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Do Tenured and Tenure-Track Faculty Matter?

by

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Abstract

During the last two decades, there has been a significant growth in the share of faculty members at American colleges and universities that are employed in part-time or full-time non tenure-track positions. Our study is the first to address whether the increased usage of such faculty adversely affects undergraduate students' graduation rates. Using institutional level panel data from the College Board and other sources, our econometric analyses suggest that the increased usage of these faculty types does adversely affect graduation rates at 4-year colleges, with the largest impact on students being felt at the public master's level institutions.

I. Introduction

During the last two decades, there has been a significant growth in the share of faculty members in American colleges and universities that are employed in part-time or full-time non tenure-track positions (Anderson 2002, Baldwin and Chronister 2001, Conley, Lesley, and Zimbler 2002, Ehrenberg 2004, Ehrenberg and Zhang 2004). This substitution of *contingent* faculty for tenure and tenure-track faculty is at least partially due to the growing financial pressures faced by public and private higher education institutions, coupled with the lower cost of non tenure-track faculty members (Ehrenberg and Zhang 2004).

Much attention has been directed to the impact of this growing substitution on the job markets for new PhDs and the attractiveness of PhD study to American college graduates.¹ The growing use of contingent faculty, coupled with the lower salaries and benefits that they receive, has also led to a growing movement to have contingent faculty covered by collective bargaining agreements.² Somewhat surprisingly, however, very few studies have addressed whether the increased substitution of part-time and full-time non tenure-track faculty for tenure-track faculty, on balance, has adverse affects on undergraduate students, such as less learning, longer times-to-degree, lower graduation rates, or lower propensities of students to go on to post-graduate study.³ Analyses of such

¹ Ehrenberg and Rizzo (2004)

² See Smallwood (2003), for example.

³ Bolge (1995) uses data from a single community college and finds no evidence that students learn less in remedial mathematics classes when they are taught by part-time rather than tenure-track full-time faculty. Harrington and Schibik (2001) study a single Midwestern comprehensive institution and find that the greater the proportion of part-time faculty members that students have during their first semester in college, the lower the probability that they return for their second semester. Bettinger and Long (2004) use a unique data set of individual student-record data for Ohio public 4-year institutions to analyze the impact of a student's having an adjunct or graduate assistant instructor, as compared to a full-time faculty member (regardless of the faculty member's tenure-track status) on the probability that the student takes a subsequent class in the subject. They find, after controlling for the process by which students are assigned

issues are essential if public institutions want to make the case to legislatures and governors and private institutions want to make the case to their trustees that improved funding that would permit increased usage of full-time tenure and tenure-track faculty members would enhance student outcomes. Absent such evidence, growing financial pressures faced by institutions will likely lead to a continuation of the increasing use of contingent faculty members.

Our study is the first study to address whether increased usage of part-time and full-time non tenure-track faculty adversely influences the graduation rates of students enrolled in 4-year and 2-year American colleges and universities. We use panel data for a large sample of institutions over a fifteen-year period to analyze these questions. The data come from *The College Entrance Examination Board's Annual Survey of College Standard Research Compilation* data file (henceforth *College Board data*), the *IPEDS Faculty Salary Survey* and other Department of Education sources. After the next section briefly describes the data and the changes in graduation rates and faculty shares that occurred during the sample period, section III presents our analytical framework and our empirical results findings for graduation rates from 4-year institutions. Section IV briefly discusses some extensions of our analyses and our findings for 2-year colleges, and then concluding comments follow.

II. The Data

Each year the *College Board data* contain information on the characteristics of entering students at each institution, the characteristics of the institution, and the

to or select into classes with different types of instructors that, on average, having a part-time faculty member or a graduate assistant instructor reduces the likelihood that students will take subsequent classes. However the effects are small and differ by subject matter – while such instructors reduce the likelihood of taking subsequent classes in the humanities, they increase the likelihood in some of the technical and professional fields.

graduation rate of a cohort of undergraduate students that entered the institution at an earlier date. Our econometric analyses use data from the 1986-87 through the 2000-2001 academic years.⁴

The *College Board data* provide us with information on the size of each entering class, the proportion of underrepresented minority students in the class, the proportion of out-of-state students in the class, the average age of entering first-year students, the 25th and 75th percentile SAT math and verbal scores of first-year students, and total enrollment at the institution. These data also permit us to compute information on the percentage of faculty at each institution that is part-time. Information on the percentage of full-time faculty at each institution that are tenured or on tenure-tracks is available each year from the *IPEDS Faculty Salary Survey*. Data on the number of undergraduate students who receive Pell grants and the average Pell grant per recipient at each institution each year is obtained from the office that administers the Federal Pell Grant Program within the U.S. Department of Education.

The *College Board data* provide information on graduation rates for full-time first-year students who entered each institution at an earlier date. The 1986-87 and 1987-1988 *College Board data* contained information on the 4-year graduation rate for students who entered college four years earlier. The 1988-89 to 1997-98 data contained information on the 5-year graduation rates for students who entered college five years prior to each of these surveys. Finally, from 1998-99 on the *College Board data* reports information on the 6-year graduation rates for students who entered college six years prior to each survey date.

⁴ More recent *College Board data* are available but our analyses end with 2000-2001 because of the lack of availability of more recent data from other sources that we needed for our analyses.

Table 1 presents information on how graduation rates, the percentages of faculty that are full-time, and the percentages of full-time faculty that have tenure or are on tenure-tracks changed during the sample period.⁵ While average graduation rates increase when the period over which the rates are measured increase first from four to five and then from five to six years, the 5-year graduation rate clearly trended downward during the 1988 to 1997 period.⁶ The percentage of faculty that are full-time at these institutions also declined during the period by about 5 percentage points and the percentage of full-time faculty that are tenured or on tenure-tracks, declined by about 2.5 percentage points during the 9 years that we have data for this variable.⁷

In estimating the impacts of the shares of part-time faculty and the share of full-time faculty that are not on tenure-tracks on graduation rates, it is important to “match up” the share variables with the correct entering cohort variables. We assume that the relevant share variables are those during the first four years that an individual is enrolled in college. So, for example, the 6-year graduation rates reported in the 2000-2001 *College Board data* are for students that first-enrolled as freshman in the fall of 1994. Hence we compute the relevant part-time faculty and non tenure-track faculty shares that this cohort of students experienced by averaging the values that their institutions reported in the

⁵ These numbers are averages each year for the institutions reporting a variable in that year. Sample sizes differ across the variables in each year because the variables come from three different sources. Appendix Table 1 presents the same information for smaller sets of institutions that reported data for each variable in all years and the results for these samples are quite similar.

⁶ Remember these are the graduation rates for the classes that entered between the fall 1983 and the fall of 1992.

⁷ Changes in these variables varied across institutional types in our sample during the 9 year period. The average 5-year graduation rate fell by 8.1 percentage points at public institutions, but only 3.6 percentage points at private institutions and by 9.7 percentage points at masters institutions, but by smaller amounts at doctoral and bachelors institutions. Similarly, the average percentage of faculty that are full-time fell by 1.8 percentage points at public institutions, but 3.6 percentage points at the privates and these changes were largest at the masters and bachelors institutions. Finally, the percentage of full-time faculty that were tenured or on tenure-tracks fell by about 1 percentage point at public institutions, but by 5.2 percentage points at private institutions, and these changes were the largest at the bachelors level institutions.

1994, 1995, 1996 and 1997 *College Board data* files. Similarly, the relevant entering characteristics of these students (test scores, out-of-state status, racial/ethnic status and age at entry) come from the 1994 *College Board data* file for this group. Because of the need to “match up” data from various surveys, institutional graduation rate data used in our econometric analyses come from the 1991-92 to 2000-2001 *College Board data* and earlier years data are used only to provide explanatory variables.

III. Econometric Results

Our analytical approach is to use our panel data to estimate models in which the 5-year (or 6-year) graduation rate of full-time students that entered institution i in year t (G_{it}) is specified to be a function of characteristics of the students and of the institution (X_{it}), the percentage of faculty that are part-time at the institution averaged over the first four years that the students were enrolled at the institution (P_{it}), the percentage of full-time faculty that are employed in tenure-track positions at the institution averaged over the first four years that the students were enrolled at the institution (F_{it}), institutional fixed effects (α_i), year fixed effects (α_t) and a random error term (ϵ_{it}),

$$(1) G_{it} = \alpha_0 + \alpha_1 X_{it} + \alpha_2 P_{it} + \alpha_3 F_{it} + \alpha_i + \alpha_t + \epsilon_{it} ,$$

where the α_k are parameters to be estimated.

The characteristics of the students included in the model are the average proportion of undergraduate students receiving Pell grants at the institution during the first four years after the students enrolled and the average Pell grant per recipient (to control for the fraction of students from lower income families at the institution), the share of underrepresented minority students in the entering class, the share of in-state students in the entering class, the average age of entering students, and the averages of

the 25th and 75th percentile mathematics and verbal SAT scores of the entering class.

Institutional level characteristics included in the model are the average number of faculty at the institution during the four years after the freshman enroll at the institution and the full-time equivalent number of freshman at the institution. The graduation rate variable represents a 5-year graduation rate for most of the sample years, but a 6-year graduation rate for the last few years. This difference is controlled for in the estimation by the inclusion of the year dichotomous variables, which also capture the effect of other time-specific omitted variables.⁸

Table 2 reports our estimates of this model for our sample as a whole and for subsamples of public, private, doctoral, masters and liberal arts institutions. Turning first to the control variables, entering freshman students with higher mathematics SAT scores (and in some specification higher verbal SAT scores) have higher graduation rates, other factors held constant. Increases in the share of undergraduate students receiving Pell grants are associated, other factors held constant, with lower graduation rates and in some specifications, the higher the average Pell grant received by recipients (which suggests either lower family income and in some cases higher tuition levels), the lower the graduation rate is – both of these findings suggest that graduation rates of lower income students are lower than those of other students.⁹ Neither the proportion of underrepresented minority students, the proportion of in-state students, nor the average age of entering freshman is related to the institution's graduation rate. Finally, increases

⁸ We are implicitly assuming here that the difference between the 5- and 6-year graduation rates at an institution does not vary across institutions.

⁹ As Stinebrickner and Stinebrickner (2003) have shown, lower graduation rates for students from lower-income families reflect factors other than the direct financial cost of attending college.

in the total number of faculty at the institution, holding constant the number of FTE freshman are associated with higher graduation rates.

Quite strikingly, our estimates suggest that, other factors held constant, increases in either the percentage of faculty that are part-time or the percentage of full-time faculty that are not on tenure-tracks, is associated with a reduction in graduation rates. The magnitudes of these relationships are larger at public colleges and universities than at private academic institutions. Other factors held constant, a 10 percentage point increase in the percentage of faculty that is part-time at a public academic institution is associated with a 2.65 percentage point reduction in the institution's graduation rate. Similarly, a 10 percentage point increase in the percentage of full-time faculty that are not on tenure-track lines at a public college or university is associated with a 2.22 percentage point reduction in the institution's graduation rate. Moreover the estimates in the last three columns of the table suggest that the magnitude of these effects is greatest at master's level institutions.

Table 3 provides estimates of the coefficients of the percentage of part-time faculty and percentage of full-time faculty employed in non tenure-track positions obtained from specifications that allow the effects of all variables to vary within both public and private higher education by institution type. The magnitudes of these effects are largest at the public masters' level institutions. Other factors held constant, a 10 percentage point increase in the percentage of part-time faculty is associated with a reduction in the graduation rate of 3 percentage points, while an increase in the proportion of full-time faculty not on tenure-track lines is associated with a reduction in

the graduation rate of 4.4 percentage points at these institutions.¹⁰ For each institutional type, increased usage of these types of faculty has a larger effect on students at public higher education institutions than on students at private higher education institutions.

IV. Empirical Extensions

Several extensions of our analyses warrant being briefly reported. First, one might hypothesize that increased reliance on part-time or full-time non tenure-track faculty might have a differential impact on students from different places in the SAT distribution of American college students. In particular, it may be that low-test score students would be hurt the most by increased reliance on these types of faculty. However, when we tested whether this was true, by allowing the coefficients of these variables to vary with the SAT scores of entering students at the institution (dividing the institutions into three categories); we found no evidence of differential impacts by average SAT scores.

Second, one might be concerned that the increased usage of part-time and full-time non tenure-track faculty at an academic institution is symptomatic of an institution that is undergoing financial stresses and that other things are happening simultaneously at the institution, such as reductions in course offerings. Hence, it may be these other things that are causing the reduction in graduation rates that we observe, not the changing nature of the faculty employed at the institution. However, when we reestimated our models, including general educational expenditures per full-time equivalent student as an additional explanatory variable, the estimated effects of changes in the faculty variables were very similar to those that we reported above in tables 2 and 3.

¹⁰ The larger part-time faculty coefficient for public liberal arts colleges is based on only 27 institutions.

Third, the data that institutions report to the *College Board* are not audited for accuracy by any outside group and this leads to concerns about data accuracy. In particular, we found a number of cases in which the exact same values for the number of part-time faculty and the number of full-time faculty at an institution were submitted by an institution to the *College Board* for a number of consecutive years. While this may reflect the relatively slow pace at which things change in academia or a constant faculty size at some small institutions, it also may reflect measurement or reporting errors. However, when we reestimated our models, leaving out institution/year observations in which the value of either of these variables was identical to the value reported by the institution in the previous year, on balance we obtained very similar point estimates of these coefficients.¹¹

Fourth, the *College Board data* also contain information for many institutions on the fraction of entering freshman that complete their first-year and the fraction of entering freshman that return for the second year. This permits us to estimate models similar to those presented in table 2, save that the dependent variable becomes either the first-year completion rate or the return-for-second-year rate, and the faculty type variables and other variables now refer only to the students' freshman year. However, when we

¹¹ At the suggestion of the referees, we conducted several other sensitivity analyses. The impact of SAT scores on graduation rates may depend more on the 25th percentile level than it does on the 75th percentile of a school's SAT distribution. So we re estimated the model in column 1 of table 2, entering these two percentile levels separately. As expected, changes in the former did have larger effects on graduation rates than changes in the latter; however, this change in specification did not change our estimates of the effects of changes in faculty "types" on graduation rates. Another change was to restrict the sample to years for which we had 5-year graduation rate data; when the model in column 1 of table 2 was re estimated using this smaller sample, the coefficients of our faculty type variables remained statistically significant, but declined slightly in magnitude. Finally, a referee was concerned that if the faculty type variables at an institution always changed in the same direction, that we may be confounding the effects of changes in faculty type with changes in other omitted variables that are moving in a trend. To test for this, we restricted our sample, to institutions in which the faculty type variables both increased and decreased during the period (remember that we are using 4-year averages for these variables), and again re estimated the model. When we did this, we obtained faculty type coefficients that were very similar to those reported in column 1.

estimated such models we found fewer statistically significant “faculty type” effects and those that were significant were of much smaller magnitude than the comparable coefficients in the graduation rate equations. For example, we found evidence that increasing the percentage of part-time faculty by 10 percentage points would decrease the first-year completion rate by only 0.5 percentage points at public colleges and universities and would have no impact on the percentage of freshman students who returned for their second year, while increasing the percentage of full-time faculty that were not on tenure tracks by 10 percentage points had no impact on either outcome at public academic institutions.

Fifth, the *College Board data* contain information for some two-year colleges on 3-year graduation rates and the percentage of entering freshman that return to the institutions for their second year of study. While tenure-track status data are not available for these institutions, we found no evidence that increasing the percentage of part-time faculty members at 2-year colleges adversely influences either of these outcomes.

Finally, one of the reasons often given for academic institutions, especially research universities, expanding their usage of part-time and full-time non tenure-track faculty is because their tenured and tenure-track faculty are spending more of their time conducting research and less of their time teaching. So the costs to undergraduate students of the increased usage of more contingency faculty may be offset by a greater volume of research being produced by the regular faculty at the institution.

To test this proposition, we employed panel data spanning the 1989 to 1999 period and regressed the logarithm of an institution’s externally funded real (in 1999 dollars) research and development expenditures per full-time tenured and tenure-track faculty

member on the percentage of its full-time faculty that were not in tenure-track positions in the year, the percentage of its faculty that were part-time in the year and institutional and year dichotomous variables. When we did this, we found that an increase in the share of full-time faculty that were not on tenure-track lines has a small positive effect on the volume of external research and development expenditures per full-time tenured and tenure-track faculty member at the institution, with the effect being the largest at the doctoral institutions. So the use of more full-time non tenure-track faculty is associated with increased external research volume for the full-time tenured and tenure-track faculty. These models also indicated that increases in the percentage of part-time faculty members at these institutions had no effect on the external research volume per full-time tenured and tenure-track faculty member at the institution.

V. Concluding Remarks

Our study is the first study using panel data on institutions that has provided evidence that the growing use of part-time and full-time non tenure-track faculty adversely affects undergraduate students enrolled at 4-year colleges and universities by reducing their 5- and 6-year graduation rates. For any given size increase in the shares of either part-time or full-time non tenure-track faculty, the magnitudes of these negative effects appear to be larger at public institutions than they are at private institutions and appear to be largest at the public masters' level (comprehensive institutions). Other factors held constant, a 10 percentage point increase in the percentage of part-time faculty at a public masters' level institution is associated with about a 3 percentage point reduction in the graduation rate at the institution and a 10 percentage point increase in the percentage of full-time faculty

that are not on tenure-track lines is associated with about a 4.4 percentage point reduction in the graduation rate at the institution.

We must caution that a study using institutional level data, such as ours, can not conclusively prove that the decline in the graduation rates that we estimate occurs when, say, the proportion of part-time faculty increases, results from increased drop-out rates for the students who actually study with part-time faculty. We may be capturing a much more complicated institutional relationship and more work research addressing this topic using individual level data would clearly be valuable.

In addition, the costs of reduced graduation rates must be balanced against the cost savings that accrue to the institutions from substituting less costly for more costly faculty members. For example, the average salary of full-time lecturers (most of whom are not on tenure-tracks) at public master's institutions was \$43,129, while the average cost of assistant professors (most of whom are on tenure tracks) at public master's institutions was \$49,725 in 2003-2004.¹² Thus, for every assistant professor that is replaced by a lecturer, an institution would save, on average \$6,596, or 13.2 percent. This calculation ignores that many assistant professors "mature" into more expensive associate and full professors and that lecturers often teach larger classes and more classes per semester than tenured and tenure-track faculty. Furthermore, to say that an institution's 5- or 6-year graduation rate is reduced when it employs more part-time or full-time non tenure-track faculty does not tell us whether the reduction implies that the students never graduate from college or implies that their graduation is delayed one or more years. The evidence we report briefly on first-year drop out rates suggest that the answer is probably a combination of both outcomes.

¹² Ehrenberg (2004), survey report Table 4.

Cost savings from substituting part-time faculty, who often receive much less generous benefit packages as well as lower salaries is likely to be much larger. However, Bettinger and Long (2004) have reported that having a part-time faculty member as an instructor, on average, leads to a decreased likelihood that a student will take subsequent classes in a subject, which surely is an additional cost to students. The impact of both types of substitution on a whole range of issues including faculty governance, student advising, and curriculum development and the evolution of the curriculum must all be addressed in a more complete cost/benefit analysis of these changes.

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Table 1
 BA Graduation Rate, Percentage of Full-Time Faculty, and Percentage of Full-Time
 Faculty on Tenured and Tenure-Track Lines

Year	BA Graduation Rate	Percentages of Faculty that are Full-Time	Percentages of Full-Time Faculty on Tenured or Tenure-Track Lines
1986 (4)	46.51	73.45	
1987 (4)	45.01	72.88	
1988 (5)	55.86	72.61	
1989 (5)	54.50	72.11	87.62
1990 (5)	52.88	71.26	86.72
1991 (5)	51.49	71.69	86.94
1992 (5)	50.57	72.37	86.70
1993 (5)	50.27	72.10	86.57
1994 (5)	49.91	71.60	86.25
1995 (5)	49.59	70.87	86.34
1996 (5)	49.72	70.26	85.90
1997 (5)	48.60	70.21	85.21
1998 (6)	53.09	70.14	
1999 (6)	52.66	69.46	
2000 (6)	53.21	68.17	

(x) graduation rate is the x year graduation rate for full-time first-year students who first enrolled at the institution x years earlier

Table 2
Panel Data Estimates of Graduation Rate Equations*
(t statistics)

	All	Public	Private	Doctoral	Master	Liberal Arts
Percentage of part-time faculty	-0.1397 (-7.73)	-0.2651 (-7.40)	-0.0711 (-3.34)	-0.0937 (-2.56)	-0.1829 (-5.53)	-0.0868 (-2.51)
Percentage of full-time faculty that are not on tenure-track lines	-0.0895 (-4.76)	-0.2228 (-3.91)	-0.0778 (-4.24)	-0.1134 (-2.38)	-0.1154 (-3.62)	-0.0387 (-1.43)
Average Pell grant per recipient	-0.0063 (-3.37)	-0.0018 (-0.48)	-0.0005 (-0.24)	-0.0123 (-2.82)	-0.0008 (-0.25)	0.0035 (1.18)
Proportion of Pell grant recipients	-0.0833 (-3.86)	-0.3057 (-4.19)	-0.1025 (-4.90)	-0.2104 (-2.81)	-0.0013 (-0.04)	-0.1218 (-3.93)
Number of faculty	0.0021 (3.25)	0.0054 (5.55)	0.0033 (3.29)	0.0017 (1.95)	0.0001 (0.03)	0.0604 (4.98)
FTE enrollment of entering freshmen	0.012 (0.91)	0.0241 (1.43)	-0.0321 (-0.86)	0.0241 (1.49)	-0.0617 (-1.69)	0.1381 (1.26)
Proportion of minority students	-0.0224 (-0.85)	0.1039 (1.90)	-0.0247 (-0.91)	0.0521 (0.84)	-0.0279 (-0.71)	-0.0907 (-1.75)
Proportion of in-state students	-0.0077 (-0.52)	-0.0001 (0.00)	-0.0182 (-1.04)	0.0325 (0.96)	-0.0059 (-0.26)	0.0184 (0.66)
Average age of entering freshmen	0.3206 (1.87)	0.1541 (0.50)	0.0184 (0.09)	0.7114 (1.72)	0.4199 (1.58)	-0.256 (-0.99)
Average of 25 and 75 Percentile math SAT scores of entering students	0.0372 (5.70)	0.0414 (3.03)	0.0431 (6.00)	0.0339 (2.40)	0.0335 (3.07)	0.0368 (3.50)
Average of 25 th and 75 th Percentile verbal SAT scores of entering students	0.0191 (2.84)	0.0163 (1.13)	0.0145 (1.98)	0.032 (2.18)	0.0051 (0.47)	0.0125 (1.19)
# observation (# institution)	4966(734)	1305(207)	3661(527)	1052(152)	1716(261)	2198(321)
R-squared	0.9271	0.9194	0.9039	0.9468	0.9104	0.9151

* Also included in the models are institution and year dichotomous variables

Table 3
 Estimated Coefficients of Faculty Type Variables from Sub Sample Models*
 (t statistics)

	Public Institutions		
	Doctoral	Master	Liberal Arts
Percentage of part-time faculty	-0.1234 (-2.05)	-0.3032 (-5.34)	-0.5747 (-3.24)
Percentage of full-time faculty not on tenure-track lines	-0.1555 (-0.99)	-0.4358 (-4.63)	-0.043 (-0.54)
#observations (# institutions)	522(87)	514(91)	152(27)
	Private Institutions		
	Doctoral	Master	Liberal Arts
Percentage of part-time faculty	-0.0554 (-1.49)	-0.145 (-3.40)	-0.0775 (-2.13)
Percentage of full-time faculty not on tenure-track lines	-0.0959 (-2.81)	-0.077 (-2.32)	-0.0191 (-0.63)
#observations (#institutions)	425(64)	1026(165)	1827(292)

* Also included in each model are all of the control variables, and the year and institution dichotomous variables included in the models underlying table 2

Appendix Table 1
 BA Graduation Rate, Percentage of Full-time Faculty, and Percentage of Tenured
 and Tenure-track Faculty, Consistent Sample

year	BA Graduation Rate	Percentages of Full-time Faculty	Percentages of Full-Time Faculty on Tenured and Tenure Track Lines
1986 (4)	53.41	73.21	
1987 (4)	52.94	72.95	
1988 (5)	61.39	72.44	
1989 (5)	59.63	71.83	87.63
1990 (5)	59.32	71.02	87.33
1991 (5)	59.70	71.08	87.76
1992 (5)	60.25	71.72	87.58
1993 (5)	60.47	71.45	87.57
1994 (5)	60.83	71.04	87.25
1995 (5)	60.65	70.45	87.17
1996 (5)	61.35	70.01	86.66
1997 (5)	60.83	69.72	85.89
1998 (6)	62.71	69.31	
1999 (6)	63.08	68.83	
2000 (6)	63.04	66.99	
# obs.	122	1022	1159