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DO UNDERGRADUATE MAJORS OR PH.D. STUDENTS AFFECT FACULTY SIZE?

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Abstract

Regression analysis using panel data for 42 colleges and universities over 14 years suggests that the economics faculty size of universities offering a Ph.D. in economics is determined primarily by the long-run average number of Ph.D. degrees awarded annually; the number of full-time faculty increases at almost a one-for-one pace as the average number of Ph.D.s grows. Faculty size at Ph.D. granting universities is largely unresponsive to changes in the contemporaneous number of undergraduate economics degrees awarded at those institutions. Similarly, faculty size at colleges where a bachelor's is the highest degree awarded is responsive to the long and short term average number of economics degrees awarded but not the annual changes in BS and BA degrees awarded in economics.

Keywords: faculty size, student body, Ph.D. degrees, bachelor degrees.

Most academic economists at one time or another have participated in department meetings in which the relationship between the number of students handled by the department and the number of faculty positions in the department has been discussed. They have watched department chairs invariably parade recently rising numbers in economics courses before their deans when requesting additional faculty slots (while often remaining mute when the numbers decline). Some faculty are cynical about the probable administrative response, anticipating that deans are likely to allow class sizes to rise during periods of increasing student demand, especially for short periods, because the expansion of tenured or tenure-track faculty is difficult to reverse if students numbers subsequently should decline.

Isaac Ehrlich (2006), Department of Economics Chair, University of Buffalo, however, provides evidence that, at least in his administrative experience, faculty size really has been driven by students. He observed that in 2000 his department had sunk to 10 full-time tenured and tenure-track members, down from 18 in 1991. "Since the 1997 academic year, however, the department has experienced a multidimensional revival. Faculty size is back to 18 this fall ... We also have experienced a tremendous growth in the number of students we serve, primarily at the graduate level, which also serves as the engine of faculty growth." Similarly, but in the opposite direction, we have the recent occurrence at Southern Mississippi University where a low number of economics majors (average of five per year) has led to an administrative

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decision to shrink the economics faculty at Southern Mississippi University from nine to five, resulting in four involuntary "early retirements." (Celano 2009). The Southern Mississippi administration first proposed to eliminate the department completely, but salvaged five positions to service other departments that require economics courses in their majors, leaving a reduction of four due just to the low number of majors.

Consistent with this anecdotal evidence, Johnson and Turner (2009), using the canonical model of dynamic labor demand in Sargent (1978), calculate an elasticity of faculty with respect to student demand to be 0.04 in the short-run and 0.6 in the long-run. These generic elasticities, however, tell us little about the response of faculty lines to changing numbers of degrees awarded or whether it is undergraduate or graduate degrees that drive faculty size in departments that offer both degrees. Johnson and Turner (2009) do propose that some university administrators/managers may view research quality and graduate training as substitutes for providing more course options or smaller classes for undergraduates. They conclude based on their individual institution statistics that those departments that are rated higher on research quality are less likely to "shoulder the heaviest burdens of undergraduate teaching and advising (p. 182). They also state, however, that a substantial part of the explanation for differences in student-faculty ratios across academic departments "may reside in the politics (traditional policy) rather than the economics of decision making in institutions of higher education,"(p. 170) because in a pure economic model, student demand determines faculty allocations. In a political economy model, political power determines the allocation of resources and rents. Highly vocal faculty members engaging in persistent lobbying may limit the extent to which administrators can adjust faculty lines to better match student demand without paying a high personal cost.

The responsibilities of a typical economics department include a variety of tasks that extend beyond providing for the education of undergraduate majors and Ph.D. students: general education (principles of economics and seminars for first-year students), service courses for other departments (e.g., money and banking for business majors), interdisciplinary teaching, occasionally a master's program, faculty research and publication, and faculty service (e.g., media relations, extension and other outreach activities, especially at public universities). Changes in the demand for any of these services can at least in theory create incentives for a supply response. The critical issue, however, comes back to the relationship between faculty size and students if changes in student demand drive the employment of faculty. While enrollment by students satisfying general education requirements and those majoring in other disciplines contribute to student demand, it is the number of undergraduate majors and Ph.D. students that usually attracts the most attention among various measures of a department's teaching responsibilities, primarily because these measures are easiest to count.

Here we examine whether undergraduate degrees (BA and BS) in economics or Ph.D. degrees in economics drive the tenured and tenure-track faculty size at those institutions that offer only a bachelor's degree and those that offer both bachelor's degrees and Ph.D.s.[1] At bachelor's degree level institutions, the number of permanent faculty primarily is determined by a short-term moving average and a long-term average number of students, with annual deviations from the long-run mean having little effect on tenured and tenure-track faculty size in departments of economics. Adjustments in instructional resources, if they are made in response to short-run volatility, must take the form of adding or subtracting term-appointment lecturers and adjunct professors. In a similar fashion, at institutions awarding both the bachelor's degree and Ph.D., the number of tenured and tenure-track faculty is predicted to depend on the long-term target number of Ph.D.s to be awarded per year and not on either annual deviations from this long-term average, or on the average level of or short-run variation in the number of undergraduate economics students.

I. Data

Our sample observations come mostly from data collected annually by the American Economic Association (AEA). The number of undergraduate economics degrees per institution per year is taken from the AEA's Universal Academic Questionnaire (UAQ), supplemented by e-mail requests to individual departments. These data form the basis for a report that has been published by one of us annually for many years in the Summer issue of

the *Journal of Economic Education* (Siegfried 2008). The numbers of Ph.D. degrees in economics awarded by departments are obtained from the Survey of Earned Doctorates, which is jointly sponsored by a half-dozen federal government agencies. So far as we know, student enrollment data are not available by department by institution.

We have degree data for each year from 1990–91 through 2005–06 for every included institution, with one exception: data on Ph.D. degrees were not collected for 1998–99. We measure degrees rather than majors or number of enrolled Ph.D. students because undergraduate students declare their major at different points during their educational experience at different colleges and universities, and Ph.D. enrollments do not correlate well with either students doing coursework, students on campus, or completions. The sample period begins in 1990–91 because that is the year that was selected as a benchmark for a study of the precipitous decline in undergraduate economics majors that occurred in the mid-1990s. The period ends with 2005–06 because those were the latest data available when we began the present study. Fortunately 1990–91 through 2005–06 includes a complete cycle of undergraduate degrees, the aggregate numbers declining by over 30 percent of initial year values in the mid-1990s, and then more than fully recovering over the subsequent decade.

The number of full-time tenured or tenure-track faculty also are collected from the UAQ. We included in our sample each institution for which we also have undergraduate economics degree data and for which the number of years of missing faculty data is no more than three over the entire 16 year interval for each institution, with no two consecutive years missing for any institution. We are missing three percent of faculty observations for the Ph.D. institutions, and six percent for the bachelor's institutions. Rather than employing a multiple random imputation procedure to handle the missing observations, we interpolated missing data on the number of faculty from the reported information in the years prior and after a missing observation. Due to the nature of faculty hiring (a slow, annual process), the missing observation is often the same as both the number of faculty in the year prior and the year after the missing observation.[2] In a few cases, the department provided a precise number from its records to replace a missing observation.

The result is a sample of 16 years of data for each of 18 colleges for which the bachelor's degree is the highest degree awarded in economics, and 24 universities for which a Ph.D. is the highest degree awarded in economics (see Appendix for names). The 18 colleges for which the bachelor's degree is the highest degree awarded all emphasize teaching. In terms of the objectives and constraints of the different types of institutions, we would expect the strongest response of permanent faculty numbers to degrees to occur at such teaching oriented colleges, where class size is an important characteristic that distinguishes them from research universities. We would expect the weakest response of permanent faculty to the number of undergraduate degrees at universities that offer a Ph.D. in economics because the missions those institutions embrace, possibly even emphasize, are graduate education and faculty research. Undergraduate education, and especially class size, is a less important concern at research universities.

Table 1 provides descriptive statistics on the 18 bachelor's degree granting colleges and the 24 universities offering both bachelor's and doctorate degrees in the 16 years from 1991 through 2006. The number of Ph.D.s awarded in 1999 is not available from the Survey of Earned Doctorates (or anywhere else). To sustain the balanced panels for the entire period, for 1999 we inserted the mean of the 1998 and 2000 numbers of Ph.D.s awarded by each of the 24 universities. Not surprisingly, both the distribution of bachelor's and Ph.D. degrees granted and number of full-time tenured or tenure-track faculty members are positively skewed. One bachelor's degree granting institution awarded no degrees in 1995, which likely would have spelled the end of the department had it not soon thereafter restored a positive number of graduates. One Ph.D. granting private university awarded no Ph.D. degrees and only four bachelor's degrees in 1992 but these were aberrations compared to its long-run average of two and seven respective degrees per year. At the other extreme, in 2003 a maximum of 45 Ph.D. degrees (and 409 bachelor's degrees) were awarded by one large state university that averaged 32 PhD. degrees (and 394 bachelor's degrees) over the 1991–2006 period. The largest number of economics bachelor's degrees, 682, was awarded in 2003 by a public university that awarded 9 Ph.D. degrees that year, and averaged 553 bachelor's degrees and 6 Ph.D. degrees over the entire period.

TABLE 1.
Descriptive Statistics for Departments of Economics in Sample

Departments of Economics (1991–2006)					
	Bachelor Degree Granting		Ph.D. Granting		
	Faculty	BA/BS Degrees	Faculty	BA/BS Degrees	Ph.D. Degrees
Mean	6.61	23.78	23.20	119.92	9.58
Standard Dev.	3.21	19.65	10.44	126.22	7.89
Minimum	2	0	8	2	0
Maximum	14	81	56	682	45
	Number of Schools			Number of Schools	
Total	18			24	
Private	4			15	
Public	14			9	
	With Competing Business Program			MBA Program Present	
	7			3	

Private institutions (PRIVATE = 2) are more prevalent than public institutions (PUBLIC = 1) in the sample for both bachelor's and Ph.D.-granting institutions; this is especially so for the bachelor's level. Finally, a binary variable that indicates the absence or presence of a business degree program is included based on findings reported in the series of empirical studies addressing the effect of a competing business program on the number of undergraduate economics majors that appeared in the Fall 1996 issue of the *Journal of Economic Education*, (Salemi 1996). Those studies find that fluctuations in excess demand for competing business degree programs affect economics department enrollments. By including an indicator of competing business programs, we test whether fluctuations in economics majors caused by changes in the business programs have a differential effect on faculty positions vis-à-vis the number of economics majors generated otherwise. For the undergraduate programs this 0–1 dummy variable (Bprog) simply reflects whether there is a business program. For institutions with a Ph.D. program in economics, an analogous MBA dummy variable was created to test whether the instructional servicing of MBAs influences faculty size.

II. Basic Model and Estimates

As a starting point, consider the pooled least squares estimates of the models of permanent faculty size for the two classes of institutions in Table 1. We assume the faculty-size-generating process for bachelor's degree-granting undergraduate departments is:

$$FACULTY\,size_{it} = \beta_1 + \beta_2 YEAR_t + \beta_3 BA\&S_{it} + \beta_4 MEANBA\&S_i + \beta_5 MOVAVBA\&BS_{it} + \beta_6 PUBLIC_i + \beta_7 Bprog_i + \varepsilon_{it}$$

where error term ε_{it} is *iid* across institutions and over time and $E(\varepsilon_{it}^2|\mathbf{x}_{it}) = \sigma^2$ for $n = 18$ schools and $T = 14$ years, and for PhD and bachelor's degree-granting departments is:

$$FACULTY\,size_{it} = \lambda_1 + \lambda_2 YEAR_t + \lambda_3 BA\&S_{it} + \lambda_4 MEANBA\&S_i + \beta_5 MOVAVBA\&BS_{it} + \lambda_6 PHD_{it} + \lambda_7 MEANPHD_i + \lambda_8 MOVAVPHD_i + \lambda_9 PUBLIC_i + \lambda_{10} MBA_i + \varepsilon_{it}$$

where error term ε_{it} is *iid* across institutions and over time and $E(\varepsilon_{it}^2|\mathbf{x}_{it}) = \sigma^2$, for $n = 24$ schools and $T = 14$.

There are three ways in which we entertain the effect of degrees on faculty size. First, an implied justification for including the number of contemporaneous degrees ($BA\&S_{it}$, PHD_{it}) is that the decision makers might form a type of rational expectation in that they set the permanent faculty size based on the anticipated number of majors to receive degrees in the future. Second, we have included the overall mean number of degrees

awarded at each institution ($MEANBA\&S_i$, $MEANPHD_i$) to reflect a type of historical steady state. That is, the central administration or managers of the institution may have a target number of permanent faculty relative to the long-term expected number of annual graduates from the department that is desired to maintain the department's appropriate role within the institution.[3] Third, the central authority might be willing to marginally increase or decrease the permanent faculty size based on the near term trend in majors, as reflected in a three year moving average of degrees awarded ($MOVAVBA\&BS_{it}$, $MOVAVPHD_i$).

The OLS estimates for bachelor's granting colleges, with standard errors adjusted for each college's potential unique random component, are reported in Table 2, Panel A. The marginal effect of an additional economics major is insignificant and even slightly negative within the sample. However, if a department of economics can document an upward trend in degrees (as reflected in the three-year moving average), then the college will respond with additional tenure-track lines. It takes an increase of 26 or 27 bachelor degrees in the moving average to expect just one more faculty position. Tenured and tenure-track faculty size is

TABLE 2.
Least Squares Regressions for Faculty Members in Economics Department

Panel A: Bachelor Degree Granting Institutions

Dependent Variable:	Faculty
R Squared	0.6484
F	75.29
P (F > 75.29)	0.0000
Observations	252

	Coefficient	Standard Error*	t Statistic	P(|t| > t Stat)
Intercept	10.1397	0.9106	11.13	0.0000
Year	−0.0281	0.0223	−1.26	0.2083
BA/BS Degrees	−0.0264	0.0187	−0.99	0.3814
Mean BA/BS Degrees	0.1083	0.0338	3.21	0.0015
Public	−3.8624	0.5695	−6.78	0.0000
Business Program	0.5811	0.9425	0.62	0.5382
Moving Avg. BA/BS Degrees	0.0378	0.0280	2.09	0.0377

*Clustering corrected for 14 observations per institution

Panel B: Ph.D. Granting Institutions

Dependent Variable:	Faculty
R Squared	0.5777
F	49.56
P (F > 64.782)	0.0000
Observations	336

	Coefficient	Standard Error*	t Statistic	P(|t| > t Stat)
Intercept	10.5474	5.7106	1.85	0.0657
Year	−0.0253	0.0747	−0.34	0.7354
Ph.D. Degrees	0.1157	0.0650	1.78	0.0761
BA and BS Degrees	0.0141	0.0202	0.70	0.4867
Public	0.9493	3.4229	0.28	0.7817
MBA Program	−0.9735	2.8452	−0.34	0.7324
Ph.D. Degree Means	0.7615	0.2797	2.73	0.0068
BA/BS Degree Means	−0.0075	0.0127	−0.59	0.5557
Moving Avg. Ph.D. Degrees	0.0181	0.1451	0.13	0.9007
Moving Avg. BA/BS Degrees	0.0169	0.0175	0.97	0.3353

*Clustering corrected for 14 observations per institution

largely and significantly determined by the institution's desired student numbers (as represented by average number of bachelor's degrees). A long-term increase of nine or ten students earning degrees in economics is required to predict one more faculty member is in a department.

Moving from a public to a private institution lowers predicted faculty size by nearly four members, *ceteris paribus* and on average increases the ratio of annual graduates to faculty from 3.6 to 9.0, an enormous difference. There is an insignificant erosion of tenured and tenure-track faculty size over time. Finally, while economics departments in colleges with a competing business program tend to have a larger permanent faculty, *ceteris paribus*, the effect is small and insignificant.

At a university with a Ph.D. program in economics (Table 2, Panel B), the marginal effect of an additional undergraduate economics major or change in short or long term undergraduate degree average is statistically insignificant (standard errors adjusted for clustering). The size of the bachelor's program does not appear to matter. Rather, it is the average size of the Ph.D. program that drives faculty size at research universities. Little more than one additional Ph.D. student added to the long-term average Ph.D. class size is required in order for predicted faculty size to increase by one, *ceteris paribus*. Based on the lack of significance in the three-year Ph.D. degree moving average and small but significant effect of contemporaneous Ph.D. degrees, changing faculty size at Ph.D. granting institutions appears to be a daunting challenge.

There seems to be no secular decline in full-time permanent faculty numbers at Ph.D. granting universities or any difference between typical permanent faculty size at public and private research universities. In addition, the presence of an MBA program is innocuous.

III. Random Effects Models and Estimates

There are likely to be substantial school specific effects in the proposed regression models. A natural approach to take in this case is to add "fixed school effects" to the regression by adding institution specific dummy variables to the model. In our case (as often happens in analyzing microeconomic level data) the fixed effects approach is unworkable because other time invariant variables in the model (e.g., PUBLIC in both equations) will be collinear with the set of school dummy variables. The alternative approach to incorporating school specific effects is a random effects model. However, the random effects model makes the strong assumption that the random school effects are not correlated with the other explanatory variables in the model. Mundlak's (1978) approach to modeling panel data is a commonly used specification that seeks a middle ground between these two formulations. The Mundlak model posits that the fixed effect in the equation, α_i, can be projected upon the group means of the time varying variables, so that

$$\alpha_i = \beta_1 + \delta' \bar{x}_i + u_i$$

where $\bar{x}_i$ is the set of group (school) means of the time varying variables and u_i is a (now) random effect that is uncorrelated with the variables and disturbances in the model. Logically, adding the means to the equations picks up the correlation between the school effects and the other variables. Adding the means of the numbers of degrees awarded, as we have already done in the two equations, has the added benefit of enabling us to follow the Mundlak approach to panel data modeling and estimation.

We have completed the model by formulating the random effects models for BA and BS degree-granting undergraduate departments as:

$$\begin{aligned} FACULTY\ size_{it} = {} & \beta_1 + \beta_2 YEAR_t + \beta_3 BA\&S_{it} \\ & + \beta_4 MEANBA\&S_i \\ & + \beta_5 MOVAVBA\&BS_{it} \\ & + \beta_6 PUBLIC_i + \beta_7 Bprog_i + \varepsilon_{it} + u_i \end{aligned}$$

where error term ε is *iid* over time and $E(\varepsilon_{it}^2 | x_{it}) = \sigma^2$ for n = 18 and T_i = 14 and $E[u_i^2] = \theta^2$ for n = 18; and for PhD and bachelor degree-granting departments as:

$$\begin{aligned} FACULTY\ size_{it} = {} & \lambda_1 + \lambda_3 BA\&S_{it} \\ & + \lambda_4 MEANBA\&S_i \\ & + \beta_5 MOVAVBA\&BS_{it} + \lambda_6 PHD_{it} \\ & + \lambda_7 MEANPHD_i \\ & + \lambda_8 MOVAVPHD_i \\ & + \lambda_9 PUBLIC_i + \lambda_{10} MBA_i + \varepsilon_{it} + u_i \end{aligned}$$

TABLE 3.
Random Effects Regressions for Faculty Members in Economics Department

Panel A: Bachelor Degree Granting Institutions

Dependent Variable:	Faculty
R Squared	0.6483 (Based on feasible GLS residuals)
Institution Specific Variance (ε_{it}):	0.6431; Common Variance (u_i): 2.9015; Correlation: 0.8186
Observations	18 Institutions, 14 Years

	Coefficient	Standard Error*	t Statistic	P(|t| > t Stat)
Intercept	10.1419	0.8746	11.60	0.0000
Year	−0.0285	0.0215	−1.33	0.1838
BA/BS Degrees	−0.0161	0.0179	−0.90	0.3696
Mean BA/BS Degrees	0.1061	0.0323	3.29	0.0010
Public	−3.8637	0.5469	−7.07	0.0000
Business Program	0.5818	0.9050	0.64	0.5203
Moving Avg. BA/BS Degrees	0.0398	0.0173	2.31	0.0212

*Clustering corrected for 14 observations per institution

Panel B: Ph.D. Granting Institutions

Dependent Variable:	Faculty
R Squared	0.5758 (Based on feasible GLS residuals)
Institution Specific Variance (ε_{it}):	5.9694; Common Variance (u_i): 40.7372; Correlation: 0.8722
Observations	24 Institutions, 14 years

	Coefficient	Standard Error*	t Statistic	P(|t| > t Stat)
Intercept	10.5780	5.5242	1.92	0.0555
Year	−0.0268	0.0729	−0.40	0.6911
Ph.D. Degrees	0.0181	0.0641	0.28	0.7783
BA/BS Degrees	0.0051	0.0182	0.28	0.7802
Public	0.9467	3.3169	0.29	0.7753
MBA Program	−1.0024	2.7770	−0.36	0.7181
Ph.D. Degree Means	0.9052	0.2813	3.22	0.0013
BA/BS Degree Means	−0.0113	0.0120	−0.95	0.3340
Moving Avg. Ph.D. Degrees	−0.0264	0.1400	−0.19	0.8503
Moving Avg. BA/BS Degrees	0.0295	0.0159	1.87	0.0622

*Clustering corrected for 14 observations per institution

where error term ε_{it} is *iid* over time with $E(\varepsilon_{it}^2|\mathbf{x}_{it}) = \sigma^2$ for n = 24 and T = 14.

The random effects estimates are reported in Table 3. Panel A contains the estimates for those institutions that award only bachelor's degrees in economics. The marginal effect of an additional economics major is again insignificant but slightly negative within the sample. Both the short-term moving average and long term average number of bachelor's degrees are significant. A long-term increase of about 10 students earning degrees in economics is required to predict that one more tenured or tenure-track faculty member is in a department. *Ceteris paribus*, economics departments at private institutions are smaller than comparable departments at public schools by a large and significant four members. Whether there is a competing undergraduate business program present is insignificant. There is no meaningful trend in faculty size.

Panel B of Table 3 reports the random effects estimates for universities with both undergraduate and Ph.D. programs in economics. As with the OLS estimates, it is the long-term average size of the Ph.D. program that drives permanent faculty size. Little more than a single Ph.D. student added to the long-term average is required for the predicted tenured or tenure-track number of faculty to increase by one, *ceteris paribus*. In the short run, increasing the number of Ph.D. degrees in any given year or as a moving average, however,

has little, if any effect. Curiously, the marginal effect of a short term moving average increase in undergraduate economics major is statistically significant at the 0.10 Type I error level, but the effect remains small. There is no statistical significance and little effect associated with trend, public versus private or whether the university has an MBA program.

IV. Conclusion

Random effects estimates to predict the number of economics faculty at bachelor's degree level colleges suggest that deans primarily target faculty size to accommodate a specific long-term expected number of students, adding one faculty member for each additional 10 graduating majors. Presidents and deans are quite cautious about responding to short-term deviations from the long-term average. Given the outcry that can be expected from faculty who are to have their oxen gored for the possible short-term gain of those with increased student demand, these central managers have little or no incentive to change the allocation of resources and rents. (This political power argument obviously depends on those with the increased student demand being too busy to squeal as loud as those with time on their hands.)

The magnitudes are quite different at research universities that produce both bachelor's and Ph.D. degrees. Faculty size at Ph.D. granting institutions is predicted to increase on a one-for-one basis as the target number of Ph.D.s awarded per year rises. Although the type of students (undergraduate versus graduate) driving decisions about permanent faculty size differs between bachelor's and Ph.D. granting institutions, in both cases the evidence indicates that it takes a much larger short-term change in student demand to induce a change in the number of full-time tenured or tenure-track faculty than it takes from a long-term change in student demand. These results are consistent with Johnson and Turner's (2009) conclusion that student-faculty ratios are driven by tradition that is based more on past politics than economics.

Appendix

Institutions in the Bachelor's Degree Sample (n = 18)

Amherst College	Augustana College	Bates College
Bowdoin College	Davidson College	Eastern Kentucky University
Gonzaga University	Hartwick College	Idaho State University
Ithaca College	Metropolitan State College	Texas Lutheran University
Randolph-Macon Women's College	Saint Lawrence College	University of Richmond
University of Vermont	Ursinus College	Whittier College

Institutions in Ph.D. Degree Sample (n = 24)

Boston College	Brown University
California Institute of Technology	Clark University
Florida State University	Indiana University
Johns Hopkins University	Kansas State University
Michigan State University	Princeton University
Purdue University	Southern Illinois University-Carbondale
Southern Methodist University	University of California-Berkeley
University of California-Santa Barbara	University of Iowa
University of Kansas	University of Nebraska-Lincoln
University of North Carolina-Chapel Hill	University of Oregon
University of Rochester	University of Wisconsin-Madison
Washington State University	Washington University-St. Louis

Notes

1. Our specification can only evaluate the association between faculty size and numbers of students. It is possible that faculty size drives enrollment. A department with more faculty *ceteris paribus*, could offer a more diverse set of course options and/or smaller class sizes, which could attract more students to the department. We doubt that prospective undergraduate majors know much about either class sizes (except in the extreme) or course option possibilities in economics. Ph.D. students, on the other hand, are likely to know about applied field possibilities, but Ph.D. admissions slots and/or financial support opportunities are usually exogenously controlled by the Graduate School.
2. Not filling in these few missing values would render the panel data analysis impossible. Moreover, any values within the range of the adjoining values are unlikely to have a substantive effect on regression coefficient estimates and their standard errors. That is, imputing 8 faculty members in a year for which this value is unknown when the adjoining years show 7 and 9 faculty members is not going to materially affect estimates where we have hundreds of observations. A multiple imputation routine, on the other hand, might enter an unreasonable value as a candidate for the missing item as an outcome of the random sampling mechanism. For the example, while it seems almost certain that the missing datum would be 7, 8 or 9, a multiple imputation algorithm would not use this information. Indeed, some missing values might be filled with values outside the range of their neighbors, which is difficult if not impossible to justify when simply looking at the data. For example, we could not justify inserting say 4.75 faculty members generated by an imputation equation for a missing value between a previous year with 7 members and the following year with 9 members. Thus, our simple interpolation appeared to us to be the most appropriate approach given the nature of data.
3. One of us, as a member on an external review team for a well known economics department, was told by a high ranking administrator that the department had received all the additional lines it was going to get because it now had too many majors for the good of the institution. Historically, the institution was known for turning out engineers and the economics department was attracting too many students away from engineering. This personal experience is consistent with Johnson and Turner's (2009, p. 170) assessment that a substantial part of the explanation for differences in student-faculty ratios across academic departments resides in politics or tradition rather than economic decision making in many institutions of higher education.

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