

Staffing Shifts in Mathematical Sciences Departments, 1990–2000

David J. Lutzer and James W. Maxwell

A 1997 *Notices* article [6] showed that between 1990 and 1996 there was a 27% decline in the number of tenure-eligible (TE) positions in the nation's doctoral mathematics departments and a roughly 30% decline in the number of TE positions in the nation's master's and bachelor's departments combined.¹ Data from the AMS-ASA-IMS-MAA annual surveys and data from [4] show that these declines were *not* offset by an increase in the number of tenured faculty members. The 1997 article noted that in doctoral departments there was substantial growth in a group that has since come to be called "other full-time" (OFT) faculty, i.e., faculty who are full-time but who are not tenured and not tenure-eligible. (The OFT category includes, for example, visiting faculty, postdoctoral appointees, and instructors who are not in the tenure stream.) By contrast, the 1997 article noted that in master's and bachelor's departments combined there was essentially no change in the number of OFT faculty

David J. Lutzer is professor of mathematics at the College of William and Mary. His email address is Lutzer@math.wm.edu.

James W. Maxwell is associate executive director at the American Mathematical Society. His email address is jwm@ams.org.

¹ The 1997 article [6] was based on AMS-IMS-MAA Annual Survey data. In [6] and throughout this paper, the term "mathematics department" includes departments of mathematics, mathematics and statistics, applied mathematics, and mathematical sciences. Departments are classified as doctoral, master's, or bachelor's, based on the highest degree they offer. A position is tenure-eligible (TE) if it is in the tenure track but is not tenured.

positions between fall 1990 and fall 1996. Finally, contrary to popular wisdom, [6] found essentially no increase in the use of part-time faculty by mathematics departments between 1990 and 1996. (Indeed, figures from [4] suggest that there was a substantial decline in the number of part-time faculty between 1990 and 1995. See Table 8 below.)

In this article we use data from CBMS2000 [5],² a recently completed survey of undergraduate mathematical sciences in the nation's bachelor's, master's, and doctoral departments, to show that between fall 1995 and fall 2000 all types of mathematical sciences departments substantially expanded their use of OFT faculty and greatly expanded their use of part-time faculty members at the same time that most types of departments further decreased their number of permanent (i.e., tenured and tenure-eligible) faculty members.

Faculty Totals from CBMS2000³

CBMS2000 found that the total number of full-time faculty (tenured, tenure-eligible, and other full-time) in bachelor's, master's, and doctoral mathematical sciences departments rose by about 4% between 1995 and 2000, thereby returning to about 98% of the total number in 1990 [1], and

² The CBMS2000 survey was an NSF-funded survey that is the most recent in a series of quinquennial national studies of bachelor's, master's, and doctoral mathematical sciences and statistics departments in the U.S. sponsored by the Conference Board for the Mathematical Sciences (CBMS).

³ Except where specifically noted, data in subsequent tables is drawn from CBMS2000.

revealed how different types of departments changed. See Table 1.

Table 1: CBMS2000 totals of full-time mathematics faculty, by year and type of department.

| Year | Total full-time faculty | Doctoral depts. total | Master's depts. total | Bachelor's depts. total |
|-----------|-------------------------|-----------------------|-----------------------|-------------------------|
| Fall 1990 | 19,411 | 6,427 | 5,058 | 7,926 |
| Fall 1995 | 18,248 | 6,221 | 4,765 | 7,262 |
| Fall 2000 | 19,007 | 6,703 | 5,001 | 7,303 |

More interesting than the totals in Table 1 are the changes within different appointment categories between fall 1995 and fall 2000 (see Table 2). (Unfortunately, the CBMS surveys can offer no direct comparison with 1990 figures, because before 1995 CBMS surveys combined “tenure-eligible” and “other full-time” into a single category.) Note that by fall 2000 the number of OFT faculty in mathematics departments exceeded the number of tenure-eligible faculty.

Table 2: Total full-time mathematics faculty by type of appointment, fall 1995 and fall 2000, and percentage change from 1995 to 2000.

| Year | Tenured faculty | Tenure-eligible faculty | Tenured plus tenure-eligible total | Other full-time faculty |
|----------------------|-----------------|-------------------------|------------------------------------|-------------------------|
| Fall 1995 | 12,779 | 3,329 | 16,108 | 2,140 |
| Fall 2000 | 12,335 | 3,136 | 15,471 | 3,536 |
| Change, 1995 to 2000 | -3.5% | -5.8% | -4% | +65% |

Changes between 1995 and 2000 in the way the four-year colleges and universities staff their mathematics departments can also be seen by comparing the percentage of all full-time faculty members who are tenured, tenure-eligible, and other full-time (OFT). That data appears in Table 3.

Table 3: Percentage of all full-time mathematics faculty who are tenured, tenure-eligible, and other full-time (OFT) in 1995 and 2000.

| Year | Tenured | Tenure-eligible | OFT |
|-----------|---------|-----------------|-------|
| Fall 1995 | 70.0% | 18.2% | 11.7% |
| Fall 2000 | 64.9% | 16.5% | 18.6% |

Tables 4, 5, and 6 present data that compare the fall faculty numbers in various kinds of departments for 1995 and 2000. Once again, comparison

with 1990 figures is not possible. Comparison of the three tables shows that the number of faculty members who are neither tenured nor tenure-eligible has increased substantially in every type of department and that the overall shift from permanent (i.e., tenured and tenure-eligible) faculty to temporary faculty is most pronounced in the nation’s bachelor’s-level mathematics departments.

Table 4: Numbers of full-time mathematics faculty in doctoral departments in fall 1995 and fall 2000 by type of appointment, and percentage change from 1995 to 2000.

| Doctoral depts. | Tenured | Tenure-eligible | Tenured plus tenure-eligible | Other full-time |
|----------------------|---------|-----------------|------------------------------|-----------------|
| Fall 1995 | 4,691 | 772 | 5,463 | 758 |
| Fall 2000 | 4,718 | 803 | 5,521 | 1,182 |
| Change, 1995 to 2000 | +0.6% | +4% | +1% | +56% |

Table 5: Numbers of full-time mathematics faculty in master’s departments in fall 1995 and fall 2000 by type of appointment, and percentage change from 1995 to 2000.

| Master’s depts. | Tenured | Tenure-eligible | Tenured plus tenure-eligible | Other full-time |
|----------------------|---------|-----------------|------------------------------|-----------------|
| Fall 1995 | 3,220 | 812 | 4,032 | 733 |
| Fall 2000 | 3,070 | 862 | 3,932 | 1,069 |
| Change, 1995 to 2000 | -4.7% | +6% | -2.5% | +46% |

Table 6: Numbers of full-time mathematics faculty in bachelor’s departments in fall 1995 and fall 2000 by type of appointment, and percentage change between 1995 and 2000.

| Bachelor’s depts. | Tenured | Tenure-eligible | Tenured plus tenure-eligible | Other full-time |
|----------------------|---------|-----------------|------------------------------|-----------------|
| Fall 1995 | 4,868 | 1,745 | 6,613 | 649 |
| Fall 2000 | 4,547 | 1,471 | 6,018 | 1,285 |
| Change, 1995 to 2000 | -6.6% | -15.7% | -9% | +98% |

Table 7 presents the figures from Tables 4, 5, and 6 in terms of the percentage of faculty in various

types of departments who hold different types of appointments. The figures show a decline in tenured percentages, coupled with an offsetting rise in OFT faculty. The percentage of tenure-eligible faculty remained essentially constant in doctoral and master's departments, while in bachelor's departments both the percentage of tenured faculty and the percentage of tenure-eligible faculty declined.

Table 7: Percentage of full-time mathematics faculty by type of appointment and type of department in fall 1995 and fall 2000.

| | Tenured | Tenure-eligible | OFT |
|------------------|---------|-----------------|-----|
| Doctoral, 1995 | 75% | 12% | 12% |
| Doctoral, 2000 | 70% | 12% | 18% |
| Master's, 1995 | 68% | 17% | 15% |
| Master's, 2000 | 61% | 17% | 21% |
| Bachelor's, 1995 | 67% | 24% | 9% |
| Bachelor's, 2000 | 62% | 20% | 18% |

At the same time that there were major increases in the number of OFT faculty appointments, there was also a marked increase in the number of part-time faculty, as can be seen in Table 8.

Table 8: Number of part-time faculty in mathematics departments by year and by type of department.

| Year | Doctoral depts. | Master's depts. | Bachelor's depts. | Total |
|----------------------|-----------------|-----------------|-------------------|-------|
| Fall 1990 | na | na | na | 6,786 |
| Fall 1995 | 1,065 | 1,456 | 2,768 | 5,289 |
| Fall 2000 | 1,276 | 2,437 | 3,448 | 7,161 |
| Change, 1995 to 2000 | +20% | +67% | +25% | +35% |

CBMS2000 found that in fall 2000 there were noticeable differences between tenure-eligible faculty members and OFT faculty. For example, the educational level of OFT faculty members was quite different from the educational level of tenure-eligible faculty members. Table F1 of [5] shows that about 94% of tenure-eligible faculty members had doctoral degrees in fall 2000, while among OFT faculty members the percentage with doctoral degrees was closer to 39%.

Other Supporting Evidence

The above tables and discussion are based on the personnel section of the CBMS2000 survey. Other sections of the survey provide results that are consistent with those tables. For example, another section of the CBMS2000 survey investigated the question "Who taught various types of courses

in fall 2000?" and comparison of that data with data from previous CBMS surveys supports the conclusion that there has been a shift from permanent (tenured and tenure-eligible) to temporary staffing within departments. Data on the percentage of mathematics department sections taught by various types of instructors appear in Table 9, which is based on Table E12 of [5]. The row percentages for fall 2000 do not add up to 100%, because there was a certain percentage of sections whose instructors were not reported by departments.

Table 9: Percentage of mathematics sections taught by tenured and tenure-eligible (T&TE) faculty, by other full-time (OFT) faculty, by part-time (PT) faculty, and by graduate teaching assistants (GTA) in 1995 and 2000. (Rows for fall 2000 do not add up to 100%.)

| Dept. type & date | T&TE | OFT | PT | GTA |
|-----------------------|------|-----|-----|-----|
| Doctoral, fall 1995 | 45% | 11% | 12% | 31% |
| Doctoral, fall 2000 | 42% | 16% | 17% | 21% |
| Master's, fall 1995 | 54% | 15% | 20% | 10% |
| Master's, fall 2000 | 48% | 19% | 22% | 5% |
| Bachelor's, fall 1995 | 70% | 9% | 21% | 0% |
| Bachelor's, fall 2000 | 60% | 13% | 21% | 0% |
| Total, fall 1995 | 58% | 11% | 18% | 12% |
| Total, fall 2000 | 52% | 15% | 20% | 7% |

One very interesting issue in Table 9 is the marked decrease in the percentage of sections taught by graduate teaching assistants in the nation's master's and doctoral departments. In both the 1995 and the 2000 surveys, departments were asked to report a section as being taught by a graduate teaching assistant if and only if the graduate student taught the section independently. The decline in the percentage of sections taught by graduate teaching assistants is not explained by any substantial drop in the number of mathematics graduate students between 1995 and 2000. However, it might be linked to the almost 18% decline in the number of U.S. citizen graduate students in American mathematics doctoral departments that is reported in Table 6B of [3].

Other recent studies show that mathematics is not alone in the decline in the percentage of all faculty who are tenured or tenure-eligible and that, across all disciplines, there has been a substantial increase in the use of part-time faculty members [7]. Data from Table 3 of a report issued in 2002 by the American Council on Education [2] can be used to compare the percentage of newly hired faculty in colleges and universities with tenure systems who were appointed to tenured or tenure-eligible positions with the percentage who were

appointed to what we have called other full-time positions in 1992 and in 1998. Table 10 presents that data.

Table 10: In public and private four-year colleges and universities having tenure systems, the percentage of full-time appointments in all disciplines in tenure and tenure-eligible (T&TE) positions, and the percentage in other full-time (OFT) positions in 1992 and 1998. Data based on [2].

| Type | T&TE 1992 | T&TE 1998 | OFT 1992 | OFT 1998 |
|----------------|--------------|--------------|-------------|-------------|
| Public 4-year | 76.9% | 65.2% | 23.1% | 34.8% |
| Private 4-year | 76.9% | 65.1% | 23.5% | 34.9% |

Why Care?

It is a fair question to ask why the mathematics community should care about the increase in the use of OFT and part-time faculty. One answer was provided in a resolution proposed by the Committee on the Profession of the Mathematical Association of America (MAA) and passed by the MAA Board of Governors in August 2002. The resolution said, in part, that while nonpermanent faculty often make valuable contributions to undergraduate education,

Over-reliance on temporary faculty (whether part-time or full-time) can decrease stable and continuous faculty involvement in course and curriculum development, peer teaching review, student advising, and departmental governance, and simultaneously lead to a shift of responsibility for out-of-class departmental duties into the hands of fewer permanent faculty members. In addition, the CBMS2000 survey shows that temporary faculty tend to have a lower level of graduate education in mathematical sciences than do permanent faculty, and widespread use of non-doctoral faculty can have an adverse effect on the intellectual life of departments. Finally, the decline in the number of permanent faculty positions can disrupt the professional development of new Ph.D. recipients who are forced to be in job-search mode year after year, as they move from one temporary position to another.

References

[1] D. ALBERS, D. LOFTSGAARDEN, D. RUNG, and A. WATKINS, *Statistical Abstract of Undergraduate Programs in the Mathematical Sciences and Computer Science in the United States: 1990-91 CBMS Survey*, MAA Notes 23, Math. Assoc. America, Washington, DC, 1992.

[2] E. L. ANDERSON, *The New Professoriate*, American Council on Education, Washington, DC, 2002.
 [3] D. LOFTSGAARDEN, J. MAXWELL, and K. PRIESTLEY, 2001 annual survey of the mathematical sciences (third report), *Notices Amer. Math. Soc.* **49** (2002), 928-938.
 [4] D. LOFTSGAARDEN, D. RUNG, and A. WATKINS, *Statistical Abstract of Undergraduate Programs in the Mathematical Sciences in the United States, Fall 1995 CBMS Survey*, MAA Reports 2, Math. Assoc. America, Washington, DC, 1997.
 [5] D. LUTZER, J. MAXWELL, and S. RODI, *CBMS2000: Statistical Abstract of Undergraduate Programs in the Mathematical Sciences in the United States*, Amer. Math. Soc., Providence, RI, 2002; available online at <http://www.ams.org/cbms/>.
 [6] J. W. MAXWELL, Changes in mathematics faculty composition, fall 1990 to fall 1996, *Notices Amer. Math. Soc.* **44** (1997), 1321-1323.
 [7] *NEA Higher Education Research Center Update*, Vol. 7, No. 3, June 2001; available online at <http://www.nea.org/he/heupdate/vol7no3.pdf>.