables in this section reveal some important staffing shifts since 1995. There was a shift of full-time faculty toward remedial and introductory level course teaching and away from all other course categories (except advanced level courses which we assumed were all taught by tenured and tenure-eligible faculty). The number of tenured and tenure-eligible faculty assigned to teach remedial sections rose by more than 40% since 1995, and the remedial level was the only course level that saw an increase (in sections taught by tenured and tenure-eligible faculty). The number of sections taught by other full-time faculty increased by about the same percentage, while the number of remedial sections taught by part-time faculty dropped slightly and the number of sections taught by graduate teaching assistants dropped by almost 60% during the five years between 1995 and 2000. However, the number of remedial sections taught by tenured and tenure-eligible faculty still remained relatively small; only about one in five remedial sections was taught by tenured and tenure-eligible faculty, and the fraction of remedial sections taught by other full-time faculty was slightly smaller.

Except in advanced level courses, responsibility for teaching shifted away from tenured and tenure-eligible faculty and toward other full-time and part-time faculty, and sometimes the shifts were quite large. In almost all course categories, the number of sections taught by graduate teaching assistants declined, in most cases by 40% or more. Calculus level courses were the exception: the decrease in sections taught by graduate teaching assistants was about 20%.

Table E.14 shows that the number of sections devoted to introductory level courses rose by about 14%, while enrollment in these courses grew by 18% (see Table E.2). There was a 36% drop in the number of introductory sections taught by graduate teaching assistants, coupled with a 40% and 49% increase in the number of sections taught by other full-time faculty (i.e., full-time but not tenured or tenure-eligible) and by part-time faculty respectively.

The number of calculus level sections, studied in Table E.15, rose by about 3% between fall 1995 and fall 2000, corresponding to an enrollment increase of about 6% in all calculus level courses. The number of sections taught by graduate teaching assistants dropped by about 20%, and the number of sections

taught by other full-time faculty rose by more than 50% during the same five year period. The number of calculus level sections taught by tenured and tenure-eligible faculty dropped slightly, and the number taught by part-time faculty grew slightly.

In mathematics departments, the number of elementary level statistics sections rose by about 20% (see Table E.16) while enrollment in these courses rose by about 18% between fall 1995 and fall 2000. The number of elementary level statistics sections taught by tenured and tenure-eligible faculty dropped by about 15% while the number of sections taught by other full-time faculty more than tripled, and the number taught by part-time faculty increased by about 60%. At the same time, the number of elementary level statistics sections taught by graduate teaching assistants dropped by about 35%. In statistics departments, enrollment in elementary statistics rose by about 10% from fall 1995 levels, remaining at less than

half of the elementary statistics enrollment in mathematics departments. The number of fall sections taught by tenured and tenure-eligible faculty dropped by about 25% from 1995 levels, while the number of sections taught by part-time faculty more than doubled, and the number of sections taught by graduate teaching assistants remained about the same.

Table E.2 shows that enrollments in lower level computer science courses taught in mathematics departments grew by over 20% between fall 1995 and fall 2000, and the number of sections offered grew by about 25% (Table E.17). The number of sections taught by tenured and tenure-eligible faculty declined by about 15% while the number of sections taught by other full-time faculty and part-time faculty grew by 73% and 40% respectively. The number of sections taught by graduate teaching assistants remained at the same negligible level (less than half of 1%) as in 1995.

TABLE E.13   Number of sections of Remedial level courses in Mathematics Departments by type of instructor and type of school: Fall 2000 (1995 figures in parentheses).

	Number of Remedial level sections taught by					
	Tenured/ tenure- eligible	Other full-time	Part-time	Graduate teaching assistants	Ukn	**Total sections**
Mathematics Departments						
Univ (PhD)	25 (20)	216 (191)	618 (561)	482 (891)	152	**1493 (1663)**
Univ (MA)	120 (327)	475 (439)	807 (1107)	221 (797)	149	**1772 (2670)**
Coll (BA)	1387 (728)	698 (344)	1829 (1808)	26 (33)	448	**4388 (2913)**
Total	**1532 (1075)**	**1389 (974)**	**3254 (3476)**	**729 (1721)**	**749**	**7653 (7246)**

TABLE E.14 Number of sections of Introductory level (including Precalculus) courses in Mathematics Departments by type of instructor and type of school: Fall 2000 (1995 figures in parentheses).

	Number of Introductory level sections taught by					
	Tenured/ tenure- eligible	Other full-time	Part-time	Graduate teaching assistants	Ukn	**Total sections**
Mathematics Departments						
Univ (PhD)	683 (886)	1159 (878)	1261 (834)	1714 (2660)	215	**5032** **(5258)**
Univ (MA)	2007 (2415)	1747 (1250)	1760 (1367)	419 (641)	573	**6506** **(5673)**
Coll (BA)	4397 (4458)	1407 (956)	2676 (1613)	0 (9)	507	**8987** **(7036)**
Total	**7087** **(7759)**	**4313** **(3084)**	**5697** **(3814)**	**2133** **(3310)**	**1295**	**20525** **(17967)**

TABLE E.15 Number of sections of Calculus level courses in Mathematics Departments by type of instructor and type of school: Fall 2000 (1995 figures in parentheses).

	Number of Calculus level sections taught by					
	Tenured/ tenure- eligible	Other full-time	Part-time	Graduate teaching assistants	Ukn	**Total sections**
Mathematics Departments						
Univ (PhD)	3522 (3576)	1134 (702)	762 (451)	1087 (1332)	263	**6768** **(6061)**
Univ (MA)	3053 (3301)	614 (450)	652 (472)	42 (57)	190	**4551** **(4280)**
Coll (BA)	4854 (5594)	820 (520)	409 (818)	0 (0)	355	**6438** **(6932)**
Total	**11429** **(12471)**	**2568** **(1672)**	**1823** **(1741)**	**1129** **(1389)**	**808**	**17757** **(17273)**

TABLE E.16 Number of sections of Elementary Level Statistics courses in Mathematics Departments and Statistics Departments, by type of instructor and type of school: Fall 2000 (1995 figures in parentheses).

	Number of Elementary Statistics sections taught by					
	Tenured/ tenure- eligible	Other full-time	Part-time	Graduate teaching assistants	Ukn	**Total sections**
Mathematics Departments						
Univ (PhD)	307 (167)	130 (27)	157 (76)	198 (281)	35	**827** **(551)**
Univ (MA)	589 (713)	146 (114)	195 (151)	20 (50)	114	**1064** **(1028)**
Coll (BA)	1087 (1451)	402 (77)	691 (423)	0 (0)	192	**2372** **(1951)**
Total Math Depts	**1983** **(2331)**	**678** **(218)**	**1043** **(650)**	**218** **(331)**	**341**	**4263** **(3530)**
Statistics Departments						
Univ (PhD)	196 (274)	104 (130)	174 (70)	254 (274)	58	**786** **(748)**
Univ (MA)	51 (47)	23 (15)	9 (10)	11 (0)	29	**123** **(72)**
Total Stat Depts	**247** **(321)**	**127** **(145)**	**183** **(80)**	**265** **(274)**	**87**	**909** **(820)**

TABLE E.17 Number of sections of Lower Level Computer Science courses in Mathematics Departments by type of instructor and type of school: Fall 2000 (1995 figures in parentheses).

	Number of Lower Level CS sections taught by					
	Tenured/ tenure-eligible	Other full-time	Part-time	Graduate teaching assistants	Ukn	Total sections
Mathematics Departments						
Univ (PhD)	41 (94)	26 (15)	8 (28)	6 (0)	11	**92** **(137)**
Univ (MA)	559 (453)	204 (144)	677 (183)	0 (16)	113	**1553** **(796)**
Coll (BA)	1162 (1503)	549 (290)	504 (638)	12 (0)	330	**2557** **(2431)**
Total	**1762** **(2050)**	**779** **(449)**	**1189** **(849)**	**18** **(16)**	**454**	**4202** **(3364)**

TABLE E.18 Number of sections of Middle Level Computer Science courses in Mathematics Departments by type of instructor and type of school in Fall 2000 (1995 figures in parentheses).

	Number of Middle Level CS sections taught by					
	Tenured/ tenure-eligible	Other full-time	Part-time	Graduate teaching assistants	Ukn	Total sections
Mathematics Departments						
Univ (PhD)	12 (39)	8 (3)	0 (6)	0 (0)	4	**24** **(48)**
Univ (MA)	286 (166)	27 (48)	106 (31)	0 (0)	46	**465** **(245)**
Coll (BA)	422 (567)	93 (75)	65 (9)	0 (0)	10	**590** **(651)**
Total	**720** **(772)**	**128** **(126)**	**171** **(46)**	**0** **(0)**	**60**	**1079** **(944)**