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AN EMPIRICAL EXAMPLE OF TRADEOFFS BETWEEN TEACHING AND RESEARCH

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ABSTRACT: Continuing public pressure on major research universities has caused a reevaluation of the balance between teaching and research. The preeminence of research is being questioned, and the focus on teaching and credit hour generation has been stated to be dominant at many institutions. Many states have begun to fund programs based on enrollment or credit hours generated, causing significant changes in the orientation of academic programs at Research I institutions. These changes in funding and philosophy suggest that research productivity may decline, and teaching quantities should increase.

Based on a two-year snapshot of faculty productivity in the NC State Department of Forestry, an empirical estimate of the tradeoffs between teaching and research was made. Teaching and research are considered multiple outputs produced by a single input (faculty). This represents a simple production possibilities curve. The tradeoffs occurring from 1995 to 1996 in faculty outputs were measured using a simple marginal rate of product substitution (MRPS) calculation. Results indicate that the anticipated inverse relationship between teaching and research productivity does hold, and indeed that more teaching greatly decreases research outputs at the current margin.

A few summary statistics from the calendar year 1995 and 1996 accomplishment reports provide revealing snapshots of changes in productivity and focus in our programs, and the tradeoffs involved in some of our strategic directions. The statistics for number of credit hours taught, academic publications, grants received, and speeches by departmental faculty are summa-

rized below. As expected, we have increased our efforts to teach more credit hours, and fortunately, have been moderately successful. This increase, however, has been associated with a proportionately larger decrease in our research productivity. Some of this may be coincidental, but the magnitude suggests that some is related.

<u>Output Indicator</u>	<u>1995</u>	<u>1996</u>	<u>Change</u>	<u>% Change</u>
Teaching Credit Hours	3456	3842	386	11.2
Research Grants (no.)	70	55	- 15	- 21.4
Grants Received (mm \$)	5.6	4.5	- 1.1	- 24.4
Refereed Publications	54	35	- 19	- 35.2
Total Publications	117	105	- 12	- 10.3
Professional Speeches	155	141	- 14	- 9.0

Based on the data summarized above, one can calculate the “cross-product elasticities” or marginal rates of product substitution that might approximate the magnitude of the tradeoffs involved in teaching more and researching less. Elasticities are unitless measure that estimate the proportional change in one output versus another. For two outputs (teaching/research) and one input (faculty time), one would expect some negative elasticity measure if the outputs were competitive. The best judge of scientific productivity still probably is research grants awarded and refereed publications—indicators of success in the judgment of scientific peers. Specifically, the relevant teaching/research elasticities (Marginal Rates of Product Substitutions, MRPS) can be calculated as:

Teaching Credit Hours for Total Grant Funding:	MRPS = -2.18
Teaching Credit Hours for Refereed Publications:	MRPS = -3.15
Teaching Credit Hours for Total Professional Publications:	MRPS = -0.92

In brief, this suggests that there is a very high elasticity of product substitution between teaching more credit hours and receiving grant funds or publishing refereed papers, and a almost proportional elasticity of substitution for the overall publication rate. For example, the elasticity of substitution for grants and refereed publications amounted to about 3 times as much, indicating that a 10% increase in credit hour generation “cost” about a 30% decrease in research productivity, at the margin. This would not hold for the entire range of production possibilities, but even at the margin it would suggest that we can drive research into the ground quickly by even a 20% to 30% increase in credit hour generation. Doubling the credit hours generated, without some significant structural change in the way we teach (e.g., eliminating field classes), could well decimate intensive research programs. This would reduce the reputation of leading graduate research programs, prevent us from getting funds to pay graduate student stipends, and not do much for morale either. While some change in NC State’s forestry productivity may be coincidental, surely some is due to the focus we are placing on teaching. We reward teachers more, based on priorities perceived from the College and the University. Faculty have tried to teach more on the margin. And furthermore, this focus probably infers or suggests psychologically that research productivity is not that important. Given that it is difficult to write and obtain grant funds or publish refereed journal articles (and be rejected), we do need to be careful about sending messages that research is not important.

The balance among teaching and research activities is crucial for all departments of forestry and natural resources. Teaching appears to have a very high opportunity cost in terms of foregone research. This can reassure teachers who have feel their work is under-appreciated. But it also must worry administrators who want to build academic reputations and strong graduate programs based on external funding. Extension or corroboration of these preliminary findings would of course be desirable. I unfortunately will have to leave that to researchers who have more time because they are not teaching much or administering large programs.