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PHASING INTO RETIREMENT

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ABSTRACT

Employers have been launching phased retirement programs to help workers navigate the transition from work to retirement more effectively. This paper examines the experience of the phased retirement system for tenured faculty in the University of North Carolina system. After phased retirement was introduced, there was a sizable increase in the overall separation rate in the system. A multinomial logit model of the retirement decision as a function of pension incentives, employee performance, demographics, and campus characteristics is developed. The key empirical result is that the odds of entering phased retirement are strongly and inversely related to employee performance, as measured by recent pay increases.

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In its simplest version, the life cycle theory of labor supply predicts that workers gradually cut back labor hours as the rewards from continued work decline and the time horizon over which retirement assets can be consumed shortens. This prediction has not been consistent with actual hours profiles of many retiring workers, who shift instantaneously from a full-time, year-around schedule to zero hours. This pattern of retirement has been facilitated in part by corporate retirement policies that require workers to resign before they can be eligible for pension benefits. Thus, many workers must quit their current full-time job and seek other employment if they wish to reduce weekly hours of work instead of completely leaving the labor force.

Recently, employers in some sectors have become more interested in retaining older workers. Reasons for this change in attitudes include an increase in the relative productivity of older workers, the overall shortage of skilled labor, and slower growth of the labor force. Some firms have begun to experiment with phased retirement plans that allow workers to start receiving pension benefits while they continue to work part-time. This encourages older workers to remain on the job part time instead of completely retiring. Workers entering phased retirement may be required to relinquish some of the claims on continued employment and provide the employer with increased employment flexibility.

Relatively little economic analysis has attempted to examine the objectives of phased retirement programs and whether phased retirement plans have achieved these goals. Key questions that need to be answered include:

1. How many workers elect to enter phased retirement?
2. In the absence of a phased retirement program, would phased retirees have fully retired or remained on the job full-time?
3. How will the introduction of phased retirement affect productivity?

Important public policy issues arise because pension regulations limit the options available to employers in designing phased retirement programs. Before deciding whether existing pension regulations should be amended to encourage the use of phased retirement programs, it would be useful to have some rigorous, empirical evidence on the effectiveness of phased retirement programs.

As a first step, this paper examines the experience of a single organization with phased retirement – tenured faculty in the University of North Carolina system. University faculty are by no means representative of the overall labor force; they are highly skilled and have self-selected into a career track with the prospect of lifetime job security. However, they face the same optimization problem of how to balance labor and leisure over the life cycle as every other worker. In addition, higher education is the sector of the economy with the highest incidence of phased retirement programs.[1] The tenure system does not generally allow for part-time work. Thus, most phased retired programs at universities require faculty to give up tenure in exchange for a fixed term contract allowing for part-time work.

Our analysis focuses on two main issues. First, how many faculty members have chosen phased retirement and whether those selecting phased retirement are doing so instead of continuing to work full-time or instead of retiring completely. This will be examined by comparing retirement behavior before and after the introduction of phased retirement, using both summary statistics and probit analysis. Second, how does the provision of phased retirement affect faculty productivity? The answer to this latter question depends on whether high or low productivity faculty are enrolling in phased retirement and whether in the absence of this program, these employees would have remained on the job or retired. Some preliminary evidence on these issues is

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[1] A survey by Watson Wyatt (1999) found that 36 percent of the employers in the education industry had phased retirement plans.

reported in Ghent, Allen, and Clark (2001), which contains a descriptive analysis of retirement patterns before and after the introduction of phased retirement.[2] This paper develops a multinomial logit model of retirement behavior which includes measures of variables reflecting economic incentives to retire (e.g., pension backloading) and measures of faculty productivity.

I. THE ECONOMICS OF PHASED RETIREMENT

To understand how the introduction of a phased retirement plan affects labor supply, consider a simple one period labor-leisure choice model.[3] Assume that workers have three choices in the absence of a phased retirement plan: (1) work full-time for H hours in a career job and earn income Y with zero pension income, (2) work half-time at another employer for 0.5H hours and earn Y' with full pension income P, and (3) retire from the career job and receive P. Let worker utility be represented by U=U(y, T-h), where y = income, T = time endowment, and h = labor hours. Workers compare U_1(Y, T-H) to U_2(Y'+P, T-0.5H) and U_3(P, T) and select the option that yields the maximum utility level.

The desirability of part-time work depends on how much labor income must be sacrificed to obtain a half-time hours reduction. For most workers we expect 0.5Y > Y'; that is, the half-time salary at another employer would be less than half of the full-time salary. This would happen because (1) specific human capital at the original job would not be valued at the new job and (2) wage rates on part-time jobs tend to be lower than on full-time jobs. The greater the income sacrifice needed to obtain a part-time work schedule (Y-Y'), the lower the odds of working part-time.

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[2] Kim (2003) examines the relationship between faculty productivity and the voluntary early retirement programs in the University of California system in the early 1990s.
[3] For a more rigorous approach to the choice of full and part time work near retirement in a life cycle context, see Gustman and Steinmeier (1986).

The probability of selecting either part-time work or full-time retirement is influenced by employer retirement programs. An increase in the present value of the pension benefits will be associated with a greater likelihood of both full and phased retirement. Once a worker has accumulated the rights to a pension that meets or exceeds half of his regular salary, phased retirement at half-pay allows him to receive more income while working fewer hours while in phased retirement. Work and retirement choices also are affected by accrual of pension benefits with continued full-time employment. If an individual anticipates a sizable increase in pension income by staying with an organization a few years more, then the likelihood of retirement is expected to be quite lower. On the other hand, if pension benefits do not increase, or even decrease, with continued work, the odds of retirement should be quite high.

The phased retirement plan provided by the UNC system offers tenured faculty the option of working half-time for half the full-time academic salary. For many faculty this represents an increase in Y', the amount of income they can earn half time. This would have the usual income and substitution effects in a framework where there is a continuous choice of hours. The higher part-time salary makes part-time work more attractive. The labor-leisure choice of faculty who can earn half or more of their regular academic salary by working half-time off campus would not be affected by the introduction of this type of phased retirement scheme.

If one expands the framework to life-cycle optimization, two additional issues arise. First, the greater payoff to part-time work in the later stages of one's career lowers the marginal utility of income and thus increases the demand for leisure in all stages of the life cycle. This partial effect would translate into earlier shifts to part-time work and full retirement. Combining this effect with the incentive to substitute part-time work for full-time work and full-time retirement noted previously, we can trace out the full effects of phased retirement over the life cycle. The odds of working part-time in the years preceding complete retirement unambiguously increase, whereas the timing of complete retirement might be delayed (because of the greater incentive to work part-time) or accelerated (because more income is generated for those who would have worked part-time anyway).

Second, one must be careful to distinguish between the adjustments that would take place when phased retirement is introduced with enough lead time that workers can fully adjust their lifetime labor-leisure choice decision versus the adjustments that would take place when phased retirement is introduced unexpectedly and is available immediately. In all likelihood there was a backlog of demand for phased retirement at the time it was introduced in the UNC system, so one must be careful to examine more than one year of data to be able to gauge its impact in a steady state.

From an employer standpoint, there are two important issues associated with the introduction of phased retirement: what happens to the retirement rate and what happens to productivity? Phased retirement makes bridge jobs at other employers less attractive, thereby increasing employee retention in terms of duration of employer attachment. However, it also increases the odds that a worker will move from a full-time to a part-time schedule, so that the impact on an hours-weighted indicator of mobility is more difficult to determine. Empirically, employers would want to know the impact of phased retirement on the total retirement rate and how that outflow varies by age, experience, and quality of workers.

The net effect on faculty productivity depends on two issues: who selects phased retirement and does phased retirement shorten or lengthen employer-employee attachments? If the probability of entering phased retirement is inversely related to faculty productivity and phased retirement shortens job durations, then the introduction of phased retirement enhances faculty productivity. Productivity effects vanish or change signs under different assumptions about these two conditions.

The implications from this discussion for empirical work are as follows:

- Some employees will view the introduction of a phased retirement plan favorably. After a plan is introduced, the sum of the rates of full and phased retirement will exceed the rate of full retirement that prevailed beforehand.
- The financial incentive for entering phased retirement depends on how the part-time salary offered under the plan compares to part-time salaries off-campus. The plan will be most attractive to those with the least attractive opportunities off-campus.
- The introduction of a phased retirement plan could have important effects on faculty productivity; the direction of those effects cannot be predicted a priori.
- The odds of entering phased retirement will be heavily influenced by pension plan characteristics.

II. PHASED RETIREMENT PROGRAMS IN HIGHER EDUCATION

Higher education is particularly well-suited for phased retirement programs because of rising concerns about managing the age structure of the professorate (Watson Wyatt Worldwide, 1999; William Mercer Company, 2001). The elimination of mandatory retirement for tenured faculty in 1994 meant that faculty age 70 and older had the right to remain on the job until they decide to retire. In addition, rapid aging has dramatically altered the age structure of university faculties. In this new environment, many colleges and universities have opted to provide older faculty with the additional choice of part-time work. A recent survey conducted by the Committee on Retirement of the American Association of University Professors indicated that of the responding institutions, 35 percent of the Research and Doctoral institutions were offering formal phased retirement plans and 29 percent of Masters and Baccalaureate institutions had adopted formal phased retirement programs. These plans were much more prevalent at private institutions.

Further examination of the responding institutions in the AAUP survey reveals that phased retirement programs are more prevalent among institutions that have a greater proportion of their faculty who are tenured and in the older age groups. For example, 17 percent of institutions with less than 40 percent of their faculty tenured offer phased retirement programs while the incidence of these plans is 27 percent when the proportion of the faculty that is tenured is 40 to 60 percent. These rates can be compared to 31 percent in institutions offering phased retirement when the tenure rate is 60 to 80 percent and 52 percent offer such plans when 80 percent or more of the faculty is tenured. In addition, 18 percent of institutions with less than 10 percent of their faculty age 60 or over offer phased retirement plans while roughly one third of those with more than 10 percent of the faculty over age 60 have introduced phased retirement plans.

In 1996, the Board of Governors of the University of North Carolina (UNC) adopted a phased retirement plan that would allow older faculty with sufficient service to reduce their workloads while remaining with the university.[4] The objective of this program was to provide faculty with a new employment option of remaining on the job part time for a fixed period of time after their retirement. The program provided for a tenured faculty member to relinquish tenure in exchange for a fixed term contract that specified half-time work for half-time pay.

Each of the 15 campuses in the UNC system that grant tenure was required to implement a phased retirement program.[5] To be eligible for the program, faculty must

[4] The UNC faculty aged rapidly between 1982 and 1999. During this period, the proportion of the faculty aged 55 and older increased from 18.2 percent to 31.2 percent and the mean age of the faculty rose from 44.5 years to 49.4 years (Clark and Ghent, 2000).

[5] The NC School of the Arts is also a member of the UNC system, but it does not award tenure.

be tenured. They also had to be age 50 with 20 years of service or age 60 with 5 years of service at the same institution. Each campus was allowed to select the length of the contract for its faculty; however, the program required a minimum length of one year and a maximum length of five years. Twelve of the 15 institutions chose a three-year phased retirement contract, two institutions chose a two-year contract, and one campus chose a five-year phased retirement contract.

Individuals who were considering entering the program negotiate their half-time duties with their department chairs prior to accepting phased retirement. Duties could be performed evenly across both semesters or the individual could work full-time one semester and have no specific assigned duties the next semester. Persons in phased retirement do not receive most employee benefits. If they begin their retirement benefits, they are eligible for the same health insurance as active employees.[6]

Using employment records for the years immediately preceding the introduction of the phased retirement program and the first three years of experience with the program, we are able to assess the determinants of phased retirement and the impact of phased retirement on the rate of full retirement. A key question in this analysis is whether phased retirees are individuals who would have been more likely to remain on the job full time if the program were not offered or whether they would have been more likely to retire in its absence.

The data used in the analysis are based on the annual faculty censuses that each campus is required to submit to the General Administration of the UNC system. These are the employment records for all faculty employed as of September of the specified year. Information on each person includes age, hire date, rank, gender, race,

[6] Interested readers can examine the details of the phased retirement program at NC State University by looking on the World Wide Web at http://www.ncsu.edu/provost/offices/academic_personnel/policy/phased_retirement/index.html.

tenure status, annual salary, and type of pension plan. The annual records are linked across years so we are able to determine whether an individual remains in his or her faculty position from one year to the next. The census data for the years 1994 until 2000 are employed in this study. The analysis is limited to faculty members who were eligible to enter the phased retirement program. This means that the sample includes only tenured faculty who were at least age 50 with 20 or more years of service or at least age 60 with 5 or more years of service.

What would the employees selecting phased retirement have done had the option not been available? Would they have worked fulltime or fully retired? In the three years prior to the introduction of phased retirement, the retirement rate from UNC institutions among eligible faculty age 50 was 8.7 percent. After the introduction of the new retirement program, the total retirement rate (full retirement plus phased retirement) increased to 10.4 percent in 1997-98, 11.3 percent in 1998-99, and 10.4 percent in 1999-2000[7]. The percentage of faculty selecting phased retirement was 3.2 in 1997-98, 2.3 in 1998-99, and 3.0 in 1999-2000. The full retirement rates were 7.2 percent in 1997-98, 9.0 percent in 1998-99, and 7.4 percent in 1999-2000. During these years, phased retirees represented 24 percent of all retirements from the UNC system. In absolute numbers, about 70 faculty entered the phased retirement program each year while around 225 fully retired.

One might question whether this increase in retirement rates was caused by the introduction of the phased retirement program or by other factors influencing the incentives to remain employed in the UNC system. Because the phased retirement program was launched across all campuses at the same time, there are no experimental data that can be used to address this issue directly. Indirectly, however, full-time faculty

[7] The pairing of years (1997-98) indicates the ratio of those employed in the initial year (1997) who were retired in the later year (1998).

in the North Carolina Community College System (NCCCS) represent a reasonable control group. They do not have a phased retirement option. Their decision to remain employed will be influenced by the same budgetary and retirement system parameters that face UNC system faculty. If there were an increase in the retirement rates for NCCCS faculty taking place at the same time that phased retirement was introduced, that would serve as evidence that other factors were contributing to the observed increase in overall retirement rates. On the other hand, if the retirement rates for NCCCS faculty remained unchanged, that would provide further evidence that the phased retirement program had causal effects.

Table 1 reports full and phased retirement rates for UNC system faculty and full retirement rates for NCCCS faculty by year. The comparison between the two groups is very striking. There is a permanent increase in the overall retirement rate for UNC system faculty in the year when phased retirement was introduced. There is absolutely no change throughout the period in the retirement rate for community and technical college faculty. Given the fact that prospective salary increases and pension plan parameters for the two groups are the same, it is hard to believe that the increase in retirement rates for UNC system was caused by anything other than the phased retirement plan.

Further evidence that the phased retirement plan had causal effects is reported in Ghent, Allen, and Clark (2001). Ghent et al. estimated two retirement probit equations using data for 1997-99: one in which retirement was defined as full retirement only and another in which retirement was defined as either full or phased retirement. The same model was estimated for 1995-97, when full retirement was the only option. Then two different across-sample pooling tests were conducted. The tests concluded that the 1997-99 retirement probit with the dependent variable equal to one only if the individual completely retired could be pooled with the 1995-97 data to estimate a retirement equation. However, when retirement in 1997-99 was defined to be both complete or phased retirement, the data could not be pooled. Assuming that the estimated retirement equations were stable over time, this implies that the phased retirees "fit better" when not counted as retired. Thus, the data indicate that the phased retirees of 1997-98 more closely resembled faculty members choosing to remain full-time in 1995-96 than those who chose to completely retire in 1995-96.

III. EMPIRICAL MODEL

How does the introduction of phased retirement affect the labor-leisure decision of tenured faculty in the UNC system? How does faculty productivity change as a result of those decisions? We use a multinomial logit model, where employees have three options: work full-time (A), enter phased retirement (R), and enter full retirement (F). The probabilities of employee i entering each of these three states are

$$\text{Prob}(Y_i = F) = \exp(\beta_F x_i)/(1+\exp(\beta_F x_i)+\exp(\beta_p x_i))$$

$$\text{Prob}(Y_i = P) = \exp(\beta_P x_i)/(1+\exp(\beta_F x_i)+\exp(\beta_p x_i))$$

$$\text{Prob}(Y_i = A) = 1/(1+\exp(\beta_F x_i)+\exp(\beta_p x_i))$$

The coefficients from this framework are useful for determining which variables have an impact on retirement decisions, but the entire set of coefficients must be transformed in order to determine the impact of each variable. For instance, to examine the difference in retirement odds between workers with 30 and 20 years of service, we calculate predicted probabilities for the entire sample using actual values for all x_i except years of service, which will be set at 20 years for all employees and then reset at 30 years. The difference between the two sets of predicted probabilities will indicate how a 20 to 30 year difference in time employed affects retirement odds. Similar calculations are performed to obtain the predicted impact of binary variables.[8]

The retirement decision is modeled as a function of demographics (gender, race, and age), pension incentives, employee performance, and unique variables that are likely to be associated with the impact of phased retirement on the decisions of UNC system faculty. Correlations between retirement and either gender or race (separate indicators for African-Americans, Asian or Asian- American, and other nonwhites) could reflect differences in either life expectancy or attitudes toward retirement. Binary indicators of age are used to avoid arbitrary constraints on the relationship between age and retirement and to capture any spikes in the retirement hazard.

UNC faculty members hired since 1971 have had the option of enrolling in the Teachers' and State Employees' Retirement System (TSERS) or in an optional retirement program (ORP). Currently the ORP options include TIAA-CREF, Lincoln Life, Fidelity Investments, and VALIC. TSERS is a defined benefit plan, with the benefit formula equal to the product of a constant, years of credited service, and final salary average. Employees are eligible for partial benefits when they reach age 50 and have 20 years of service[9]; for full benefits, at age 60 and 5 years of service or at 30 years of service. Once an employee is eligible for partial benefits, the constant in the benefit formula gradually increases by three to five percent for each additional year of service.

To understand the impact of pension characteristics on retirement incentives, it is useful to focus on pension wealth, pension accrual, and pension backloading. Pension wealth at time t is the present value of the expected lifetime income from a stream of pension income if one retires at time t. Higher levels of pension wealth should be associated with a greater likelihood of retirement through pure wealth effects. Pension

[8] All models were estimated using the mlogit procedure in Stata, version 6.
[9] These are identical to the eligibility criteria for phased retirement for tenured professors.

accrual is the change in pension wealth between year t-1 and year t. Pension accrual is typically positive in a plan such as the TSERS up through the age of normal retirement, as the constant, years of service and salary average all increase with t up until that point. In a defined contribution plan, pension accrual reflects the contributions into the plan by the firm and the worker. Pension backloading arises in defined benefit plans because a large percentage of the accruals take place in the five years or so before early or normal retirement.[10] It equals the difference between maximum pension wealth (across all possible retirement ages) and pension wealth if one retires immediately. Pension accrual and backloading should be associated with a lower likelihood of retirement; high values of these variables indicate a financial incentive to delay retirement.

For faculty in the TSERS, the pension benefit formula is used to construct measures of these three pension variables. Pension wealth is calculated under the assumptions of no post-retirement increases in benefits, a three percent discount rate, and a maximum life expectancy of 100 years.[11] Pension accrual is the change in pension wealth that results if the employee works for another year; salary growth is assumed to be two percent.

Option value is used in some studies to measure pension backloading, but full implementation of the model developed by Stock and Wise (1990) in a multinomial logit framework is beyond the scope of this study. We experimented with the approach used by Coile and Gruber (2000) where specific values of the risk aversion, discount rate, and disutility of work parameters were assigned so that option value could be used as one of the x_i. However, when we calculated the option value measure used by Coile and Gruber, it implied that for about half of the workers in our sample, utility would not be maximized unless they worked at least another 20 years. With a mean age of 58.3 and

[10] See Ippolito (1985) for a full explanation.

a maximum age of 75, we concluded that we would have to experiment with a much broader range of utility function parameters in order to successfully apply that approach over our sample.

Instead we used an alternative measure of backloading developed by Coile and Gruber called peak value. To calculate peak value, one must estimate pension wealth at all future retirement dates. Peak value equals the difference between maximum pension wealth at some future retirement date and pension wealth if an employee retires immediately. It indicates how much can be gained in pension wealth by delaying retirement.

The full impact of pension incentives cannot be estimated for employees in ORPs because our data set contains no information on their pension wealth and by design there is no backloading. Pension accrual in a defined contribution plan is a function of two variables: (1) employee and employer contributions to the plan and (2) the investment performance of the assets in the plan. The latter component is not observable in our data set, so we use pension contributions (12.84 percent of salary) as our measure of accrual for those in ORPS. Pension contributions do not vary with age or years of service in the North Carolina system. An indicator of whether an employee is in TSERS or one of the ORPs is included in the model when the two samples are pooled. This variable acts as a proxy for differences in pension incentives and for differences in tastes and behavior associated with pension choice.[12] Pension backloading is set equal to zero for employees in ORPs as well as for those who would have maximized their pension wealth by retiring in an earlier year. A binary variable is

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[11] Conditional age-specific survival probabilities from Anderson (2001) were used in these calculations.

[12] Clark and Pitts (1999) empirically examine the TSERS/ORP choice faced by faculty at NC State. Ghent, Clark and McDermed (2003) examine the choice for newly hired faculty at all 15 UNC institutions from 1983-2000.

included in the model to flag the latter set of individuals because they may very well have preferences on labor-leisure choice that are quite distinct from the average worker.

Current salary and years of service are included in the model as controls. Much of the variation in pension incentives across individuals in TSERS reflects variation in these two variables because they are part of the benefit formula. It would be presumptuous to omit them from the model and then claim to have produced evidence of the effects of pensions. Also, both salary and years of service could have independent causal impact. The cost of entering phased or full retirement rises with salary; years of service are an indicator of match quality.

Two variables are examined to determine how faculty productivity changes with the availability of phased retirement. There is no formal system of performance ratings for UNC system faculty, although performance appraisals are conducted annually. Faculty pay increases in the UNC system were given strictly on the basis of merit during the sample period, so this is the most logical available measure of relative performance. The mean pay increase for each faculty member over the previous three years of employment is used in this study. The use of three years of data instead of one is intended to smooth out noise factors, such as promotion or a transitory shock to performance. We also include academic rank in the model as a performance measure. In a sample of tenured faculty eligible for retirement benefits, full professors have presumably been judged more productive than associate or assistant professors.

It is natural to expect the response of the UNC system faculty to the availability of phased retirement to vary with some unique features of the employer and its system of human resource policies. A potentially important factor is teaching loads, which vary across campuses depending on the mission of the university. Faculty workloads consist not just of teaching, but also of research, service to the university, and service to the community. Of these four dimensions, however, teaching effectiveness is the only one where time allocation can be observed systematically and with short time lags. For the optimizing shirker interested in on-the-job leisure, the risk of being penalized for cutting back on time allocated to research and service is much lower than the risk for cutting back on time allocated to teaching. As any dean or department head knows, poor research productivity can be disguised for a while by explanations such as bad draws from the referee lottery or long lags needed for an ambitious project.

Other faculty on research-oriented campuses may seek the ability to shift time away from teaching toward research. In disciplines where grants and contracts are not widely available, phased retirement would be valuable to faculty seeking extra time for scholarly pursuits. The structure of colleges and departments varies so much across the 15 campuses that it was impossible to develop reliable indicators of such disciplines in our data.

Faculty on teaching-centered campuses have much less ability to substitute on-the-job leisure for work on research. Put alternatively, a 50 percent reduction in teaching loads buys much more free time on teaching-centered campuses than on those which place a greater emphasis on research. This would lead us to expect phased retirement to be less attractive to faculty in Research I universities (UNC-Chapel Hill, NC State) than other campuses, which fall into the categories of Doctoral, Masters, and Baccalaureate.[13]

Summary statistics for the variables used in the analysis are reported in Appendix Table 1. Although there is widespread concern about a rising share of professors age 70 and older, it should be noted that faculty in this age group represent less than two percent of a sample that excludes all faculty under 50. In fact, only 8.4

[13] Other campuses in the sample by Carnegie classification are Doctoral I and II (UNC-Greensboro, East Carolina), Masters I (Appalachian State, Fayetteville State, NC A&T, NC Central, UNC-Charlotte, UNC-Pembroke, UNC-Wilmington, Western Carolina) and Baccalaureate I and II (UNC-Asheville, Elizabeth City State, Winston-Salem State).

percent of the faculty in the sample are over age 65. Over half of the sample is enrolled in TSERS, and those faculty members have mean pension wealth of $436,651 if they retired immediately. Pension backloading, the difference between maximum expected future pension wealth and pension wealth if they retire now, is rather sizable (mean $56,253 for TSERS faculty) compared to pension accruals (mean $8,585 for the entire sample, mean $6,877 for TSERS faculty).

The last two columns of Appendix Table 1 show how full and phased retirement rates vary by sample characteristics. Both rates rise with age. The full retirement rate spikes after age 59, 61, 64, and 69.[14] The first spike corresponds with eligibility for full benefits in TSERS; the middle two with eligibility for early and normal Social Security benefits. The spike at age 69 may reflect peer pressure to leave by age 70, despite the elimination of mandatory retirement at that age. The phased retirement rate spikes after ages 58, 64, and 70, reflecting many of these same factors.

Women have higher full retirement rates than men, but phased retirement rates for men and women are not very different. Nonwhites have lower phased retirement rates than whites, but higher full retirement rates. Both full and phased retirement rates are remarkably higher for faculty in TSERS than those in ORPs, possibly reflecting self-selection. Faculty who have not reached the rank of full professor have higher full and phased retirement rates than full professors. Full and phased retirement rates are lower on the two Research I campuses than on the other 13 campuses in the UNC system.

IV. EMPIRICAL RESULTS

Three samples are examined in the empirical results: the entire sample, a subsample limited to workers in the defined benefit plan (TSERS), and a subsample limited to workers in defined contribution plans (ORPs). There are three reasons for splitting the sample by type of pension plan: (1) a measure of pension wealth and an independent measure of pension accruals are only available for those in TSERS; (2) examining TSERS participants by themselves permits a cleaner estimate of the impact of pension backloading; and (3) self-selection by workers into TSERS and ORPs implies that the coefficients for each group need not be the same.

Predicted retirement odds derived from the estimated coefficients are calculated at the sample means for all other variables in model and are reported in Table 1 along with their levels of significance. The results in Table 1 are based on the entire sample, except for those pertaining to pension backloading, which are based on the TSERS sample.[15] The most important result in Table 1 is that both full and phased retirement odds decrease sharply with employee performance, measured in terms of average pay increase over the last three years. Compare two professors, one who received no pay raise for three years and the other with an average raise of eight percent (roughly twice the amount budgeted for raises during the sample period). The professor who received no raise has a 10.3 percent chance of fully retiring and a 4.3 percent chance of entering phased retirement. The professor who averaged an eight percent raise has a 5.9 percent chance of fully retiring and only a 1.7 percent chance of entering phased retirement.

What does this mean for faculty productivity? Recall the finding from section 3 that those who select phased retirement more closely resemble active employees than those selecting full retirement. Because faculty who receive low pay increases are much more likely to enter phased retirement than faculty earning sizable pay raises, the introduction of phased retirement is apparently accelerating the rate at which low-

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[14] Retirement rates are calculated by comparing faculty rosters in September of year t-1 to September of year t. The age variable refers to age in year t-1.

performing faculty separate from the university. As for the other measure of employee performance, there is no difference in the rates at which full, associate, and assistant professors enter phased retirement. However, associate and assistant professors are much more likely to fully retire than full professors, so the net effect of the entire selection process is consistent with productivity enhancement.

Phased retirement is much more attractive on campuses where the main mission is teaching than on those where the main mission is research. On Research I campuses, the model predicts that 1.6 percent of faculty enter phased retirement, compared to 3.2 to 4.0 percent on other campuses. This is consistent with phased retirement providing a greater increase in free time on campuses with heavy teaching loads. Full retirement rates also are lower in research-oriented than teaching-oriented campuses.

Not surprisingly, pension incentives come into play in faculty retirement decisions. Faculty in TSERS are much more likely to enter phased retirement than faculty in ORPs. The predicted phased retirement rate for faculty who selected the defined benefit plan is 3.8 percent, compared to 1.6 percent for faculty in defined contribution plans. Full retirement rates also are higher in TSERS. These patterns reflect the greater reward to continued work in ORPs; for most employees in TSERS, pension wealth is maximized once they reach their early 60s.

Pension backloading plays an important role in the decision to enter phased retirement. The odds of entering phased retirement for a person with no pension backloading (i.e., someone who has passed the age where his pension wealth is maximized in TSERS) are 5.8 percent. Those odds plummet to 1.0 percent for someone who stands to gain an additional $100,000 in TSERS by working additional years.

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[15] Complete multinomial logit results are reported in Appendix Table 2.

Pension backloading is also associated with lower retirement odds of full retirement, but this effect could not be measured with precision.

The other two pension variables have modest to zero effect on retirement decisions. Pension accrual is unrelated to the odds of full retirement. The results for pension accrual and phased retirement are conflicting; there is a significant positive correlation for the entire sample but when the sample is limited to those in TSERS, the coefficient stays the same but is estimated with much less precision. Pension wealth has no correlation with full or phased retirement. This is not entirely surprising, as pension wealth is but one of many sources of assets that can be used to finance consumption during retirement.

As for the other variables, age has the expected effect on retirement decisions; the hazard rates implied by the model estimated over the entire sample correspond closely to the sample means shown in Appendix Table 1. Figure 1 reports the predicted hazard rates from separate multinomial logit models estimated by type of pension plan. Predicted full retirement rates for those in the defined benefit plan were consistently higher than the rates for those in the defined contribution plan, but there was no difference between the two groups in the pattern of retirement spikes. Predicted phased retirement rates for those in defined benefit and defined contribution plans were roughly equal through age 63, but at age 64 and above the predicted probability of entering phased retirement was somewhat higher for those in the defined contribution plan than for those in the defined benefit plan. This indicates that the estimated difference in phased retirement rates between those in defined benefit and defined contribution plans in Table 1 is largely attributable to failure to interact age and type of pension plan.

Women are more likely to fully retire than men, but there is no gender difference in the odds of phased retirement. African-Americans, Asians and Asian-Americans have lower full and phased retirement odds than whites in the multinomial logit results. The fact that African-Americans have higher full retirement rates in the raw data must reflect differences in other variables in the model. The odds of full retirement increase with years of service and salary, but the odds of phased retirement are unrelated to these variables.

V. CONCLUSION

This paper has examined the response of UNC system faculty to the introduction of a phased retirement plan. The overall rate at which eligible workers elect to leave full-time employment with the university increased significantly, accompanied by a small decrease in the rate at which workers enter full retirement. Based on observable characteristics such as age, salary, years of service, and job characteristics, faculty members entering phased retirement more closely resemble those remaining in full-time jobs than those entering full retirement.

The productivity impact of this increased outflow of faculty depends on whether those entering phased retirement are more or less productive than the average faculty member. On this point, the evidence is unambiguous – the odds of entering phased retirement are strongly and inversely related to employee performance, as measured by recent pay increases. Faculty members also are more likely to enter phased retirement when they have heavy teaching loads and when they are near the age-service level where their pension wealth is maximized. Presuming that junior positions now open up more quickly, universities have a greater opportunity to address concerns about an aging professoriate.

On balance, the introduction of phased retirement in the UNC system seems to have been a plus from both employee and employer perspectives. Phased retirees now account for slightly more than one-fourth of all flows out of the full-time faculty, indicating that a sizable number of faculty members clearly appreciate having more degrees of freedom in making time allocation decisions. The university system is now getting advance warning about employee decisions to fully retire. Fears that the best and brightest faculty might leave academe more rapidly have thus far been unfounded.

An important caveat about these findings is that they apply to a workplace environment where workers are extremely independent and have lifetime job security. Workers who do not have the equivalent of academic tenure still have to balance time at work and away from work, so it is quite possible that the share of workers electing phased retirement reported here would be comparable across many types of jobs. However, to the extent that nonacademic employers can directly control the employee productivity through other mechanisms, our results on phased retirement and productivity may be limited to the situation at hand. By providing the first solid evidence on the impact of introducing a phased retirement option, this study provides a foundation for further work in this area.

REFERENCES

Robert N. Anderson, "United States Life Tables, 1998," *National Vital Statistics Reports*, Vol. 48, No. 18, Hyattsville, Maryland: National Center for Health Statistics, 2001.

Robert L. Clark and Linda S. Ghent, "Faculty Aging and Retirement Policies at the University of North Carolina," manuscript, February 2000.

Robert L. Clark and M. Melinda Pitts, "Faculty Choice of a Pension Plan: Defined Benefit vs. Defined Contribution," *Industrial Relations*, Vol. 38, No.1, January 1999, pp. 18-45.

Courtney Coile and Jonathan Gruber, "Social Security and Retirement," NBER Working Paper No. 7830, August 2000.

Linda S. Ghent, Steven G. Allen, and Robert L. Clark, "The Impact of a New Phased Retirement Option on Faculty Retirement Decisions," *Research On Aging*, Vol. 23, No. 6, November 2001, pp. 671-693.

Linda S. Ghent, Robert L. Clark, and Ann A. McDermed, "Pension Plan Choice and Faculty Mobility," manuscript, February 2003.

Alan S. Gustman and Thomas L. Steinmeier, "A Structural Retirement Model," *Econometrica*, Vol. 54, No. 3, May 1986, pp. 555-584.

Richard A. Ippolito, "The Labor Contract and True Economic Pension Liabilities," *American Economic Review*, Vol. 75, No. 5, December 1985, pp. 1031-1043.

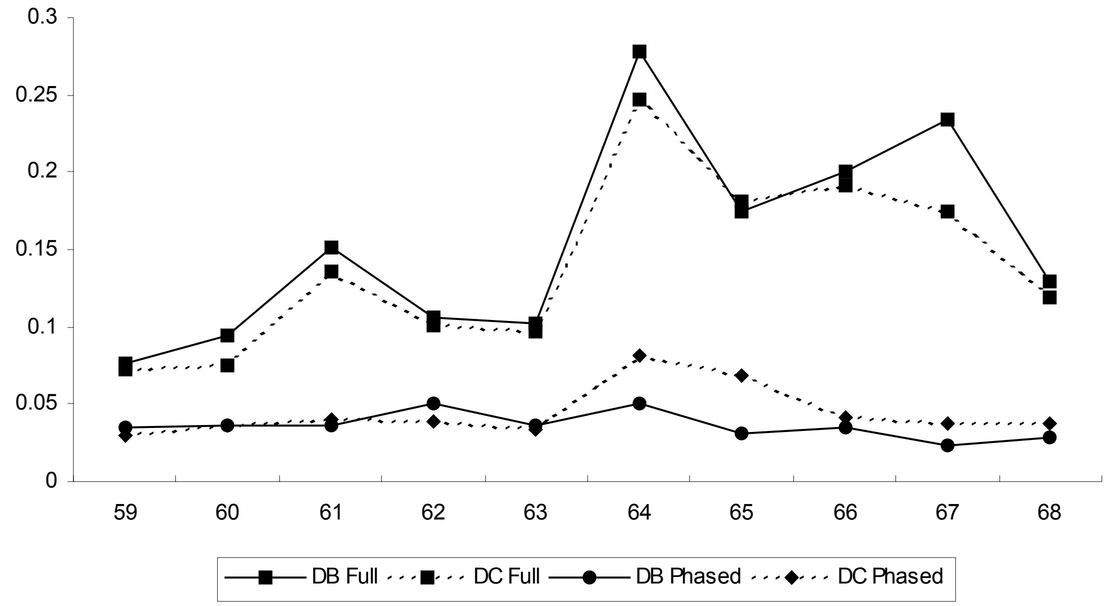
Seongsu Kim, "The Impact of Research Productivity on Early Retirement of University Professors," *Industrial Relations*, Vol. 42, No. 1, January 2003, pp. 106-125.

William M. Mercer Co., *Capitalizing on an Aging Workforce: Phased Retirement & Other Options*, William M. Mercer Co., April 2001.

James H. Stock and David A. Wise, "Pensions, the Option Value of Work, and Retirement," *Econometrica*, Vol. 58, No. 5, September 1990, pp. 1151-1180.

Watson Wyatt, *Phased Retirement: Reshaping the End of Work*, Watson Wyatt Consulting Research Report, 1999.

Figure 1. Predicted full and phased retirement rates from multinomial logit model, by age and type of retirement plan



Note: DB indicates defined benefit plan and DC indicates defined contribution plan

Table 1. Retirement rates for North Carolina faculty, by type of institution

Year	UNC system			Community College System
	Full retirement	Phased retirement	Sum	Full retirement
1994-95	8.7		8.7	8.1
1995-96	8.7		8.7	9.0
1996-97	8.8		8.8	8.7
1997-98	7.2	3.2	10.4	8.4
1998-99	9.0	2.3	11.3	8.9
1999-2000	7.4	3.0	10.4	10.0

Table 2. Predicted retirement odds from multinomial logit model, by sample characteristics

	Predicted full retirement rate	Predicted phased retirement rate
Entire sample	0.079	0.028
Age		
50-52	0.026	0.002
53-54	0.027	0.006
55	0.042	0.015
56	0.043	0.018*
57	0.038	0.015
58	0.040	0.046*
59	0.069*	0.027*
60	0.074*	0.028*
61	0.134*	0.032*
62	0.099*	0.032*
63	0.094*	0.028*
64	0.244*	0.067*
65	0.183*	0.053*
66	0.194*	0.034*
67	0.178*	0.031*
68	0.123*	0.033*
69	0.254*	0.038*
70	0.115*	0.085*
71 and over	0.184*	0.060*
Male	0.072	0.029
Female	0.116*	0.027
White	0.084	0.033
African-American	0.064*	0.006*
Asian or Asian-American	0.030*	0.011*
Other nonwhite	0.079	0.032
Defined benefit	0.087*	0.038*
Defined contribution	0.068	0.016
Full professor	0.072	0.029
Associate professor	0.091*	0.026
Assistant professor	0.128*	0.028
Research I	0.067	0.016
Doctoral	0.092*	0.040*
Masters	0.083*	0.039*
Bachelor	0.122*	0.032*
Years of service = 20	0.070*	0.026
Years of service = 30	0.087*	0.029
Average raise = 0	0.103*	0.043*
Average raise = 0.08	0.059*	0.017*
Pension backload = 0	0.098	0.058*
Pension backload = 100000	0.082	0.010*

*=Multinomial logit coefficient for this variable is statistically significant at the .05 level. Omitted categories in the multinomial logit model are age 50-52, male, white, defined contribution plan, research 1 university, and full professor.

Appendix Table 1. Summary statistics

	Mean	Standard deviation	Full retirement rate	Phased retirement rate
Total (N=7179)			0.079	0.028
Age: 50-52	0.133	0.340	0.022	0.001
53-54	0.126	0.331	0.026	0.004
55	0.073	0.260	0.042	0.013
56	0.071	0.257	0.045	0.018
57	0.063	0.243	0.040	0.015
58	0.066	0.248	0.042	0.053
59	0.071	0.257	0.072	0.031
60	0.073	0.260	0.077	0.036
61	0.061	0.240	0.138	0.041
62	0.053	0.224	0.099	0.037
63	0.050	0.218	0.095	0.031
64	0.044	0.205	0.244	0.079
65	0.031	0.173	0.171	0.063
66	0.022	0.148	0.191	0.043
67	0.019	0.137	0.175	0.036
68	0.015	0.122	0.137	0.046
69	0.010	0.100	0.278	0.056
70	0.006	0.080	0.130	0.109
71 and over	0.012	0.109	0.198	0.081
Male	0.824	0.381	0.073	0.029
Female	0.176	0.381	0.104	0.024
White	0.867	0.339	0.078	0.030
Black	0.080	0.271	0.103	0.010
Asian	0.040	0.196	0.042	0.017
Nonwhite	0.013	0.114	0.105	0.042
Defined benefit	0.540	0.498	0.094	0.039
Defined contribution	0.460	0.498	0.061	0.015
Full professor	0.722	0.448	0.073	0.027
Associate professor	0.236	0.425	0.082	0.029
Assistant professor	0.040	0.196	0.160	0.042
Research I	0.460	0.498	0.068	0.016
Doctoral	0.171	0.376	0.104	0.048
Masters	0.336	0.472	0.077	0.035
Bachelor	0.033	0.179	0.121	0.029
Salary	79799	36681		
Years of service	24.6	6.5		
Average raise	0.042	0.038		
Pension accrual	8571	17415		
Pension backloading	50282	92685		
Pension wealth	439226	248572		

Appendix Table 2. Coefficients and standard errors of multinomial logit model of full and phased retirement

	Entire sample		Defined benefit		Defined contribution	
Full retirement	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error
Age						
53-54	0.057	0.308				
55	0.524	0.315	0.311	0.373		
56	0.562	0.314	0.590	0.346		
57	0.439	0.333	0.215	0.390		
58	0.534	0.326	0.102	0.407		
59	1.092*	0.290	0.914*	0.334	0.827*	0.323
60	1.170*	0.291	1.149*	0.357	0.648	0.332
61	1.852*	0.276	1.712*	0.344	1.543*	0.277
62	1.505*	0.295	1.311*	0.378	1.247*	0.304
63	1.436*	0.301	1.253*	0.383	1.178*	0.340
64	2.686*	0.276	2.555*	0.357	2.305*	0.278
65	2.273*	0.306	1.880*	0.399	2.356*	0.344
66	2.319*	0.321	2.066*	0.415	2.237*	0.399
67	2.203*	0.336	2.259*	0.427	1.182*	0.554
68	1.758*	0.381	1.509*	0.498	1.659*	0.517
69	2.692*	0.366	2.340*	0.488	2.541*	0.417
70	1.750*	0.512	1.432*	0.651	2.541*	0.417
71 and over	2.291*	0.374	2.230*	0.500	1.857*	0.579
Female	0.577*	0.121	0.550*	0.160	0.632*	0.206
African-American	-0.376*	0.178	-0.298	0.208	-0.507	0.394
Asian or Asian-American	-1.197*	0.309	-0.990*	0.348	-1.786*	0.730
Other nonwhite	-0.073	0.359	-0.046	0.438	-0.149	0.646
Salary/10000	0.026*	0.013	0.016	0.051	0.022	0.022
Years of service	0.026*	0.008	0.034	0.018	0.019	0.012
Defined benefit plan	0.340*	0.164				
Associate professor	0.269*	0.121	0.399*	0.152	0.032	0.204
Assistant professor	0.700*	0.201	0.765*	0.231	0.444	0.458
Doctoral	0.433*	0.130	0.311	0.176	0.549*	0.198
Masters	0.295*	0.126	0.194	0.166	0.393*	0.198
Bachelor	0.757*	0.245	0.693*	0.289	n.a.	
Average raise	-8.872*	2.159	-4.839	2.625	-16.326*	3.763
Pension accrual/10000	0.035	0.036	0.035	0.040		
Pension backloading/10000	-0.027	0.016	-0.028	0.020		
Backloading < 0	-0.102	0.204	-0.175	0.232		
Pension wealth/100000			0.132	0.825		
Constant	-4.644*	0.371	-4.467	0.568	-3.852*	0.486

Partial retirement						
Age						
53-54	1.084	1.122				
55	1.970	1.076	0.880	0.649		
56	2.132*	1.063	0.905	0.631		
57	1.968	1.078	0.658	0.658		
58	3.170*	1.030	1.646*	0.584		
59	2.630*	1.047	0.850	0.641	2.477*	0.682
60	2.682*	1.040	0.885	0.642	2.353*	0.682
61	2.912*	1.042	0.961	0.658	2.928*	0.660
62	2.864*	1.050	1.303*	0.665	1.103	1.128
63	2.694*	1.060	0.904	0.701	1.996*	0.880
64	3.912*	1.037	1.551*	0.692	4.233*	0.605
65	3.542*	1.055	0.844	0.772	4.460*	0.662
66	3.055*	1.092	1.007	0.786	2.624*	1.147
67	2.945*	1.118	0.604	0.903	3.235*	0.895
68	2.919*	1.120	0.705	0.875	2.891*	1.146
69	3.280*	1.146	1.284	0.883	3.229*	1.153
70	3.972*	1.135	1.785*	0.907	3.229*	1.153
71 and over	3.681*	1.098	1.327	0.915	4.085*	0.922
Female	0.030	0.222	-0.078	0.295	0.468	0.408
African-American	-1.764*	0.444	-2.061*	0.546	-0.594	0.766
Asian or Asian-American	-1.306*	0.474	-1.340*	0.536	-1.257	1.043
Other nonwhite	-0.034	0.544	-0.143	0.632	-0.228	1.136
Salary/10000	-0.058	0.035	0.069	0.128	-0.023	0.051
Years of service	0.014	0.015	0.076*	0.038	0.015	0.022
Defined benefit plan	0.960*	0.312				
Associate professor	-0.056	0.195	-0.302	0.239	0.617	0.366
Assistant professor	0.074	0.347	0.041	0.386	-0.302	1.095
Doctoral	1.072*	0.214	0.946*	0.260	1.179*	0.402
Masters	1.008*	0.213	1.054*	0.251	0.840*	0.415
Bachelor	0.890*	0.453	1.165*	0.481	n.a.	
Average raise	-13.704*	4.090	-16.251*	5.257	-11.086	7.331
Pension accrual/10000	0.166*	0.080	0.167	0.102		
Pension backloading/10000	-0.136*	0.055	-0.193*	0.064		
Backloading < 0	0.480	0.338	0.433	0.380		
Pension wealth/100000			-0.224	0.206		
Constant	-6.663*	1.154	-5.278*	1.158	-6.727*	1.074
N	7159		3864		3295	

Note: omitted age category is 50-52 for entire sample, 50-54 for defined benefit sample, and 50-58 for defined contribution sample. Ages 69 and 70 are combined into a single category in the defined contribution sample. The binary indicator for bachelor-level universities could not be estimated for the defined contribution sample because no one in that category elected phased retirement.

- = Statistically significant at the .05 level