# Golden Peaks and Perilous Cliffs

## RETHINKING OHIO'S TEACHER PENSION SYSTEM

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# FOREWORD

In August 2006, an Ohio journalist asked the Thomas B. Fordham Institute whether we knew of any research on how the Buckeye State's teacher retirement system and its funding affected school-district finances. At the time, the newspaper was trying to determine if there was a connection between a local teachers' strike and rising retirement and health care costs. It turns out that there was and is.

Indeed, our preliminary analysis pointed to serious questions and profound concerns about the health of Ohio's teacher pension system. Later that month, we noted in an editorial that the state and its six-hundred-plus school districts "face a looming fiscal crisis triggered by rapidly rising health care and pension costs." As we looked around, it also became clear that similar time bombs are ticking in other states. Michigan's public schools will pay an estimated $1,015 *per student* in 2006-07 to cover their retiree pension and health care costs. The *New York Times* ran a series of articles highlighting the crises facing public pensions and health care programs in New York City and California. In the private sector, Ohio's employers have been battered by rising pension and health care costs for the better part of a decade, with grievous impact on such firms as General Motors and Delphi. As a result of the legacy costs, numerous industrial and manufacturing sites have been shuttered and many companies are mired in debt.

In early September, we called Michael Podgursky, a leading economist at the University of Missouri who has previously done expert work for Fordham, and asked if he knew of any work being done on state teacher pension systems. It so happened that Dr. Podgursky was, at that very moment, organizing a conference for the Ewing Marion Kauffman Foundation called "Teacher Pensions: Today and Tomorrow." Attending it, we learned that, while similar problems exist in pension systems across the nation, there is no unanimity among economists and actuaries as to the scale of the problem in different states. Nor is there much consensus on possible solutions.

One important consensus item did emerge out of the conference, however: the fact that Ohio, along with many other states, would benefit greatly from an extensive review of its state teacher retirement system. We envisioned a review that would help inform legislators, policymakers, teachers, and other stakeholders about:

- the workings of Ohio's teacher pension system, and the nature and scale of its challenges;
- the implications of those challenges for teachers (present and future), school districts, taxpayers, and the state; and
- the options available for improving Ohio's teacher pension system.

We engaged Dr. Podgursky and Robert Costrell, a professor of education reform and economics at the University of Arkansas and former policy adviser to three governors of Massachusetts (and Governor Jane Swift's representative on the Massachusetts Public Employee Retirement Administration Commission from 2001-2003), to lead such a review – knowing that few, if any, experts in this field do better work. Starting in October 2006, Drs. Costrell and Podgursky scoured public sources on the state teachers' retirement system and contacted officials at the Ohio State Teachers Retirement System (STRS) and at the Ohio Department of Education. Additionally, they made contact with several district treasurers across the state. They also pored over the system's history so as to understand better its present features and structure.

Their task was not made easier by the inherent opacity of the teachers' retirement system, a problem not unique to Ohio nor confined to teacher pension systems. One cannot know how much of this problem is intentional.

But the lack of transparency certainly makes it harder for researchers, journalists, lawmakers, and others interested in this issue to understand it. This same lack of transparency also explains, to some extent, why so little debate has taken place about the teachers' retirement system and its troubled future.

In the course of their research, it became clear to Drs. Costrell and Podgursky that serious and comprehensive reform would be needed to right Ohio's teacher pension ship – and navigate it into the twenty-first century. Several clear and, at least in our eyes, startling conclusions emerge from their findings:

■ **The system is obsolete and in need of an overhaul.** Ohio's teacher retirement system was designed for a different era (one in which employees were far less mobile), and for a time when life expectancies were considerably shorter than they are today. Now, many new retirees can expect to collect pensions for as many years as they taught. These incongruities are expensive, and the costs rise further when relatively young people (some in their early fifties) retire.

■ **The system is too pricey to sustain in its current manifestation.** In 2005, the National Association of State Retirement Administrators (NASRA) reported that STRS faces $20 billion in unfunded liabilities (well over $4,000 per Ohio household). These unfunded liabilities are commitments made to current and retired employees that the program's current assets cannot cover. Couple these fiscal pressures with steep drops in district enrollments over the past several years, and public coffers may run dry sooner rather than later. Consider the Columbus Public Schools. Even as the district sheds teachers and students, its "instructional" expenditures, which include teacher salaries and benefits, ballooned by 52.6 percent per teacher from 2001 to 2005. Similar trends are found across Ohio's urban districts and well beyond.

■ **The system is out of step with the state's current teacher needs, labor markets, and career patterns.** While Ohio's teacher retirement system provides impressive benefits to teachers who make it through a thirty-year career, these benefits come at a serious cost to younger system members, to taxpayers, and to the state. For instance, teachers who separate from the system before the twenty-five- or thirty-year mark face substantial losses in pension wealth. (Even long-time members can be penalized by steep declines in pension wealth at various points in their tenure.) Thus the system contains potent and perverse incentives that seriously hinder teacher recruitment and mobility, and that foster generational inequities between younger and older teachers. These incentives are illustrated by Drs. Costrell and Podgursky throughout the report by the "golden peaks" and "perilous cliffs" along the path to teacher retirement in the Buckeye State.

■ **This system is not likely to fix itself.** Indeed, the STRS trustees are mostly teachers or former teachers themselves.[1] It will take leadership from the state's policymakers to reform – and modernize – the system. It's time that such repairs to the pension system are factored into the current discussion of school finance in Ohio, and how to fix it. If they are not, these spiraling costs will ultimately impact the state's general operating budget. (Ohio is constitutionally obliged to meet all public employee pension costs, including those for teachers and other school employees.)

It's not our purpose in this report to redesign the system so much as to sound the alarm bell about the need to redesign it; however, Costrell and Podgursky do set forth four principles for reforming it (see pages 29-30) that we think make a lot of sense. At a minimum, we hope that this report triggers a long-overdue discussion about the state's teacher retirement system, its challenges, and ways it can be improved for the benefit of current members, future teachers, and state taxpayers.

*Chester E. Finn, Jr., President*
*Terry Ryan, Vice President for Ohio Programs & Policy*

**Thomas B. Fordham Institute**

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# PRINCIPAL FINDINGS AND RECOMMENDATIONS

## Ohio's State Teacher Retirement System: The Need for Change

Dating to 1920, Ohio's State Teacher Retirement System (STRS) is the oldest of the Buckeye State's five public pension systems. It now covers close to half a million members – active, inactive, and retired – or one member for every ten Ohio households.

The system is becoming increasingly expensive for all parties. Employees contribute 10 percent of their earnings to the pension fund and employers contribute 14 percent, for a total contribution of 24 percent. This total has drifted up from 10 percent since 1945 (see figure A). Yet this is still insufficient to meet the state's funding goals: the system's unfunded liability is $19.4 billion, which represents a debt of over $4,300 per Ohio household. This liability far exceeds that of the state's other four public pension systems combined, despite the fact that STRS's membership is little more than one-third of those systems.

At current contribution rates, STRS actuaries estimate that it will take 47.2 years to amortize the unfunded liability, a funding period that exceeds the 30-year requirement established in state law. To address this problem,

**Figure A. Employer and Employee Contributions to STRS**
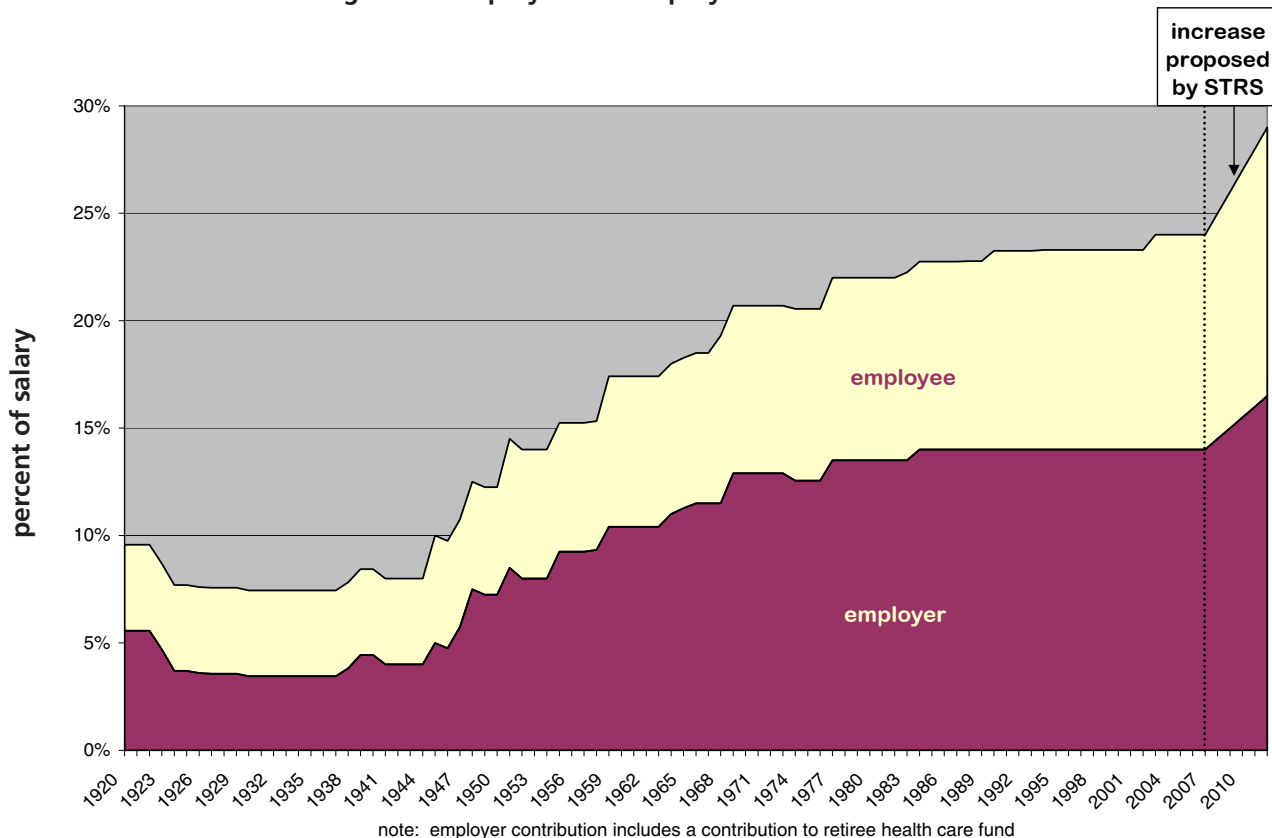


note:  employer contribution includes a contribution to retiree health care fund

as well as the unfunded liability for retiree health care, the STRS board has voted to seek legislative action increasing contributions to the system by an additional 5 percentage points (2.5 percentage points each from teachers and districts). This would raise the total contribution to 29 percent, a rather sizable "wedge" between the payments of employers and the net salary of teachers, and one due to retirement costs alone.[2] Yet it is doubtful that this would stop the upward trend in costs, given Ohio's practice of raising benefits well before full funding is achieved.

A system that is so large and increasingly costly should meet basic public policy requirements of transparency and efficiency. This study analyzes the teacher pension benefit system, particularly the incentives for work and retirement that are built into its benefit formula. We conclude that the system fails to meet either requirement: it lacks transparency, and its incentives are perverse. As a result, Ohio's pension system almost certainly hinders rather than helps in the recruitment and retention of a highly qualified teaching workforce. Four points are key:

## 1. The Ohio teacher pension system encourages early retirement.

The traditional rationale for defined-benefit (DB) teacher pensions was to encourage classroom longevity.[3] Over time, however, the pattern of pension accrual built into teacher pension systems like Ohio's has created powerful incentives for instructors to retire in their fifties. The average retirement age for Ohio teachers is 58 years – well below the current minimum age for regular retirement in the Social Security system (65.5, rising to 67 in coming years), and below the private sector generally. Teacher pensions are increasingly out of step with trends elsewhere in the labor market. With rising life expectancies, a defined-benefit system that encourages a worker to retire in her fifties is going to be very costly. Many retirees can expect to collect pensions for as many years as they taught. (About half of women retiring at age fifty-five can expect to live another thirty years or more.) The fact that Ohio teachers retire so early also gives rise to a demand for health insurance, since Medicare coverage does not begin until sixty-five. This puts increasing strain on Ohio's severely underfunded teacher retiree health insurance fund.

## 2. The Ohio system hinders mobility.

DB pension systems have been described as "golden handcuffs." Young teachers who move from the teacher DB system to another teaching or nonteaching job suffer serious losses in pension wealth. Teachers with ten or more years of seniority will suffer very large losses if they move into another line of work or to another state. While schools may benefit from "locking in" their employees (but then losing them in their fifties), they lose by stifling labor market mobility, as this back-loaded system discourages prospective career-switchers from applying for a teaching job. In addition, the high payroll contribution rate (currently 10 percent and likely to rise) may hinder recruitment of new teachers. This system is completely out of line with the high levels of job mobility ("job shopping") among most of today's young college graduates.

## 3. The system lacks transparency.

Teacher pension systems, and the incentives they create, have become remarkably complex and opaque. As a result, relatively few people understand the intricacies of Ohio's system, or its legislated changes over time. This has allowed the system to evolve into a costly and completely irrational incentive structure – a set of golden peaks and perilous cliffs in pension wealth that defy any logic, let alone the original intent of defined-benefit systems – without much public awareness.

## 4. The system is rife with ad hoc fixes.

Because these DB systems now encourage early retirements, Ohio and other states have responded to that problem by adding ad hoc incentives for continued employment, creating further complexity and costs. Most recently, Ohio added a large retirement benefit for those who work thirty-five years, layered on top of a system that still punishes teachers for working beyond thirty years. In addition, Ohio has one of the most liberal schemes in the nation, permitting teachers to collect their pensions while continuing to work full time as a teacher ("double-dipping"), and this at a time when the assets of the pension system fall far short of accumulated pension and heath insurance liabilities.

We believe that the time has come to rethink Ohio's defined-benefit pension system from the ground up.

## Pension Wealth and Perverse Incentives

The perverse incentives embedded in the Ohio teacher pension system arise from its idiosyncratic pattern of pension-wealth accumulation. When an individual retires under a DB plan, he or she is entitled to a stream of payments with a lump-sum value that can be readily determined using standard actuarial methods. Such an analysis of the STRS reveals how oddly it is configured.

Figure B depicts the pension wealth, in inflation-adjusted dollars, for a twenty-five-year-old entrant to the Columbus teaching force, at various ages of separation.[4] Clearly, the accumulation of pension wealth is not smooth and steady; it instead rises in fits and starts after age fifty. During her first twenty years in the classroom, this teacher accumulates roughly $200,000 in pension wealth. However, over the next ten years she accumulates an additional $800,000, and she crosses the million dollar mark at age fifty-six. Pension wealth reaches a peak by her early sixties.

A classroom teacher receives compensation in two forms: current compensation and deferred compensation. Current compensation is her paycheck and deferred compensation is the growth of her pension wealth. In our view, the most revealing picture of a pension system's incentives is given by the annual measure of deferred compensation. This can be directly compared with the annual measure of current compensation (i.e., her salary).

Figure C shows the change in pension wealth arising from an additional year of work, expressed as a percentage of salary.[5] One might imagine a system in which the employer and employee contributions – currently 24 percent in Ohio – simply accrue as pension wealth for each individual. This would be depicted in figure C by the flat dotted line at 24 percent. Such a system would neither encourage nor discourage retirement at any particular age. This is a far cry from the Ohio system, however, which is characterized by golden peaks in pension-wealth accrual at various levels of experience. For example, our twenty-five-year-old entering teacher finds that, in her twenty-fourth year of work (age forty-nine), her growth in pension wealth amounts to 34 percent of her salary. In her twenty-fifth year of work (age fifty), however, her pension wealth jumps by 175 percent of her salary.

What gives rise to such steep peaks? Our longer analysis provides a full explanation. An important part of the answer is shown in figure C and lies in the age at which the pension is first collected. One additional year of work (age forty-nine to fifty) allows the teacher to begin drawing her pension five years earlier (at fifty-five rather than sixty). There is a complex collection of other factors, but the result is a bizarre set of peaks that have no underlying economic rationale (i.e., there is nothing special about the twenty-fifth and thirtieth years of experience).

Worse, for a teacher who works beyond age sixty – beyond the third peak, at thirty-five years of service – additional years in the classroom (or mentoring, for example) are punished by an annual *decrease* in pension

## Figure B.  Pension Wealth, in Inflation-Adjusted Dollars
### age of first pension draw indicated



age at separation (entry age = 25)

(Assumptions:  2006-2007 Columbus Public Schools Salary Schedule, all cells assumed to grow at 2.5% inflation,
COLA = 3%, interest rate = 5%, unisex 2003 Mortality Table from IRS Revenue Ruling 2002-62 Appendix B.)
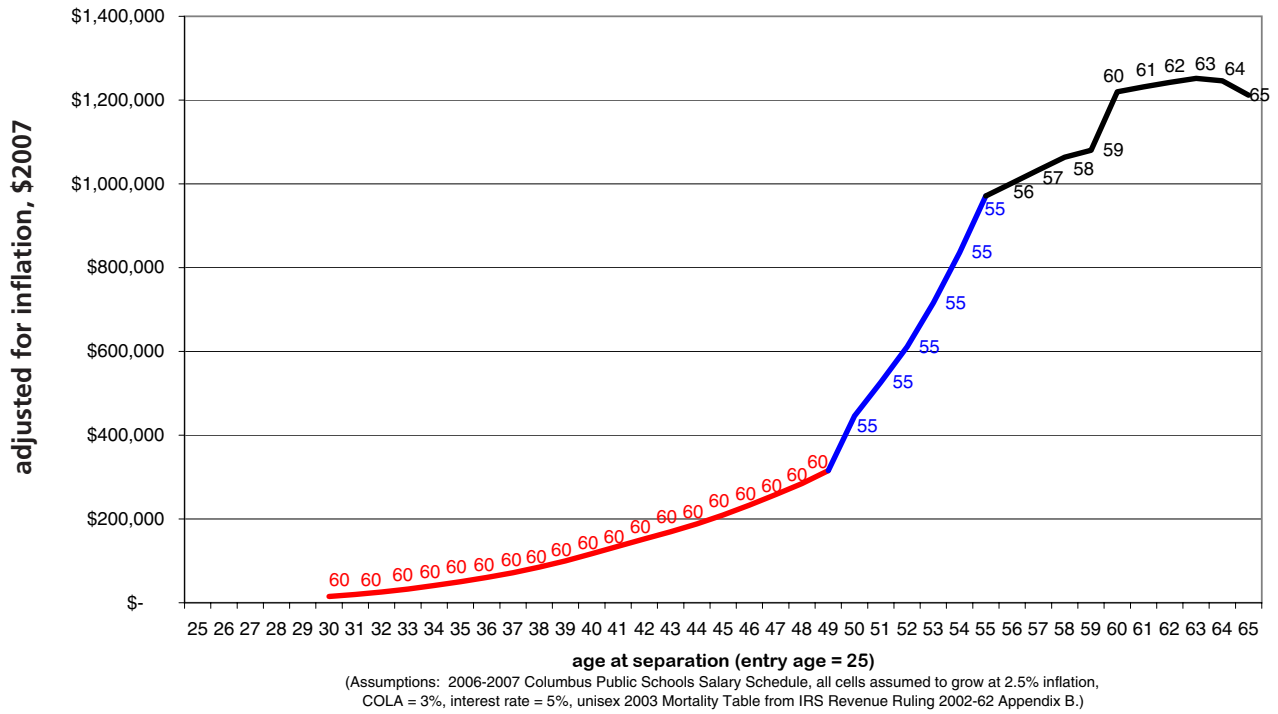
## Figure C.  Annual Deferred Income, as Percentage of Earnings
### age of first pension draw indicated



age at separation (entry age = 25)

(Assumptions:  2006-2007 Columbus Public Schools Salary Schedule, all cells assumed to grow at 2.5% inflation,
COLA = 3%, interest rate = 5%, unisex 2003 Mortality Table from IRS Revenue Ruling 2002-62 Appendix B.)

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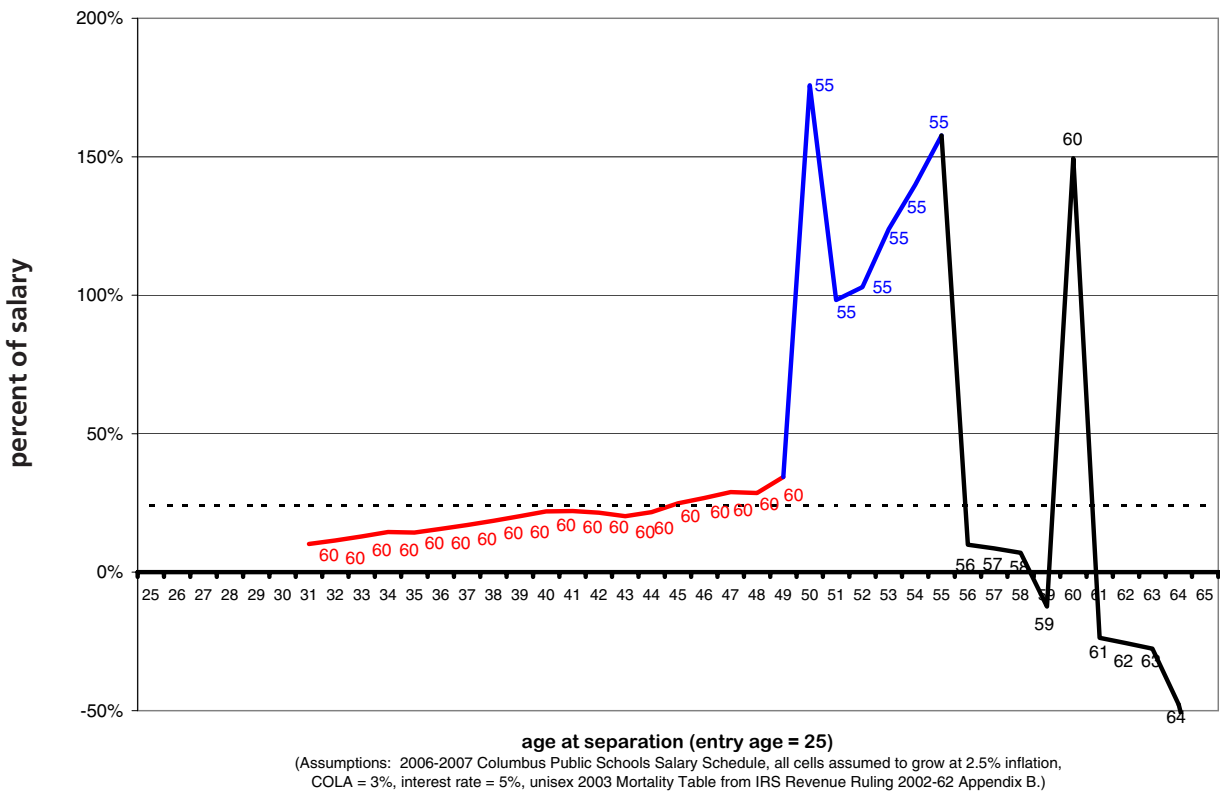
**Figure D.  Annual Deferred Income, Then and Now**



age at separation (entry age = 25)
(Assumptions:  2006-2007 Columbus Public Schools Salary Schedule, all cells assumed to grow at 2.5% inflation,
COLA = 3%, interest rate = 5%, unisex 2003 Mortality Table from IRS Revenue Ruling 2002-62 Appendix B.)

1968-71     2000 -
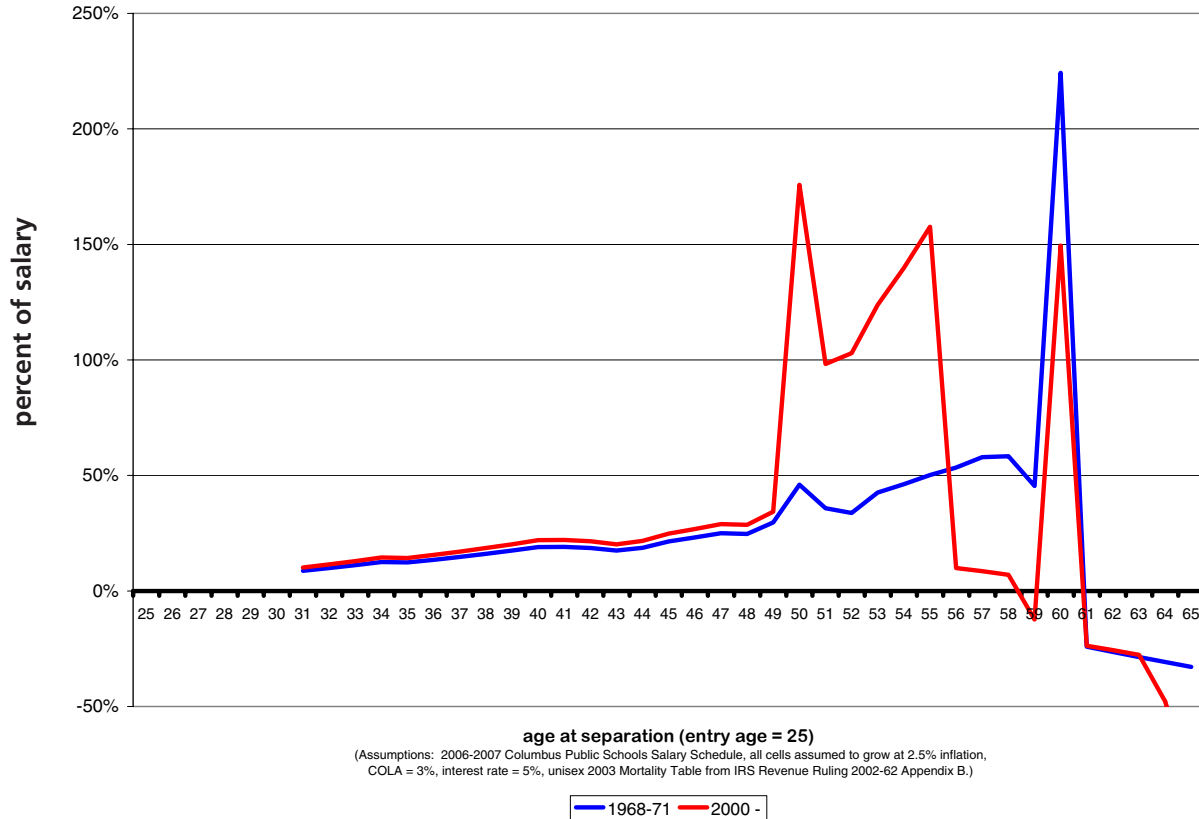
wealth that exceeds a quarter of her salary – despite the fact that she continues to contribute to the pension fund. Pension wealth declines because the loss of a year's pension (from waiting another year) outweighs the slow growth in starting pension at this stage. By age sixty-five, after reaching the maximum replacement rate of 100 percent at sixty-four, our teacher is literally working without compensation, as the negative deferred income (not shown, as it is off the chart), plus pension contribution, completely offsets her salary. Hence the perilous cliffs of Ohio's teacher pension system.

Contrast this with a system where employer and employee contributions steadily accumulate at an even rate for each individual. If an employee works an additional year, the value of the fund never goes down. In Ohio's DB system, pension wealth actually goes down if a teacher continues to work beyond a certain point. In the case of our twenty-five-year-old entrant, this occurs beyond age sixty. It occurs even earlier for a younger (say, age twenty-two) entrant.

In an appendix to the full report, we present a history of changes in Ohio's DB system. Figure D illustrates the direction in which those changes have taken this system (again, for our twenty-five-year-old entrant.) The older plan – in place until 1971 – had a single peak at age sixty. It clearly encouraged teachers to work for thirty-five years and then retire. Many other state systems are similarly single-peaked. In Ohio (as elsewhere), the peaks have gradually moved toward the left – thus encouraging earlier retirement. The current Ohio system has *three peaks*. The first two were in place by 2000. The last peak, at thirty-five years of service (age sixty), was added in 2000, to try to reverse course and encourage teacher longevity.

A system with one peak basically says to a teacher, "We want you to work until age *X* and then retire." What is the message of the three-peaked system?

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# Post-Retirement Employment and "Double-Dipping"

We have seen that the Ohio teacher pension system has strong incentives for teachers to retire at relatively young ages. Given concerns about teacher shortages, pressures from the federal No Child Left Behind Act to ensure that all classrooms are staffed with "highly qualified" teachers, and particular concern about providing more disadvantaged students with more experienced instructors, it makes little sense for districts to nudge qualified veteran teachers out the door. Not surprisingly, all teacher pension systems have loopholes to allow educators to continue to teach while also collecting their pension (that is, to engage in "double-dipping").

Although we are aware of no systematic national study of post-retirement teaching employment, the current Ohio regulations are surely some of the most liberal in the nation: STRS retired teachers may return to the same or another STRS school district after a break in service of as little as two months. In other words, a teacher can "retire" in June, return to work in August, and collect her pension as well as a paycheck. (In fact, teachers can resume employment after a *single day*, although the pension payment does not begin for two months.)

STRS data show that 19,749 teachers are collecting pensions and have been reemployed by a STRS covered employer.[6] This double-dipping might make fiscal sense for the district, to the extent that costs are shifted onto the pension system, but the total cost to taxpayers can be high. A recent *Akron Beacon Journal* article reported that more than two hundred teachers statewide were earning in excess of $100,000 per year as a result of this provision.[7]

Again, this illustrates the expensive consequences of the peculiar incentives built into the STRS defined-benefit system. Teachers are encouraged to "retire" at early ages, but, in response to resulting teacher shortages, are permitted immediately to resume work. By contrast, when private-sector pension systems choose to offer early-retirement incentives, it is part of a downsizing effort, not one that offers reemployment.

# Retiree Health Insurance

The focus of this report is the teacher pension system, not retiree health insurance. Yet Ohio is one of the few states to fund its retiree health insurance program through its pension system. Given that STRS members typically retire well below the age for Medicare eligibility (sixty-five), there is a gap of many years filled by optional STRS health insurance. The plan currently covers 75 percent of the cost of insurance premiums for most teachers.

This benefit is funded by a carve-out of the employer's 14 percent contribution to STRS. The carve-out has varied over time, depending on the funding status of the pension system proper. In the late 1990s, when large investment gains on the pension fund improved the system's status, eight percentage points were redirected to funding the retiree health liability. When the stock market turned down, however, the health carve-out was slashed to help shore up the pension's unfunded liability, while deferring funding for the health liability. Today, *only one percentage point* of the employer's 14 percent premium goes to the health liability, which is entirely inadequate to sustain these benefits.

That is why the STRS board voted to ask the legislature for a 2.5 percentage point hike in both employer and employee contributions (5 percentage points total). Under this proposal, 4.4 percentage points of the 5-point total hike would go to fund the health liability, while the pension fund would get the 1 point currently diverted plus 0.6 points of the hike. The legislature has not acted on this proposal. Nor have the steps taken in recent years to reduce health care liabilities been sufficient to address the problem. There have been a series of reports on this problem – by STRS itself, by Millman actuaries, and by the Ohio Retirement Study Council – but the situation continues to fester.

The proposed contribution hike illustrates an important trade-off in these benefit systems. As shown earlier, the primary beneficiaries are older teachers who work at least twenty-five years. However, it is well known that many young teachers leave the profession in the first five to ten years of teaching. Many teachers change states in the course of their careers. Thus a number of teachers will never reap these benefits. While the benefits may seem elusive and distant for young teachers, the costs are incurred up front. The proposed retiree health insurance bailout is case in point: it would raise the teacher's payroll deduction from 10 percent to 12.5 percent. Proponents of these generous retiree benefit systems claim that they make teaching more attractive for new recruits. However, many young teachers, who are paying off student loans, attempting to start families, and hoping to buy homes, might prefer more of their compensation up front rather than deferred into a system from which they may well never benefit.

## Options for Reform:
## Cash-Balance or Defined-Contribution Plans

Cash-balance (CB) plans offer an alternative to traditional DB formulas in that they are essentially neutral in the incentive they offer for the timing of one's retirement (or other separation). In the private sector, many large corporations have switched from traditional plans to CB plans over the last twenty years, and some public entities – including some teacher pension systems – have started to include CB or CB-like components in their plans. CB plans are very similar to defined-contribution (DC) plans, in which employees accumulate 401(k)-type funds from their own contributions and matching employer contributions. The main difference between CB and DC plans is that a CB plan's return is guaranteed by the employer, so the market risk is not borne by the employee.

The neutrality of simple CB plans with regard to age of separation can be easily depicted. The flat dotted line in figure C shows the pattern of deferred income, under an illustrative cash balance plan of 24 percent contributions and 5 percent interest. The contribution rate here matches Ohio's current rate (employer plus employee), but the point remains valid with higher and lower contribution rates: deferred income is flat. That is, each year, the individual is credited with deferred income equal to that year's contributions. The peaks, plateaus, and cliffs are gone – no one is locked into a job or punished for working too long.

In addition, DC and CB plans have much better funding properties. DC plans are, by definition, always fully funded. CB plans can still have funding issues, since the employer bears the market risk and the employee's return is guaranteed. Yet if the return is set judiciously, the risk should be very manageable. In addition, because the CB plans are far more transparent than traditional DB plans, they are much less susceptible to benefit enhancements being enacted below the public radar screen. Although the transition to CB or DC plans will not help with the funding of previously accrued liabilities, it would certainly help prevent future underfunding problems.

It should be noted that Ohio currently has a DC plan as well as a "combination" plan with a DC component, and its DB plan has a "money-purchase" fallback option that is similar to CB. However, all of these alternative Ohio plans have design features that render them unattractive, and have them in part to help shore up the fiscally troubled DB plan.[8] Participants in these alternative plans are, in effect, subsidizing participants in the DB plan. Consequently, these plans enroll only about 5 percent of active members.

## Recommendations

Policy discussions about teacher recruitment, retention, and quality often focus on young teachers; however, the timing of retirements also has important consequences for the teaching workforce. In addition, pension pol-

icy has powerful effects on K-12 school finance. Teachers who retire in their mid-fifties not only create vacancies that must be filled, they also draw pension benefits for periods of time that are likely to equal or exceed their years of classroom service. A teacher retiring at age fifty-five with a $50,000 annual pension (indexed) has received an annuity valued at over $1 million. Moreover, because the pension systems create incentives for teachers to retire long before they are eligible for Medicare, a costly demand for retiree health insurance arises as well.

We believe that it is time to rethink the Ohio system from the ground up. A new or reworked retirement system should embody several key features:

- *Neutrality.* Each additional year of work should add additional pension wealth in a fairly uniform way. There should be no golden peaks or perilous cliffs at any particular years of service. Longevity decisions by individuals and their employers should be based on other grounds that have a more direct connection to education needs and priorities.

- *Transparency.* The accrual of benefits should be simple and clear. There should be no opportunities for "gaming" the system.

- *Portability.* Young professionals change jobs. That is why the private sector has moved toward systems that do not penalize young mobile workers. The current DB systems redistribute income from young mobile teachers to high-seniority incumbents. Portability could help attract an energetic, talented portion of the labor pool to work in education, including those trained in math and science, who could add much to Ohio's teaching force.

- *Sustainability.* The pension system should be self-funding. The system should not be subject to the pattern of benefit enhancements when the stock market is up, followed by funding shortfalls and contribution hikes when the market sours. Benefits should be tied to contributions.

A defined-contribution or cash-balance system satisfies all these conditions far better than the traditional – and outdated – defined-benefit system. Ohio's legislature showed foresight in creating embryonic DC and CB-type programs. However, these innovations have been inadequate thus far, as STRS efforts have been devoted to patching a broken DB system. If, instead, Ohio chooses to build on its earlier efforts, it could lead the nation toward a teacher pension system that better serves both its fiscal and its educational needs.

# DETAILED FINDINGS

## Background

Pensions have long been an important component of teacher compensation. Traditionally, it has been argued, current compensation (i.e., salaries) has been relatively low for public employees, but pension benefits have been relatively high. This difference was typically rationalized by the contention that the public good was best served by the longevity of service that would be induced by defined-benefit pension plans.[9] In recent decades, however, mounting evidence has shown that many such plans encourage early retirements, and so may actually *shorten* rather than lengthen professional careers.

This trend highlights the incongruity of these systems within the larger public discussion of pension and Social Security solvency in an era of longer life spans and the impending bulge of retirees. (About half of women retiring at age fifty-five can expect to live another thirty years or more.) Much of that discussion focuses on raising the retirement age as part of a solution to growing funding problems. By contrast, there is little discussion of the incentives to retire even earlier in teaching, despite the fact that a substantial body of research in labor economics demonstrates that the incentives in pension systems matter – not only for the timing of retirement, but for labor turnover and workforce quality.[10]

These incentives for early retirement contribute to the funding problems for teacher pension systems, problems that are at least as challenging as those in other sectors of the economy. In addition to facing the same demographic trends, teacher pension systems have also become more expensive following the expansion of legislatively enacted benefits in recent decades. It is not uncommon for these pension systems to raise benefits when a strong stock market improves the funding status, and then to increase contribution rates when the stock market is weak. Such actions ratchet up the cost of the system and also create chronic problems of system underfunding.

More generally, in spite of the growing visibility of problems faced by states and districts in the area of pensions and retiree benefits, there is minimal public understanding of these programs. Specifically, policymakers and the general public need a better understanding of pension accrual patterns over time, since these provide incentives to retire and may affect teacher recruitment and retention, as well as the overall cost of the system.

## Ohio's Teacher Pension System

Dating to 1920, Ohio's State Teacher Retirement System is the oldest of the Buckeye State's five public pension systems. It now covers close to half a million members – active, inactive, and retired – or one member for every ten Ohio households. This includes Ohio's public school teachers (and other licensed staff, including administrators), as well as faculty in two- and four-year state colleges and universities.[11]

This retirement system is particularly important for Ohio teachers because they are not part of the federal Social Security system. State and local employees were originally excluded from the Social Security System when it was set up in 1935. Congress amended the law in 1950 to permit states to arrange voluntary entry of some or all state and local employees to the system. Some states and districts chose to do so, while others did not.[12] Ohio is one of fourteen states in which most or all of the public school teachers are not covered by the federal Social Security system.

Ohio's teacher pension system is different from most others in several other respects as well. Unlike teachers in most states, newly hired Ohio teachers have three choices as to their retirement system.

## 1. A Traditional Defined-Benefits Plan

Roughly 95 percent of active teachers are in the *DB plan*. Under the DB plan, STRS guarantees a retiring teacher, based on his or her final salary and years of service, an annuity payment for life and, optionally, for a surviving spouse. The formula that determines this pension is very complicated but quite important, and will be analyzed in depth below.

Not all teachers who opt for the DB plan end up receiving this pension. Teachers typically become entitled to retirement benefits only after a certain period of employment, at which point they are "vested." In Ohio, this occurs after five years. If a teacher leaves employment before five years, she receives back her contributions to the system (with interest, at a below-market rate), but she does not get the employer share. If a teacher withdraws from the pension system after five years, she receives 1.5 times her contributions, plus interest. In other words, she receives only part of the employer contribution.

The DB system is becoming increasingly expensive for all parties. In Ohio, teachers contribute 10 percent of their salary and school districts contribute 14 percent for a combined total of 24 percent.[13] This total has drifted up from 10 percent since 1945 (see figure 1). Yet it is still insufficient to meet the state's funding goals: the system's unfunded liability is $19.4 billion, which represents a debt of over $4,300 per Ohio household. This far exceeds the debt of the state's other four public pension systems combined, despite the fact that STRS membership amounts to little more than one-third of the membership of those systems.

At current contribution rates, STRS actuaries estimate that it will take 47.2 years to amortize the unfunded liability, a funding period that exceeds the 30-year requirement established in state law. To address this problem, as well as the unfunded liability for retiree health care, the STRS board has voted to seek legislative action increasing contributions to the system: an additional 2.5 percentage points each by teacher and district. This would raise the total contribution to 29 percent, a rather sizable "wedge" between the payments of employers and the net salary of teachers, and one due to retirement costs alone.[14]

## 2. A Defined-Contribution Plan

Ohio also offers a *DC plan*, similar to those found in the private sector and most of higher education. Under the DC plan, teachers and employers contribute jointly into a 401(k)-type retirement account for the teacher (10 percent from teachers and 10.5 percent from employers). The employer has no obligation beyond making annual payments into this account. The teacher has a range of options as to how the funds in her account will be invested. If she quits before retirement, the fund travels with her. The teacher is free to retire at any age she chooses. If she postpones retirement, the fund simply grows larger. Roughly 3 percent of teachers are enrolled in the DC plan.

## 3. A Combined Plan

Finally, STRS offers new teachers the option of a *combined plan*, which incorporates aspects of both the DB and DC plans. Under this option, the teacher's share of pension contributions (10 percent) goes into a DC plan and the employer's share (14 percent) finances a DB annuity. Combined-plan participants account for only 2 percent of active members.

**Figure 1. Employer and Employee Contributions to STRS**

increase
proposed
by STRS

note: employer contribution includes a contribution to retiree health care fund
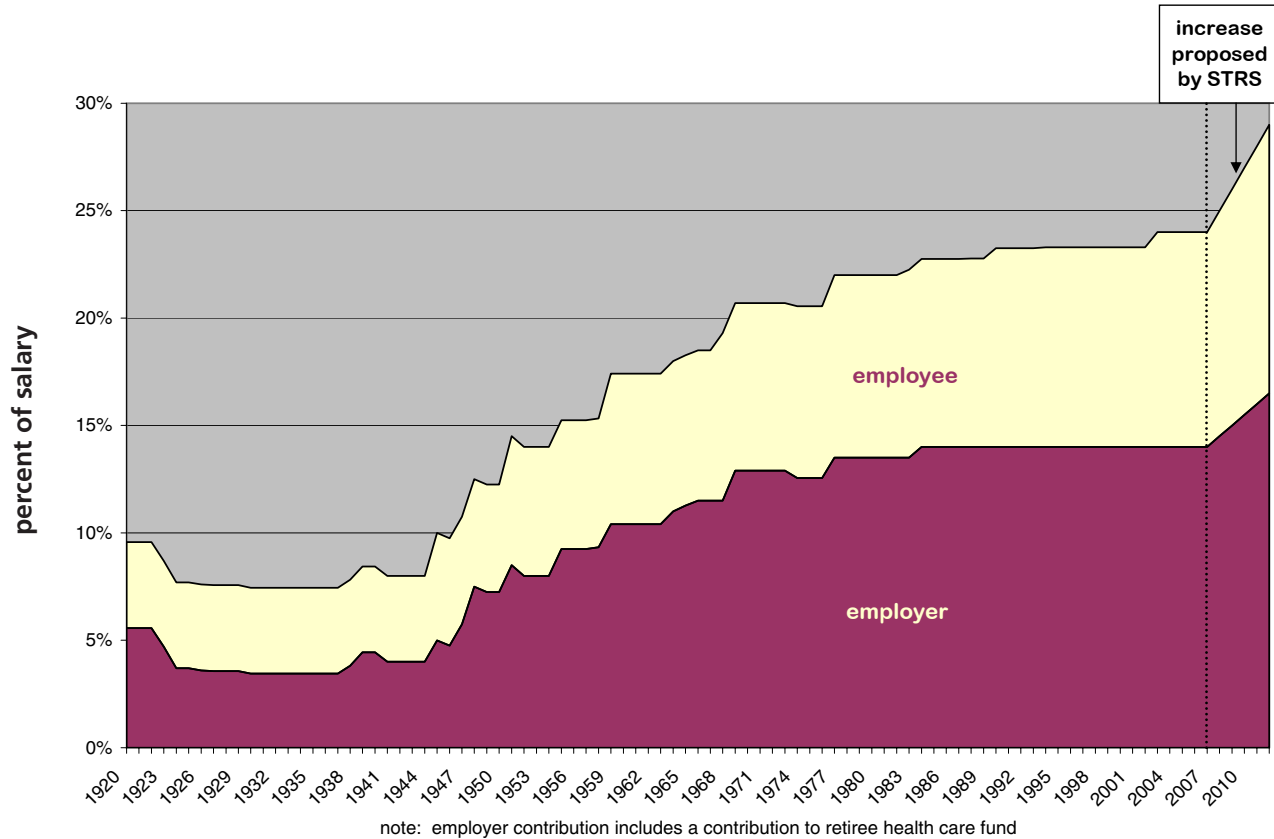
# A Closer Look at Ohio's Teacher Defined-Benefits Plan

The pension system's incentives to retire or work are embedded in the benefit formula. This formula is little understood by the general public, in part because few workers in the private sector have pensions of this type. Yet it is important to understand this arcane element of the system if one is to appreciate the public policy issues at stake.

Teachers in DB systems become eligible to draw a pension at a specific age that depends on the number of years of service. In Ohio, there are three ways a teacher can qualify for regular retirement benefits:

    1) five years of service and an age of sixty or more;

    2) twenty-five years of service and an age of fifty-five or more; or

    3) thirty years of service, regardless of age.

Benefits in DB systems are usually determined by a formula of the following sort:

    Annual Benefit = (years of service) x (final average salary) x *r*.

The final average salary is an average of the last few years of salary (typically three, as in Ohio), and *r* is a percentage that we will call the "replacement factor." For example, if *r* were two percent, a teacher retiring after thirty-five years of service would receive an annuity equal to 70 percent of her final average salary.

In many states, as in the example above, *r* is constant and does not depend on service years (assuming full pension eligibility). That used to be the case in Ohio, but over time, as benefit enhancements were enacted that

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raised the replacement factor, *r* also came to depend on years of service. Currently, for years of service up to thirty, *r* = 2.2 percent. Each year over thirty earns a higher weight, starting with 2.5 percent at thirty-one, 2.6 percent at thirty-two, and so on. Upon reaching thirty-five years of service, the factor for the first thirty years is raised from 2.2 percent to 2.5 percent, effectively adding 6 percent to the total replacement rate. The total replacement rate is capped at 100 percent of the final average salary, which is reached in year 39.

The formula given above applies only to individuals with thirty years of service or age sixty-five. For individuals with fewer than thirty years of service who draw their pension before age sixty-five, the formula is adjusted. Prior to 1971, the adjustment percentage varied strictly with age. Since then, however, the adjustment percentage has been based on age *or* years of service. Statute sets the adjustment percentage at 75 percent for individuals who have acquired twenty-five years of service but have not reached age fifty-nine. It rises to 80 percent upon reaching age fifty-nine or twenty-six years of service, and 85 percent upon reaching age sixty or twenty-seven years of service. It continues to rise in smaller increments with additional years of age or service until reaching 100 percent at age sixty-five or thirty years.

As a result, the replacement rate is a complicated function of age and years of service, as depicted in figure 2. In this graph, the heavy green line depicts the replacement rate for an individual drawing a pension at age sixty-five, the heavy red line for an individual of age sixty, and the heavy blue line for an individual of age fifty-five, with other ages depicted by lighter lines. The heavy black line depicts individuals of any age with more than thirty years of service.

**Figure 2. Replacement Rate: Starting Pension, as Percentage of Final Average Salary**
by age & years of service
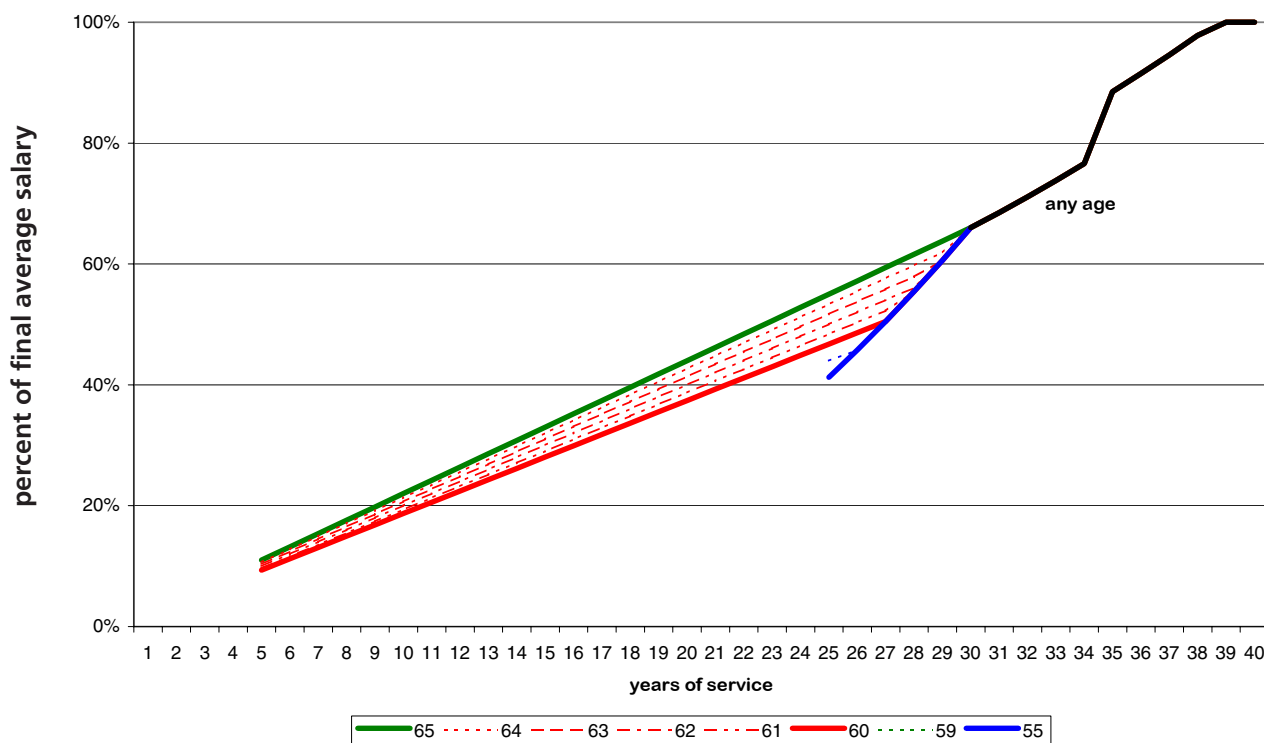
To understand how this plays out for an individual teacher, consider someone entering service at age twenty-five. After five years, at age thirty, she is eligible for a pension, but if she leaves service before twenty-five years, she must defer collecting her pension until age sixty.[15] Her replacement rate, therefore, follows the heavy red line in figure 2 – up to twenty-four years of service, at age forty-nine. If she continues working to age fifty, she attains twenty-five years of service, so she need only defer her pension to age fifty-five. The replacement rate is reduced, however, due to the earlier age, dropping her down to the heavy blue line. If she continues to work, her replacement rate would follow this line up to thirty years of service (age fifty-five), beyond which she would be eligible for the full, unadjusted pension, without deferral. Beyond fifty-five, her replacement rate is depicted by the heavy black line. If she stays until age sixty, she attains thirty-five years of service, and the replacement rate jumps as indicated.

Once the pension draw begins, there is typically some form of inflation adjustment, although the nature of it varies from state to state. In Ohio, the pension automatically rises by 3 percent per year (uncompounded).

As complicated as this formula is, our presentation has excluded a number of further complications and enhancements. For example, Ohio has often provided retirees a supplemental "thirteenth check." Retirees are also guaranteed that their pension will not fall below a certain percentage of their initial pension's purchasing power, if the cumulative, compounded rate of inflation exceeds the uncompounded 3 percent hikes. (These and other complications are excluded from the following analysis of pension wealth.)

## Pension-Wealth Accumulation in Ohio's Teacher Defined-Benefits Plan

When an individual retires under a DB plan, he or she is entitled to a stream of payments with a lump-sum value that can be readily determined, using standard actuarial methods. In principle, this pension wealth represents the market value of the annuity. If, instead of providing a promise to pay benefits, the employer were to provide a lump sum of this magnitude upon separation, the employee could buy the same annuity on the market.[16] The analysis of incentives embedded in the Ohio teacher pension system is based on the time pattern of accumulation of pension wealth over one's career.

In calculating the pension wealth for an individual in the Ohio system, we make certain assumptions. As indicated above, we consider a teacher entering the workforce at age twenty-five and working continuously until leaving service.[17] We assume salaries follow a pattern based on the actual salary grid for Columbus. For districts with higher or lower salary scales, the dollar amounts of pension wealth would differ, but not the time pattern of accumulation. We assume all cells of the grid grow at the rate of inflation, which is set at 2.5 percent. We use a 5 percent interest rate, and a federal unisex mortality table.[18] If the individual leaves teaching with sufficient years of service to qualify for the pension, but is too young to receive it just yet, the value of the future stream of benefits is discounted back.

Figure 3 depicts the pension wealth, in inflation-adjusted dollars, for a twenty-five-year-old entrant to the Ohio teaching force at various ages of separation. The salient point of this diagram is that the pension wealth trajectory is not smooth and steady; after age fifty, pension wealth grows by fits and starts. Specifically, there are three distinct periods of her career.

### 1. Years 1 to 24

Up to age forty-nine (year 24 of her tenure), a teacher contemplating separation would have to defer pension to age sixty. Each additional year of service will increase the pension benefit to which she will be entitled because

her earnings are increasing and her replacement rate is also rising with years of service, as depicted on the red curve of figure 2. By age forty-nine, she will be entitled to a pension starting at about $30,000 (in 2007 dollars, inflation-adjusted), collectible beginning at age sixty. In addition, with each passing year this pension will also be one year closer in time, so it is discounted one year less. Together, these factors account for the gentle upward slope of the pension wealth curve along the red segment of figure 3. By age forty-nine, this individual has accumulated pension wealth of about $315,000.

## 2. Years 25 to 30

At age fifty, this teacher will have twenty-five years of service, which makes her eligible to receive her pension at age fifty-five instead of sixty. Her adjustment factor drops from 85 percent (at age sixty) to 75 percent; she drops down from the red replacement rate curve in figure 2 to the blue one. But this drop is far outweighed by the additional five years of pension she will receive on the front end. Consequently, her pension wealth jumps that year to about $446,000, as depicted in figure 3. For the next five years, her pension wealth continues to grow rapidly. This is because her replacement rate is rising along the particularly steep blue segment of figure 2, as her adjustment factor rises from 75 to 100 percent upon completion of thirty years of service. By that point, at age fifty-five, she will be eligible for a pension of about $47,000, collectible immediately upon separation. From age forty-nine to fifty-five, her pension wealth has risen from about $315,000 to about $970,000, as shown on the blue segment of figure 3.

## 3. Year 30 and Beyond

From age fifty-five on, each year of further employment delays the pension and results in one less year of expected pension benefits. The annual benefit continues to rise, since additional service raises the replacement rate, but this results only in slowly rising pension wealth. If this teacher stays on until age sixty, she reaches thirty-five years of service, and her replacement rate is bumped up by an additional six percentage points, so pension wealth jumps to about $1.22 million. Beyond sixty, her pension wealth tops out and then starts to decline.
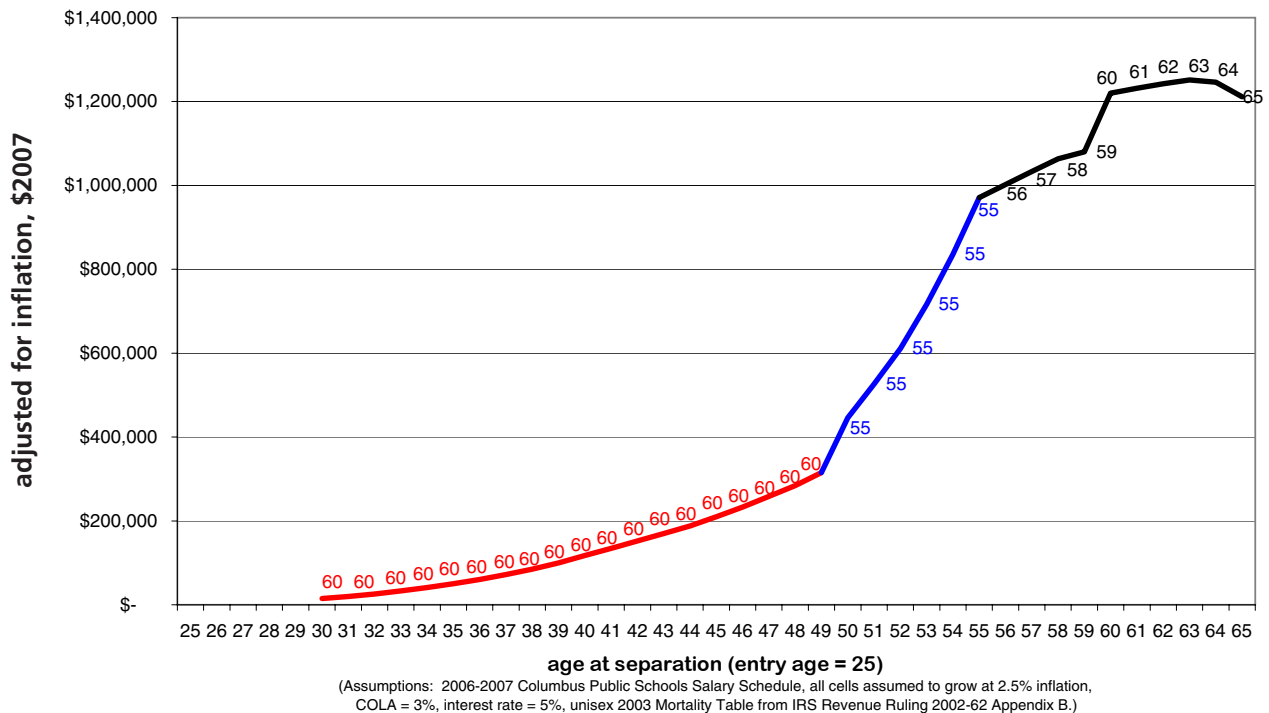
Figure 4 provides an alternative depiction of pension wealth, using a different metric: pension wealth as a percentage of cumulative earnings. This format has a few advantages. First, it is relatively insensitive to the salary grid. For districts with salary grids that are very different from that of Columbus, this curve will be approximately the same, so the time pattern of pension-wealth accumulation will still be accurate.

Second, this graph helps net out the growth in pension wealth that is due to an additional year's work, as opposed to simply the passage of a year's time. The growth of wealth depicted in figure 3 includes interest on the previous year's wealth, since each successive year's calculation includes one less year of discounting.[19] In figure 4, pension wealth is divided by cumulative earnings, which also include interest, so this effect is netted out.

The main difference between figures 3 and 4 is that in figure 4 pension wealth, as a percentage of earnings, tops out at age fifty-five. This differs from figure 3 because the continuing growth after fifty-five in that diagram largely reflects the interest on the previous year's wealth, rather than the effect of an additional year's work. In figure 4, the curve does bump up again at age sixty, a result of the bonus in the replacement rate at thirty-five years of service, but it does not quite match the overall maximum at fifty-five.

Before leaving figure 4, there is another point to be made from the funding side. The curve in figure 4 indicates the percentage of earnings that must be set aside each year (from employer and/or employee) in order to fully fund the pension benefit that one will be owed, for any given age of separation.[20] Clearly, those individuals who

**Figure 3.  Pension Wealth, in Inflation-Adjusted Dollars**
age of first pension draw indicated



**age at separation (entry age = 25)**
(Assumptions:  2006-2007 Columbus Public Schools Salary Schedule, all cells assumed to grow at 2.5% inflation,
COLA = 3%, interest rate = 5%, unisex 2003 Mortality Table from IRS Revenue Ruling 2002-62 Appendix B.)
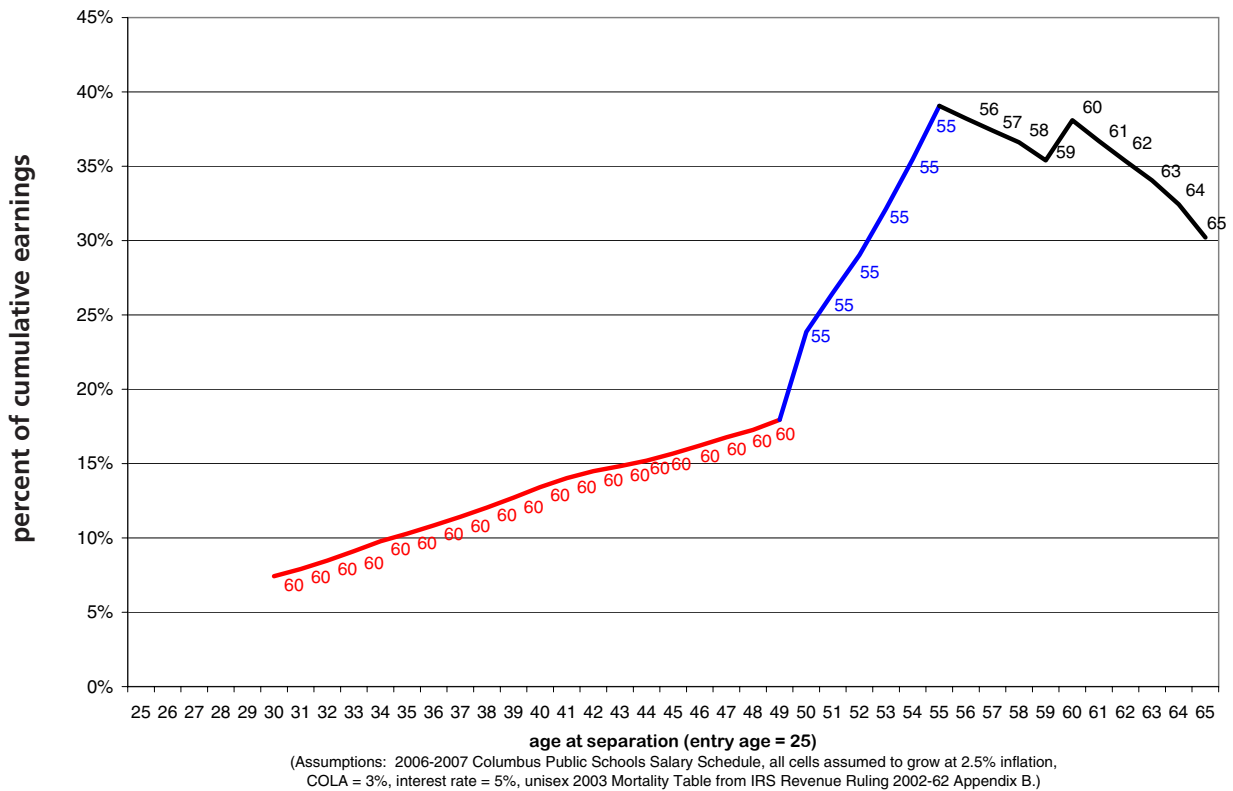
retire at or around fifty-five receive significantly more in benefits than was contributed to the system on their behalf, while those who separate from service earlier in their career do not. Figure 4 therefore illustrates the inequities that are built into the system. Since all employees contribute 10 percent of their earnings to the pension fund, the net benefits are even more unequally distributed than the gross benefits. The question, then, is whether there is any efficiency purpose served by these policies that might justify the apparent inequity. As discussed below, we are not aware of any evidence to this effect.

# Change in Pension Wealth as a Measure of Annual Deferred Compensation

A teacher receives compensation for a year's work in two forms: 1) *current compensation*, and 2) *deferred compensation*. Current compensation is simply her paycheck, while deferred compensation is the growth of her pension wealth due to an additional year's work. In our view, the most revealing picture of a pension system's incentives is given by the annual measure of deferred compensation. This can be directly compared with the annual measure of current compensation – the salary.

More specifically, the standard measure of annual deferred compensation is simply the change in pension wealth, net of the interest accrued on the previous year's wealth. Equivalently, it is the difference between this year's pension wealth and last year's pension wealth increased by the interest rate, to provide comparability at the same point in time.[21]

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**Figure 4. Pension Wealth, as Percentage of Cumulative Earnings**
age of first pension draw indicated

(Assumptions: 2006-2007 Columbus Public Schools Salary Schedule, all cells assumed to grow at 2.5% inflation, COLA = 3%, interest rate = 5%, unisex 2003 Mortality Table from IRS Revenue Ruling 2002-62 Appendix B.)

Figures 5 and 6 present calculations of annual deferred compensation for an Ohio teacher entering service under the DB plan at age twenty-five. These figures present deferred compensation in inflation-adjusted dollars and as a percentage of annual earnings.

Both figures paint the same overall picture of a highly idiosyncratic pattern of annual deferred income – one that looks more like a cardiogram of a patient in arrhythmia than a compensation program consciously designed to convey appropriate incentives.

Before examining the pattern more closely, we note that the income from deferred compensation in any given year has three conceptual pieces:

1. the rise in starting pension, due to the formula (higher replacement rate with more years of service, coupled with higher final average salary);

2. at a certain break point in the formula, additional years of pension eligibility; and

3. later in one's career, the loss of a year of benefits from deferring separation.[22]

Now consider the annual deferred income over the different phases of one's career:

■ Once vested, five years after entering at age twenty-five, this teacher is entitled to a pension at age sixty, as discussed above. The individual earns deferred income due to annual increments to her starting pension, from a gradually rising replacement rate applied to a rising salary. By age forty-nine, she is receiving about $24,000 in inflation-adjusted deferred income, adding about one-third to her annual salary.

**Figure 5: Annual Deferred Income, in Inflation-Adjusted Dollars**
age of first pension draw indicated
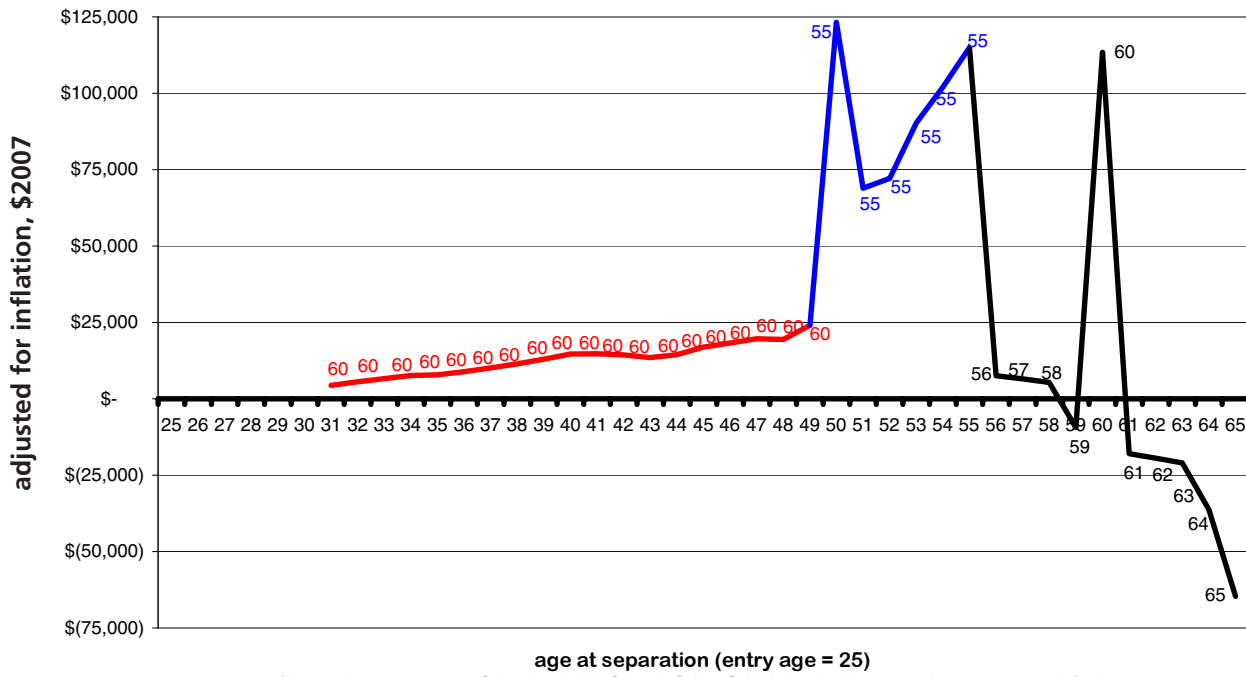


age at separation (entry age = 25)
(Assumptions: 2006-2007 Columbus Public Schools Salary Schedule, all cells assumed to grow at 2.5% inflation,
COLA = 3%, interest rate = 5%, unisex 2003 Mortality Table from IRS Revenue Ruling 2002-62 Appendix B.)

**Figure 6. Annual Deferred Income, as Percentage of Earnings**
age of first pension draw indicated
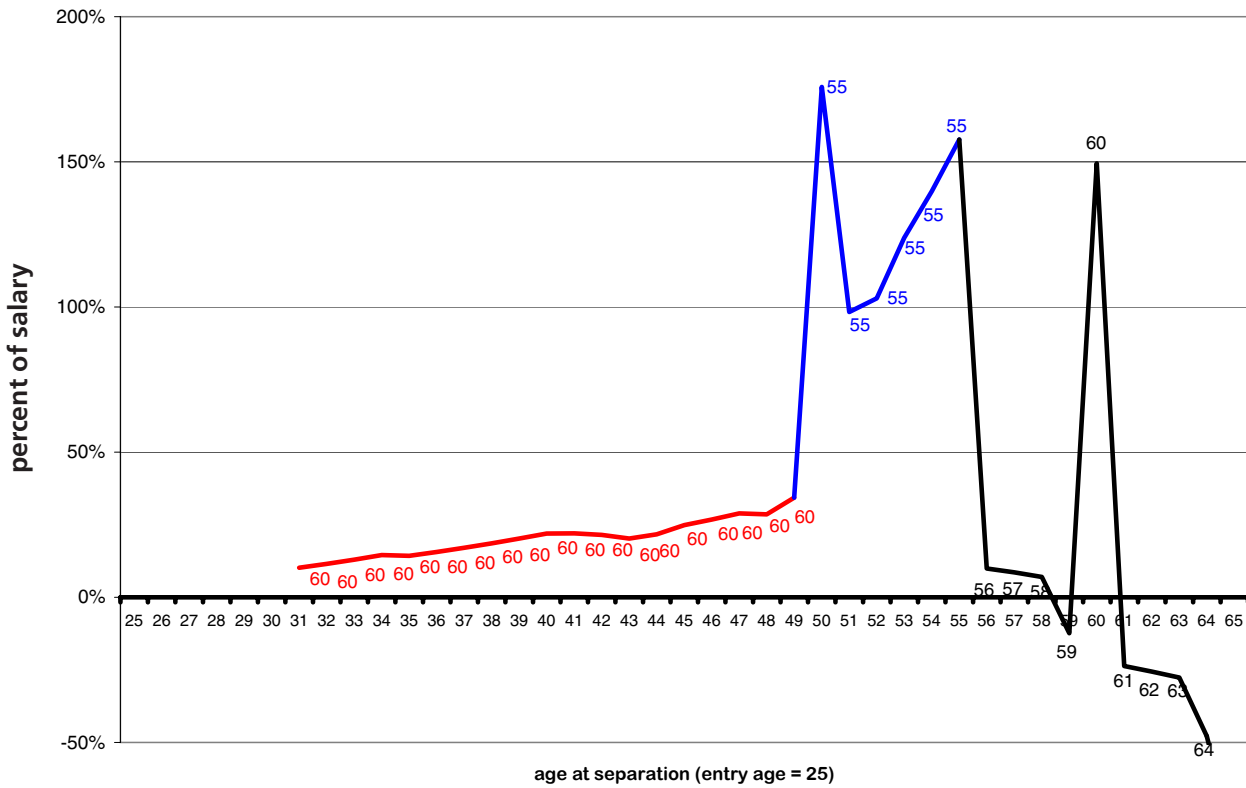


age at separation (entry age = 25)
(Assumptions: 2006-2007 Columbus Public Schools Salary Schedule, all cells assumed to grow at 2.5% inflation,
COLA = 3%, interest rate = 5%, unisex 2003 Mortality Table from IRS Revenue Ruling 2002-62 Appendix B.)
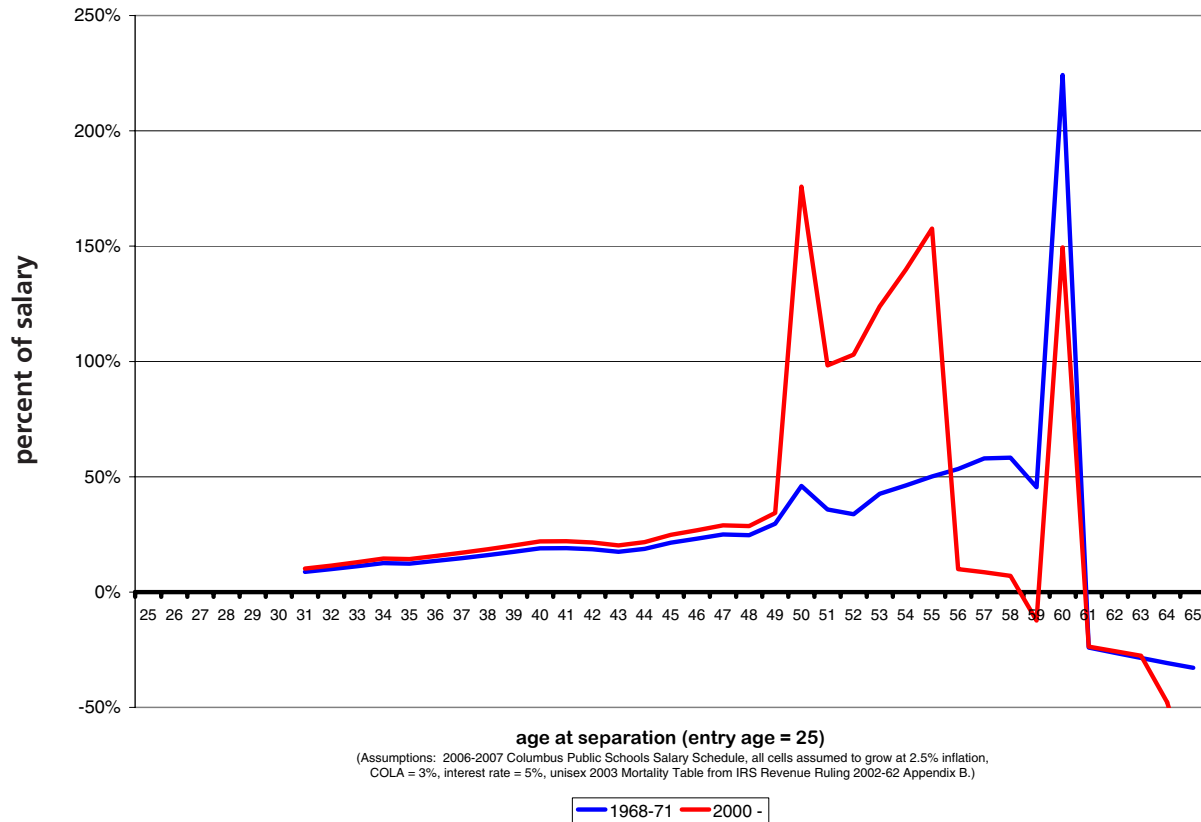
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■ At age fifty, as we have seen, this individual enjoys a jump in pension wealth because her twenty-five years of service qualify her to receive an extra five years of pension, starting at age fifty-five instead of sixty. Netting out the reduction in starting pension due to the adjustment factor, her deferred income comes to about $123,000, which adds 176 percent to her annual salary that year – the first golden peak. Clearly, if one is considering leaving the profession in one's late forties, it may be well worth staying on to at least age fifty to harvest that year's windfall.

■ Over the next five years, from ages fifty-one to fifty-five, deferred income continues to be quite high, but not as high as at age fifty, and for a different reason. There are no additional years of pension being added, but the annual increase in the starting pension is quite steep. This is due to the phaseout of the penalty for early retirement, as the teacher approaches thirty years of service. In all five of those years, her deferred income equals or exceeds her salary, reaching 158 percent at age fifty-five. Although no single year in this interval offers as much deferred income as year 50, taken as a whole these extra five years may well be golden handcuffs for someone who is otherwise inclined to leave.

■ After age fifty-five, deferred income plummets. There are two reasons. First, the starting pension rises much more slowly once the adjustment factor has reached 100 percent. The second and more powerful reason is that each additional year of work beyond age fifty-five costs this individual one year of pension benefits. As a result, deferred income adds less than 10 percent to salary – it does not even recoup the employee's contribution – and then goes negative by age fifty-nine.

■ At age sixty, another golden peak appears, due to the bump in the replacement rate upon reaching one's thirty-fifth year of service. If one is willing to work through the previous four years with little or no deferred income, then one can cash in for another $113,000, adding about 149 percent to one's salary that year.

■ For those who work beyond age sixty, their labor of love is punished by an annual decrease in pension wealth that exceeds a quarter of their salary – even as those employees continue to contribute to the pension fund. Deferred income is negative because the loss of a year's pension outweighs the slow growth in starting pension at this stage. By age sixty-five, after reaching the maximum replacement rate of 100 percent at age sixty-four, the teacher is literally working without compensation, as the negative deferred income (not shown, as it is off the chart), plus pension contribution, completely offsets the salary.

How did this system come to its current form? It was not always this complicated, and the pattern of pension accrual was not always so idiosyncratic. The legislative process of benefit enhancement over time is an important part of Ohio's pension story.

Figure 7 illustrates how those changes have influenced this system. (Appendix A provides a more complete history and analysis of changes in Ohio's DB system since 1965.) The older plan – in place until 1971 – had a single peak at age sixty. It clearly encouraged teachers to work for thirty-five years and then retire. Many other state systems are similarly single-peaked. In Ohio (as elsewhere), the peaks have gradually moved toward the left – thus encouraging earlier retirement. The current Ohio system has *three peaks*. The first two were in place by 2000. The last peak, at thirty-five years of service (age sixty), was added in 2000, as a means to try to reverse course and encourage teacher longevity.

A system with one peak basically says to a teacher, "We want you to work until age X and then retire." What is the message of the three-peaked system?

**Figure 7. Annual Deferred Income, Then and Now**



age at separation (entry age = 25)
(Assumptions: 2006-2007 Columbus Public Schools Salary Schedule, all cells assumed to grow at 2.5% inflation, COLA = 3%, interest rate = 5%, unisex 2003 Mortality Table from IRS Revenue Ruling 2002-62 Appendix B.)

1968-71    2000 -

# Historic Rationales, Equity, and Efficiency

Historically, the rationale for public defined-benefit plans was to encourage longevity. As the National Education Association (NEA) Research Division has pointed out, however, this purpose has "been lost for many in the mists of time," and "many pension administrators would be hard-pressed to give an account of why their systems are structured as is except to say that 'the Legislature did it' or 'It is a result of bargaining.'"[23]

Like Ohio's, many pension systems no longer encourage longevity. (See appendix B for a comparison of Ohio's system with those of four other states.) Indeed, the same NEA report cited above also provided survey results that found the most common recent or planned changes in retirement plans involved early retirement provisions.

To the extent these changes have occurred, is there any reason to believe that they have efficiently advanced public policy? That is, has the socially optimal retirement age dropped? We are not aware of any evidence that it has.

To be sure, the rhetoric put forth by advocates of pension changes has cited teacher burnout (presumably more pronounced now than in previous times) and the need to get "new blood" in the classroom. But even taken at face value, this is an argument not for early retirement but for switching jobs, which would be best facilitated by pension portability, not defined benefits.

The other argument for changing pensions to encourage earlier retirement has stressed the need to enhance recruitment, but again, there is no reason to believe that early retirement provisions are more attractive to new hires than current compensation (either across-the-board, or differentiated). Indeed, to the extent that augmented retirement benefits are partially funded by higher employee contributions, this can easily make recruitment more difficult.

From a societal viewpoint, there would seem to be a *prima facie* case that with expanded life spans and the impending demographic bulge, the retirement age should be raised, not reduced. That, of course, is the thrust of policy debates about Social Security, and in fact the age for regular retirement is rising from sixty-five to sixty-seven. For state and local pensions, surely the combination of longer life spans and lower retirement ages is a significant underlying contributor to the funding crises we observe.

The question of individual variation in career paths, however, is just as important as the question of the overall retirement age. Perhaps in the distant past all teachers were drawn from the same profile and followed the same career paths. Today, however, it is more widely recognized that we have a mobile workforce that brings a great variety of individual needs and talents to the teaching force. Some will be individuals who teach for a few years, while young and energetic, and then move on to something else. Others will be individuals whose wisdom grows with age and whose students benefit from their long teaching experience. And still others will have acquired valuable experience in other fields (e.g., engineering) and seek to give back to society with a mid-career change. The breadth of individual variation raises important efficiency and equity concerns about traditional defined-benefit plans that were designed for a different era, one in which workers tended to follow a single career path.

We have seen in figure 4 that the gross pension benefit received, as a percentage of cumulative earnings, varies widely depending on whether one separates early, late, or at the curve's peak. Netting out the employee's 10 percent contribution means the benefit is even more uneven. Unless there are powerful efficiency reasons to drive employees to some prespecified retirement age, these inequities would seem to be indefensible.

On efficiency grounds, there is no rationale for driving all teachers to the same separation age, and this is now widely recognized. One might think that understanding this fact would lead to serious consideration of fundamental reform, including a transition to retirement-neutral systems such as cash-balance or defined-contribution plans (discussed below). Unfortunately, the response instead has been to continue adding enhancements to the same defined-benefit structure, with the additional feature of allowing more teachers to take early "retirement" and then return to teaching, possibly after a short hiatus.

## Post-Retirement Employment and "Double-Dipping"

Clearly, many teachers, even if they nominally "retire" at age fifty-five or fifty-seven, will continue with labor market work of some sort for many years. Given concerns about "teacher shortages" and pressures from the federal No Child Left Behind Act to ensure that all classrooms are staffed with qualified teachers, it makes little sense for districts to nudge qualified veteran teachers out the door. Not surprisingly, all teacher pension systems have loopholes to allow educators to continue to teach while simultaneously collecting their pensions (that is, to engage in double-dipping). Such loopholes appear to be expanding.

Although we are aware of no systematic national study of post-retirement teaching employment, the current Ohio regulations are surely some of the most liberal in the nation: STRS retired teachers may return to the same or another STRS school district after a break in service of as little as two months. In other words, a teacher can "retire" in June, and return to work in August and collect her pension as well as a paycheck. In fact, a teacher can resume employment after *one day*, but the pension payment will not begin for two months.

STRS data show that 19,749 teachers are collecting pensions and have been reemployed by a STRS covered employer.[24] This double-dipping might make fiscal sense for the district, to the extent that costs are shifted

onto the pension system, but the total cost to taxpayers can be high. A recent *Akron Beacon Journal* article reported that more than two hundred teachers statewide were earning in excess of $100,000 per year as a result of this provision.

Again, this illustrates the expensive consequences of the peculiar incentives built into the STRS defined-benefit system. Teachers are encouraged to "retire" at early ages, yet in response to resulting teacher shortages, are permitted to immediately resume work. By contrast, when private-sector pension systems choose to offer early-retirement incentives, it is part of a downsizing effort, not one that offers reemployment.

## Retiree Health Insurance

While the focus of this report is on the teacher pension system, retiree health insurance is another important – and costly – STRS benefit. Ohio is one of the few states to fund its optional retiree health insurance program through its pension system. Given that STRS members retire well below the age for Medicare eligibility (sixty-five), there is a gap of many years to be covered by this expensive program. The plan currently covers 75 percent of the cost of insurance premiums for most teachers.

This benefit is funded by a carve-out of the employer's 14 percent contribution to STRS. The carve-out has varied over time, depending on the funding status of the pension system proper. In the late 1990s, when large investment gains on the pension fund improved the system's status, eight percentage points were redirected to funding the retiree health liability. When the stock market fell, however, the health carve-out was slashed to help shore up the pension's unfunded liability, while deferring funding for the health liability. Today, only one percentage point of the employer's 14 percent premium goes to the health liability, which is completely inadequate to sustain these benefits.

That is why the STRS board voted to ask the legislature for a 2.5 percentage point hike in both employer and employee contributions. Under this proposal, 4.4 percentage points of the 5-point total hike would go to fund the health liability, while the pension fund would get the 1 point currently diverted plus 0.6 points of the hike. The legislature has not acted on this proposal. Nor have the steps taken in recent years to reduce health care liabilities been sufficient to address the problem. There have been a series of reports on this problem – by STRS itself, by Millman actuaries, and by the Ohio Retirement Study Council – but the situation continues to fester.

The proposed contribution hike illustrates an important trade-off in these defined-benefit systems. As shown earlier, the primary beneficiaries are older teachers who work at least twenty-five years. However, it is well known that many young teachers leave the profession in the first five to ten years of teaching. Moreover, many teachers change states. Thus many teachers will never reap these benefits.

While the benefits may seem elusive and distant for young teachers, the costs are incurred up front. The proposed retiree health insurance bailout is a good example, as it would raise the teacher's payroll deduction from 10 percent to 12.5 percent. Of course this does not count employer contributions – which might also have been payable as up-front salaries rather than deferred. Proponents of these generous retiree benefit systems claim that this makes teaching more attractive for new recruits. However, many young teachers, who are paying off student loans, attempting to start families, and hoping to buy homes, might prefer more of their compensation up front rather than deferred into a system from which they may well never benefit.

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# Why Ohio's Alternative Pension Plans
# Don't Attract More Teachers

## Ohio's Defined-Contribution Plan

The traditional DB system described above may be contrasted with a defined-contribution plan. In a DC plan, the employer merely agrees to contribute a fixed amount annually to a 401(k)-type retirement account for an employee. For example, a common arrangement in the private sector is for the employer to contribute 5 percent of an employee's salary and match employee contributions up to an additional 5 percent. If the employee quits, the fund goes with him. The employer is under no obligation to provide a given monthly payment to the employee at the time of retirement.

DC plans now predominate in the private sector,[25] and they are particularly attractive for professionals who exhibit high rates of mobility between employers (or who go into self-employment and out). Not surprisingly, given their relatively high rates of professional mobility, DC plans (predominately TIAA-CREF) tend to be the norm in both public and private higher education institutions.

Ohio is one of only two states (the other being Florida) with a DC option for new teachers. Like the DB plan, the Ohio DC plan calls for teachers to contribute 10 percent of gross salary. However, in the DC plan, employers contribute only 10.5 percent, as compared to 14 percent under the DB plan. The 3.5 percent difference is the employee's contribution to the large unfunded liability ($19.4 billion) in the DB system.

Another major disadvantage of the Ohio DC plan is that DC recipients are not eligible for subsidized health insurance at retirement. As discussed above, the STRS health insurance fund currently pays 75 percent of the insurance premiums for most retired members, an important benefit under the DB plan given that retirement typically occurs well before normal eligibility for Medicare. In addition, STRS health insurance plans cover many of the exclusions and deductibles under Medicare. The fact that DC recipients are ineligible for these benefits makes this plan a much less attractive option for teachers.

## Ohio's Combined Pension Plan

The combined plan allows members to put their contribution (10 percent) into a DC plan, while the employer contribution (14 percent) goes into the DB fund. While this plan gives employees some portability, the replacement factor used for the DB annuity (1 percent per year of service) is disadvantageous as compared to the DB formula, since it is less than proportionate to the contribution. In addition, unlike the regular DB plan, the DB portion of the combined plan provides no cost-of-living adjustment after retirement.

Given these restrictions, it's hardly surprising that most STRS members choose the DB plan. Moreover, under both the DC and combined plans, after five years of employment, teachers are automatically moved to the DB plan unless they specifically request otherwise. As a result, 95 percent of active members are in the DB plan, with only 3 percent in the DC plan and 2 percent in the combined plan.

## Money-Purchase Component of Ohio's Defined-Benefit Plan

Ohio's DB program has long had a component called the money-purchase plan, which represents a third alternative to the traditional DB plan. This plan has some features in common with a cash-balance plan, which is discussed below. Unfortunately, like Ohio's DC options, its money-purchase plan also suffers from design fea-

tures that render it unattractive, including a below-market rate of return. These features were adopted, in part, to shore up the fiscally troubled traditional DB plan. The money-purchase plan and its flawed design features are analyzed in appendix D.

# Options for Strengthening Ohio's Teacher Pension System

## Cash-Balance Plans and Defined-Contribution Plans

CB plans offer an alternative to traditional DB formulas in that they are essentially neutral in the incentive they offer for the timing of separation. In the private sector, many large corporations have switched from traditional plans to CB plans over the last twenty years, and some public entities – including some teacher pension systems – have started to include some CB or CB-type components in their plans. CB plans are very similar to DC plans. The main difference is that the return is guaranteed by the employer so the market risk is not borne by the employee.[26] The return is typically set at a rate comparable to risk-free Treasury bonds.

The neutrality of simple CB plans with regard to age of separation can be easily depicted. The flat line in figure 8 depicts the pattern of deferred income, under an illustrative cash balance plan of 24 percent contributions and 5 percent interest. The contribution rate here matches Ohio's current rate (employer plus employee), but the point remains valid with higher and lower contribution rates: deferred income is flat. That is, each year, the individual is credited with deferred income equal to the contributions. This is a far cry from Ohio's DB system, also represented in figure 8. The golden peaks and perilous cliffs are gone – teachers are not locked into a job or punished for working too long.

**Figure 8.  Annual Deferred Income:  Ohio's DB vs. Hypothetical Cash-Balance**
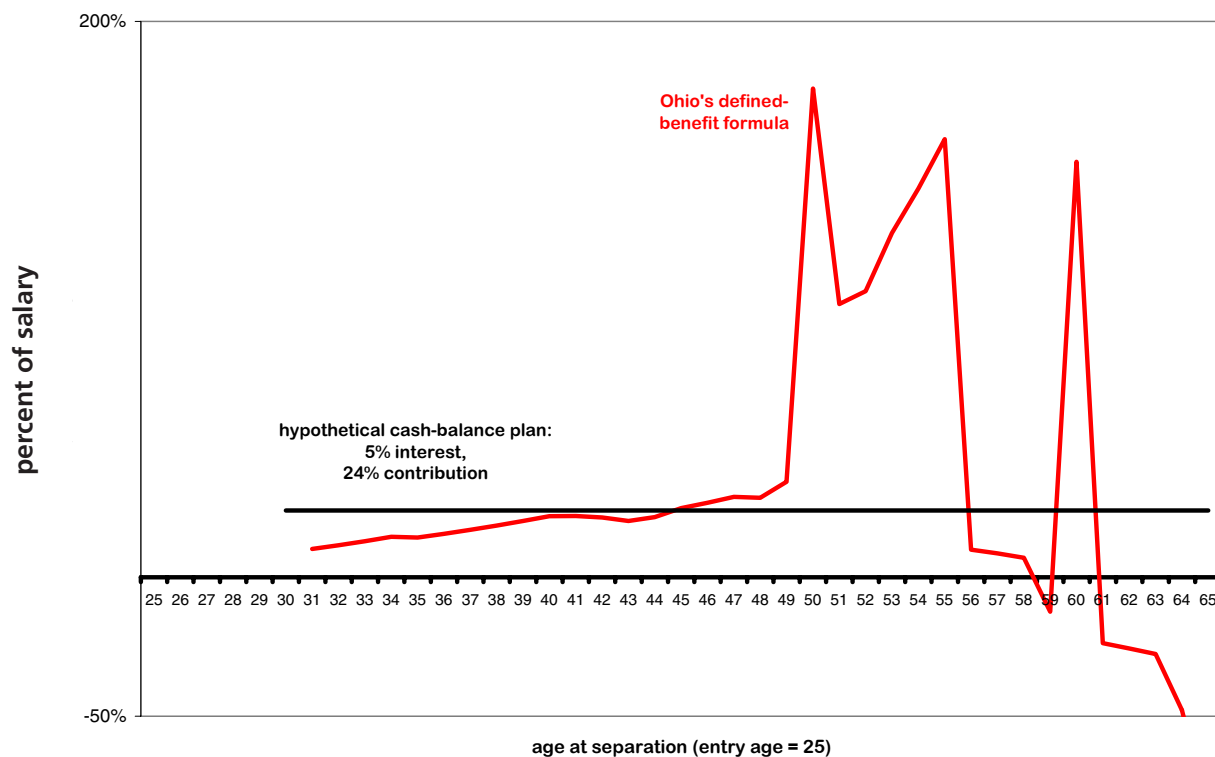


age at separation (entry age = 25)
(Assumptions:  2006-2007 Columbus Public Schools Salary Schedule, all cells assumed to grow at 2.5% inflation, COLA = 3%, interest rate = 5%, unisex 2003 Mortality Table from IRS Revenue Ruling 2002-62 Appendix B.)

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On the latter point, consider the difference between CB (or DC) and traditional DB plans late in one's career. Under traditional DB plans, deferred income turns negative because one forgoes a year's worth of pension payments, and this outweighs any growth in the annual benefit. Under a CB or DC plan, this does not happen: employer and employee contributions steadily accumulate at an even rate for each individual. If an employee works an additional year, the value of the fund never goes down.

Consider this same point in terms of an annual annuity payment. Under a DC or CB plan, deferring retirement for a year means that one can buy a larger annual payment with the same lump sum (over and above the increase in the lump sum from the additional year's contributions and return). By contrast, traditional DB formulas punish individuals for staying on the job beyond a certain point by failing to raise the annuity payment by an actuarially fair amount.

There are many variants of CB plans that pension specialists have developed. For instance, some feature rising employee contributions with employer matches, since employees may find it easier to save more later in their career. Other plans address this issue instead by supplementing flat CB contribution rates with optional DC plans that employees can ramp up as circumstances permit.

Under all these variants, CB and DC plans grant employees much more latitude in arriving at individually optimal separation decisions, based on their lifestyle preferences. These plans also make it much easier for the schools to tailor their workforce to the educational needs of the students. In our view, this is far preferable to the heavy-handed DB formulas, supplemented by reemployment or other make-shift provisions.

In addition, DC and CB plans have much better funding properties. DC plans are, by definition, always fully funded. CB plans can still have funding issues, since the employer bears the market risk and the employee's return is guaranteed. However, these issues are typically considered to be more manageable, since the liabilities are known with greater certainty. In addition, because CB and DC plans are far more transparent than traditional DB plans, they are much less susceptible to benefit enhancements being enacted below the public radar screen. Thus, although the transition to CB or DC plans will not help with the funding of previously accrued liabilities, it would certainly help prevent future underfunding problems.

## Conclusion

Policy discussions about teacher recruitment, retention, and quality often focus on young teachers; however, the timing of retirements also has important consequences for the teaching workforce. In addition, pension policy has powerful effects on K-12 school finance. Teachers who retire in their mid-fifties not only create vacancies that must be filled, they also draw pension benefits for periods of time that are likely to equal or exceed their years of classroom service. A teacher retiring at age fifty-five with a $50,000 annual pension (indexed) has received an annuity valued at over $1 million. Moreover, because the pension systems create incentives for teachers to retire long before they are eligible for Medicare, a costly demand for retiree health insurance arises as well.

A system that is so large and increasingly costly should meet basic public policy requirements of transparency and efficiency. This study analyzed the teacher pension benefit system, particularly the incentives for work and retirement that are built into the pension benefit accrual – a pattern of golden peaks and perilous cliffs. We conclude that the system fails to meet either requirement: it lacks transparency, and its incentives are perverse. As a result, Ohio's pension system almost certainly hinders rather than helps in the recruitment and retention of a highly qualified teaching workforce. Four points are key:

## 1. The Ohio teacher pension system encourages early retirement.

The traditional rationale for defined-benefit teacher pensions was to encourage classroom longevity. Over time, however, the pattern of pension accrual built into teacher pension systems like Ohio's has created powerful incentives for instructors to retire in their fifties. The average retirement age for Ohio teachers is 58 years, well below the current minimum age for regular retirement in the Social Security system (65.5, rising to 67 in coming years) and below the private sector generally. With rising life expectancies, a defined-benefit system that encourages teachers to retire in their fifties is going to be very costly, and increasingly out of step with trends elsewhere in the labor market.

## 2. The Ohio system hinders mobility.

DB pension systems have been described as golden handcuffs. Young teachers who move from the teacher DB system to a nonteaching job or to another state suffer serious losses in pension wealth, compared to those who stay. While schools may benefit from "locking in" their employees (but then losing them in their fifties), they lose by stifling labor market mobility, as this back-loaded system discourages prospective career-switchers from applying for a teaching job. In addition, the high payroll contribution rate (currently 10 percent and likely to rise) may hinder recruitment of new teachers. This system is completely out of line with the high levels of job mobility ("job shopping") among most of today's young college graduates.

## 3. The system lacks transparency.

Teacher pension systems, and the incentives they create, have become remarkably complex and opaque. As a result, relatively few people understand the intricacies of Ohio's system, or its legislated changes over time. This has allowed the system to evolve into a costly and completely irrational incentive structure – a set of spikes that defy any logic, let alone the original intent of defined-benefit systems – without much public awareness.

## 4. The system is rife with ad hoc fixes.

Because these DB systems now encourage early retirements, Ohio and other states have responded to that problem by adding ad hoc incentives for continued employment, creating further complexity and costs. Most recently, Ohio added a large retirement benefit for those who work thirty-five years, layered on top of a system that still punishes teachers for working beyond thirty years. In addition, Ohio has one of the most liberal schemes in the nation, permitting teachers to collect their pensions while continuing to work full time as a teacher ("double dipping"), and this at a time when the assets of the pension system fall far short of accumulated pension and heath insurance liabilities.

We believe that it is time to rethink the Ohio system from the ground up. A new or reworked retirement system should embody several key features:

- **Neutrality.** Each additional year of work should add additional pension wealth in a fairly uniform way. There should be no peaks or cliffs at any particular years of service. Longevity decisions by individuals and their employers should be based on other grounds that have a more direct connection to education needs and priorities.

- **Transparency.** The accrual of benefits should be simple and clear. There should be no opportunities for "gaming" the system.

- **Portability.** Young professionals change jobs. That is why the private sector has moved toward systems that do not penalize young mobile workers. The current DB systems redistribute income from young mobile teachers to high-seniority incumbents. Portability may help attract an energetic, talented portion of the labor pool, including those trained in math and science, who could add much to Ohio's teaching force.

- **Sustainability.** The pension system should be self-funding. The system should not be subject to the pattern of benefit enhancements when the stock market is up, followed by funding shortfalls and contribution hikes when the market turns sour. Benefits should be tied to contributions.

A defined-contribution or cash-balance system satisfies all these conditions far better than the traditional – and outdated – defined-benefit system. Ohio's legislature showed foresight in creating embryonic DC and CB-type programs. However, these innovations have been inadequate thus far, as STRS efforts have been devoted to patching a broken DB system. If, instead, Ohio chooses to build on its earlier efforts, it could lead the nation toward a teacher pension system that better serves both its fiscal and its educational needs.

# APPENDIX A

## A History of Ohio's Pension Formula Since 1965

Ohio's teacher pension system was not always so complicated, and the pattern of pension accrual was not always so idiosyncratic. The legislative process of benefit enhancement over time is an integral part of the story. This appendix provides a review and analysis of the history of the Ohio pension formula, illustrated in figures A1-A3 and the text's figure 7, with details provided in table A.

This analysis identifies four distinct eras in the history of Ohio's teacher pension system:

**Table A**

Features of Ohio Teacher Pension Formula, 1968 – present
**Bold** entries indicate changes in the formula

|  | replacement factor | maximum replacement rate | eligibility: (Service & Age) | adjustment factor: (Service or Age) |
|---|---|---|---|---|
| 1965 | 1.75% | 75% | (5 & 60); or (25 & 55); or (35, any age) | (age 55): 60% … (age 60): 85% … (35 or 65): 100% |
| 1968 | **1.9%** | **80%** | " | " |
| 1971 | **2.0%** | 80% | " | **(25** or 55): 60% … **(30** or 60): 85% … **(35** or 65): 100% |
| 1973 | 2.0% | **90%** | (5 & 60); or (25 & 55); or **(32**, any age) | **(25** or 56): 65% … **(30 yrs):** 90% … **(32** or 65): 100% |
| 1976 | 2.0% | 90% | (5 & 60); or (25 & 55); or **(30**, any age) | **(25** or 58): 75% … **(30** or 65): 100% |
| 1989 | **1-30: 2.1%** **31+: 2.5%** | **100%** | " | " |
| 1997 | 1-30: 2.1% 31: 2.5% **32: 2.6%,..** | 100% | " | " |
| 2000 | **1-30: 2.2%** 31: 2.5% 32: 2.6%,.. **35: add 6%** | 100% | " | " |

1. From 1965 to 1971, the formula was somewhat simpler than it is today. The replacement factor was flat (1.75 percent, raised to 1.9 percent in 1968). The adjustment factors depended on age alone (not service), rising from 60 to 85 percent between ages fifty-five and sixty – and then, more slowly, to 100 percent by age sixty-five. One could also reach 100 percent with thirty-five years of service.

Figure A1 shows the deferred income pattern under this formula. There is a very small bump at age fifty, as the twenty-five-year-old entrant reaches twenty-five years of service, making her eligible to receive a pension before age sixty. The bump is quite small because the adjustment factor for age fifty-five is so low – 60 percent. In fact, it is worth advancing the pension only to age fifty-seven, at an adjustment factor of 70 percent.[27]

The most notable feature in this era is the huge spike at age sixty, caused by the large jump in the adjustment factor from 80 percent at age fifty-nine to 100 percent at age sixty, upon reaching thirty-five years of service. This picture accords with the traditional rationale for defined-benefit plans, which is to induce some degree of longevity.

2. In 1971, the formula for the adjustment factor was changed to include service, starting at twenty-five years. One could now achieve higher adjustment factors at a younger age. For a twenty-five-year-old entrant, upon reaching age fifty-five the adjustment factor would be 85 percent (due to thirty years of service) instead of 60 percent. This advances the peak forward from age sixty to fifty-five, as shown in figure A2. In addition, in 1973 the service required to reach 100 percent adjustment factor was reduced from thirty-five years to thirty-two. This raised deferred income for age fifty-seven, and drove it negative at age fifty-eight, three years earlier than before.

Comparing figures A1 and A2, we see that the benefit enhancements during this period were clearly chosen to reduce longevity. The classical rationale for the defined-benefit system had been abandoned in Ohio by

### Figure A1.  Annual Deferred Income, 1965-71



**age at separation (entry at age = 25)**

(Assumptions:  2006-2007 Columbus Public Schools Salary Schedule, all cells assumed to grow at 2.5% inflation, COLA = 3%, interest rate = 5%, unisex 2003 Mortality Table from IRS Revenue Ruling 2002-62 Appendix B.)

1965-68      1968-71

**Figure A2. Annual Deferred Income, 1971-76**



age at separation (entry at age = 25)
(Assumptions: 2006-2007 Columbus Public Schools Salary Schedule, all cells assumed to grow at 2.5% inflation,
COLA = 3%, interest rate = 5%, unisex 2003 Mortality Table from IRS Revenue Ruling 2002-62 Appendix B.)

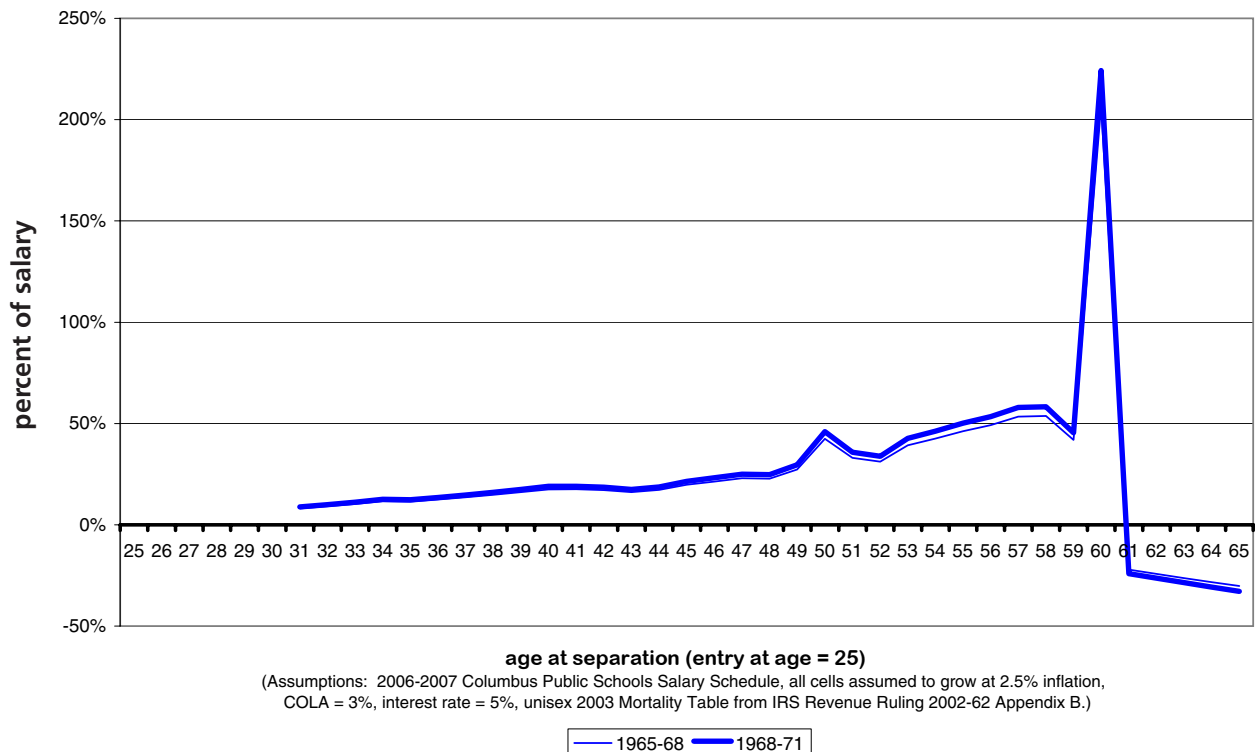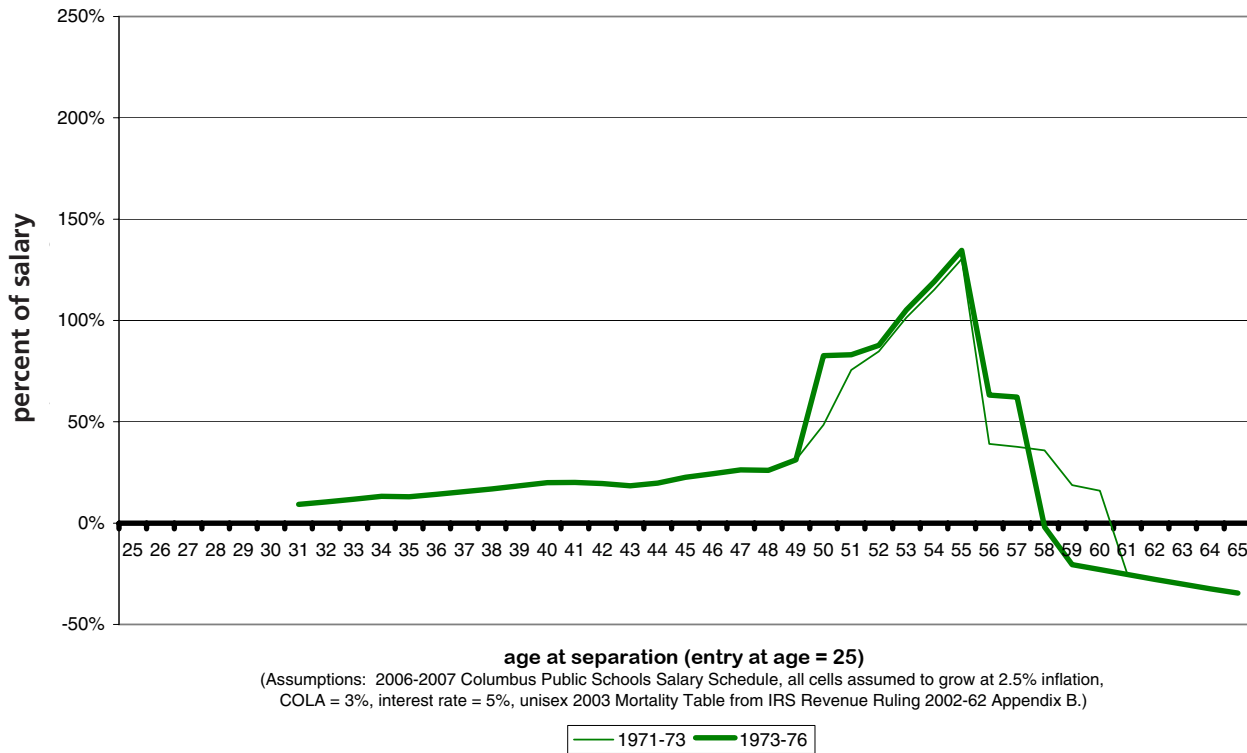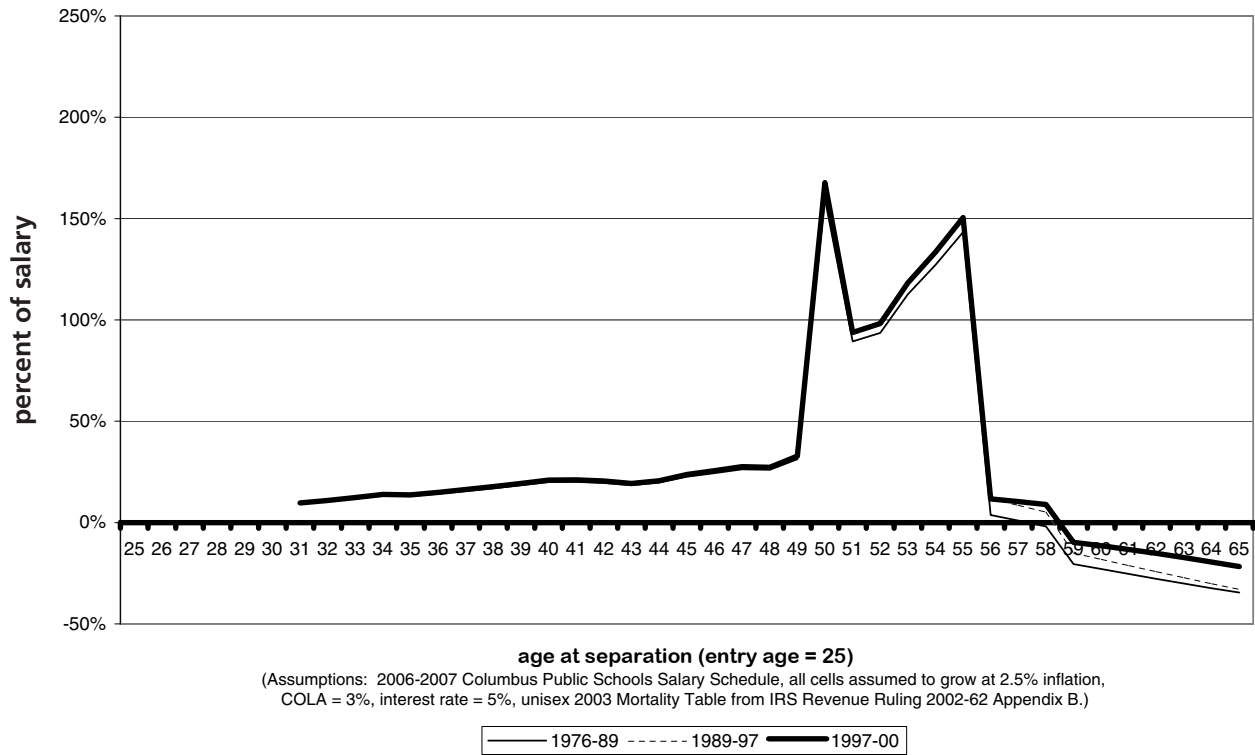1971-73    1973-76

1976, even though union leaders at the NEA continued to defend DB systems on that basis for at least another two decades.

3. In 1976, there was a further move away from longevity. The adjustment factors were revised again, raising the factor for twenty-five years of service to 75 percent from 65 percent. This meant that at age fifty, our twenty-five-year-old entrant's deferred pension (to age fifty-five) would be worth quite a bit more than it had been. The bump in deferred income at age fifty, which had been evident since 1965, would now grow to a full-fledged peak.

Comparing figures A1 and A3, we see that the single peak at age sixty had now been replaced by two peaks at ages fifty and fifty-five, with a plateau in between. There had been a dramatic shift of incentives toward earlier retirement. By 1989, when the next round of benefit hikes was enacted, the choice was made to include some incentives on the high end of service, but these were not very strong. The replacement factor was raised to a higher rate for service years beyond thirty (and raised a bit more in 1997), and the total replacement rate cap was raised to 100 percent. As figure A3 shows, these changes only slightly raised the very low (or negative) deferred income following the spike at fifty-five.

4. The next round of benefit enhancements occurred in 2000, with the stated purpose of inducing teachers to stay beyond "normal" retirement after thirty years. The rationale given was the changing demographics (i.e., the coming bulge of boomer retirees, coupled with longer life spans and growing retiree health costs).[28] The formula hike chosen toward this end was to add six percentage points to the total replacement rate upon reaching thirty-five years of service. This is the bump we saw in figure 2, which created the golden peak at age sixty that we saw in figure 6.

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**Figure A3.  Annual Deferred Income, 1976-2000**



(Assumptions:  2006-2007 Columbus Public Schools Salary Schedule, all cells assumed to grow at 2.5% inflation,
COLA = 3%, interest rate = 5%, unisex 2003 Mortality Table from IRS Revenue Ruling 2002-62 Appendix B.)

——— 1976-89   - - - - - - 1989-97   ━━━ 1997-00

Ohio has now come full circle. As the text's figure 7 shows, the peak that existed at age sixty up until 1971 has now been restored – almost, it seems, as an afterthought. In the meantime, a massive increase in deferred income has been added over ages fifty to fifty-five, followed by several years of deferred income that is much lower than it used to be. Overall, there clearly remains a large shift in the incentive structure toward earlier retirement.

This completes the history of Ohio's golden peaks. It seems unlikely that the features of this evolution were well understood by more than a few interested parties over the decades in which it took place. This, we believe, is a consequence of the low degree of transparency inherent in defined-benefit formulas. Low transparency begets even lower transparency, and over time the system becomes ever more complex and further removed from sound policy. Ohio's defined-benefit program appears to be a prime example of this process.

# APPENDIX B

## A Comparison of Ohio's Pension System with Other States

The troubling problems found in Ohio's teacher retirement system are not unique. The formulas in other states also exhibit accrual patterns that are far from retirement-neutral. There are, however, significant variations. Table B provides information on differences in formulas among five states, and figures B1-B4 illustrate the patterns of pension accrual.[29]

As figure B1 illustrates, the incentives in Arkansas' pension formula seem to be significantly more tilted toward early retirement than those in Ohio's. While Ohio has large accruals from ages fifty to fifty-five, the system in Arkansas concentrates the accrual far more heavily at age fifty (for a twenty-five-year-old entrant). Deferred in-
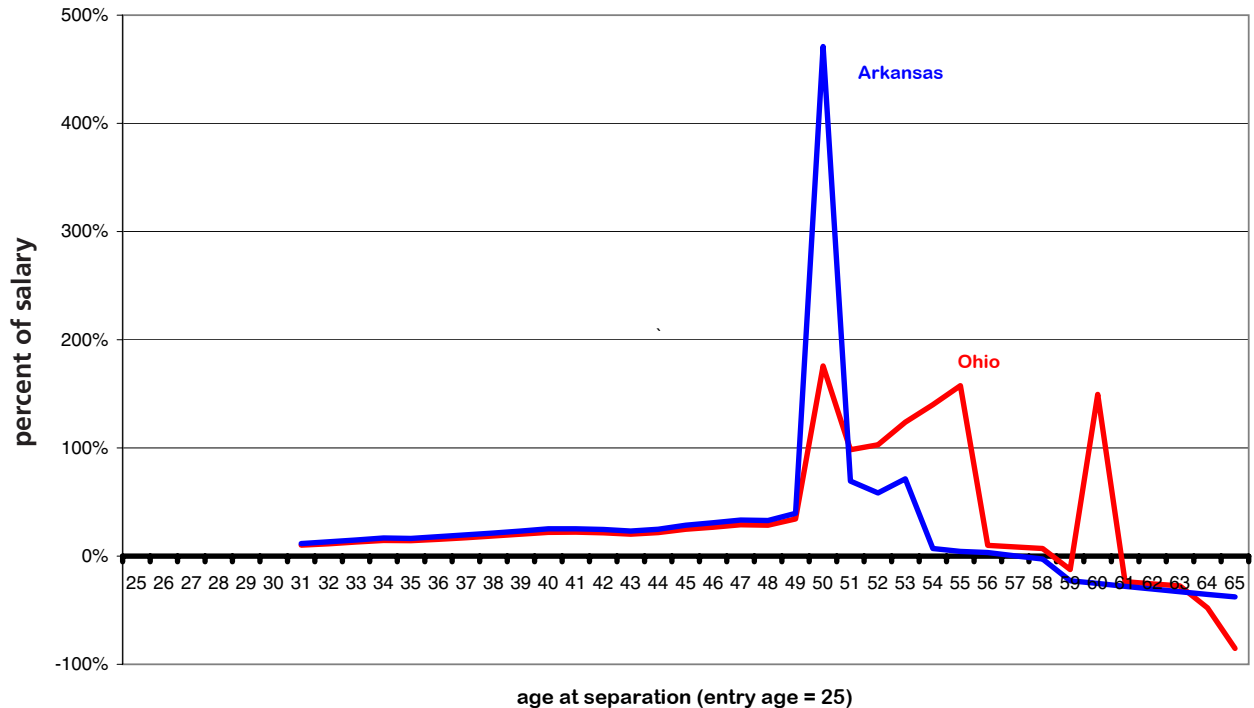
**Table B**

Key Features of State Defined-Benefit Pension Plans

| | Ohio | Arkansas | California | Massachusetts | Missouri |
|---|---|---|---|---|---|
| In Social Security | No | Yes | No | Yes | No |
| Vesting (years) | 5 | 5 | 5 | 10 | 5 |
| Regular Retirement | Age=60; or Age=55 if Service = 25; or Service = 30 | Age = 60; or Service = 25 | Age = 55; or Age = 50 if Service = 30 | Age = 55; or Service = 20 | Age = 60; or Service = 30; or Age + Service = 80 |
| Contribution Rates | District 14% Teacher 10% | Employer 14% Teacher 6% | District 8.25% Teacher 6%* | State, varies Teacher 11% | District 11.5% Teacher 11.5% |
| Replacement factor (percent per year of service) | Yrs 1-30: 2.2% Yr 31: 2.5% Yr 32: 2.6%, … For S ≥ 35, add 6% to total For S < 30 and age < 65, adjustment % applies | 2.15% + $900 For S < 28, benefit reduced 5% x (28-S) | Linear segments: 1.1% at age 50 1.4% at age 55 2.0% at age 60 2.4% at age 63 For S ≥ 30, add 0.2% to factor, to max of 2.4% | Linear: 0.1% at age 41 to 2.5% at age 65 For S ≥ 30, add 2% x (S-24) Max replacement = 80% | 2.5% |
| COLA formula | 3%, simple | 3%, simple | 2%, simple, plus floor of 80% initial purchasing power | CPI to max of 3%, simple, on first $12,000 | CPI, compound, up to 1.80 maximum factor |

Sources:  State pension fund web sites.
* An additional 2% contributes to a supplemental plan.

## Figure B1.  Annual Deferred Income:  Ohio vs. Arkansas



**age at separation (entry age = 25)**
(Assumptions:  2006-2007 Columbus Public Schools Salary Schedule, all cells assumed to grow at 2.5% inflation,
COLA = 3%, interest rate = 5%, unisex 2003 Mortality Table from IRS Revenue Ruling 2002-62 Appendix B.)

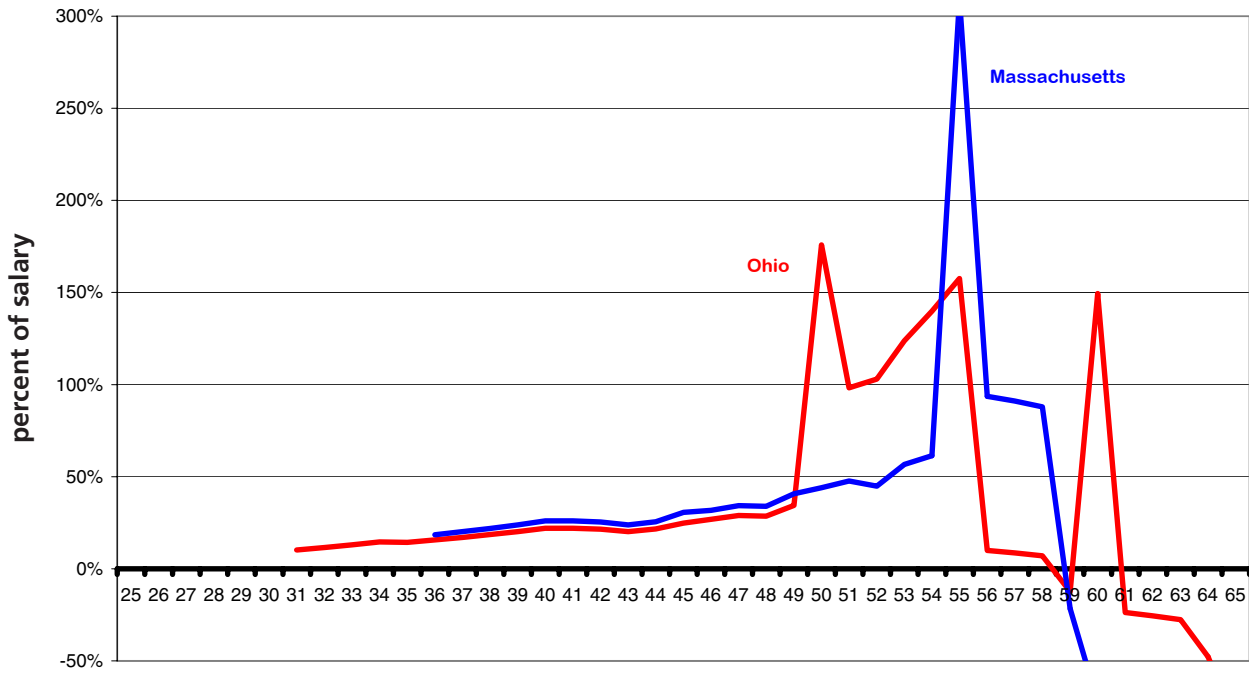## Figure B2.  Annual Deferred Income:  Ohio vs. Missouri
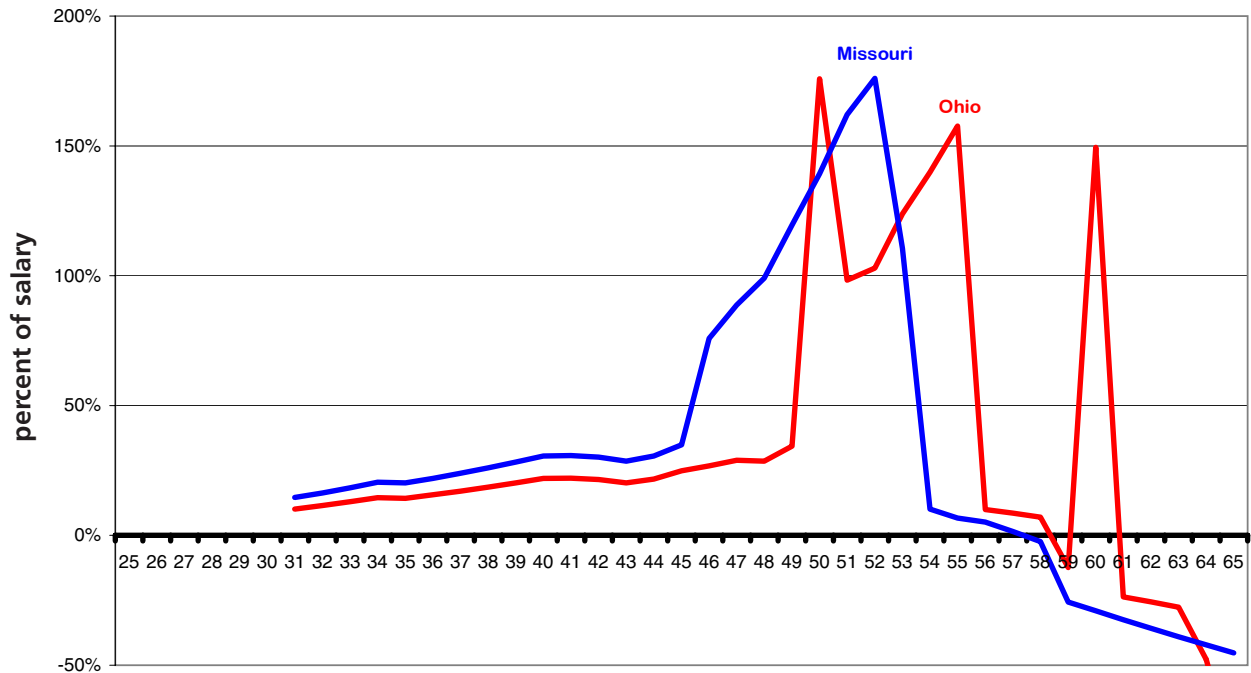


**age at separation (entry age = 25)**
(Assumptions:  2006-2007 Columbus Public Schools Salary Schedule, all cells assumed to grow at 2.5% inflation,
COLA = 3%, interest rate = 5%, unisex 2003 Mortality Table from IRS Revenue Ruling 2002-62 Appendix B.)

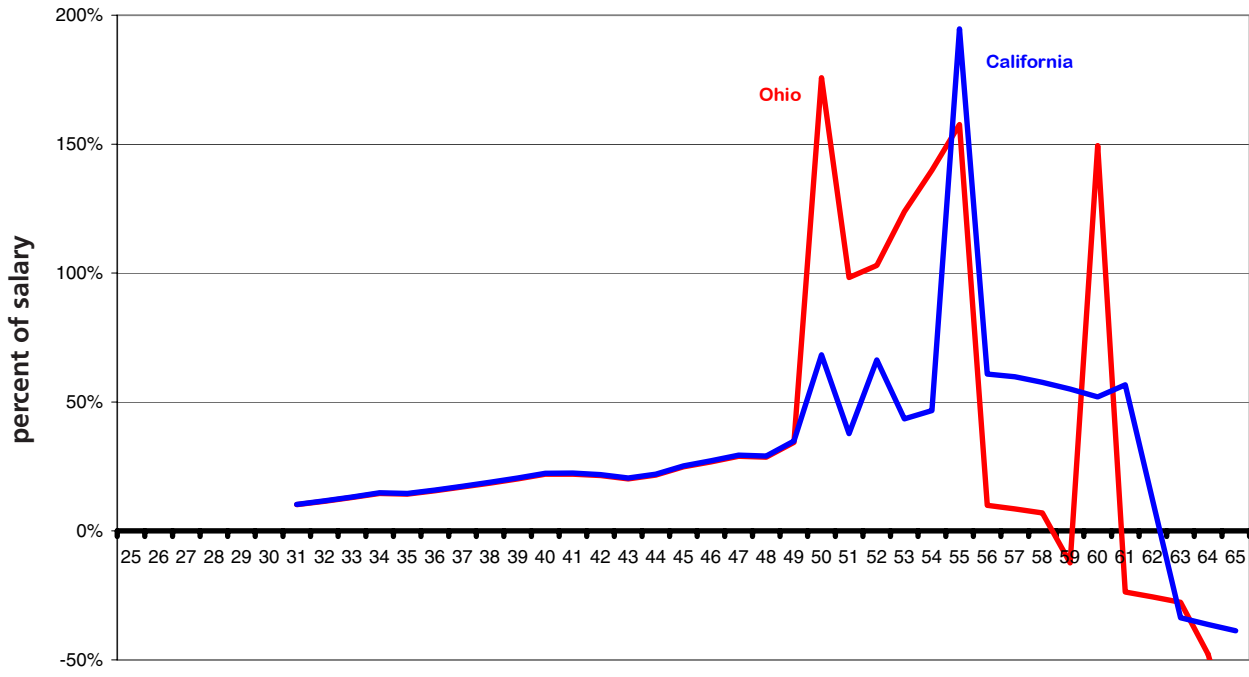**Figure B3.  Annual Deferred Income:  Ohio vs. Massachusetts**



age at separation (entry age = 25)
(Assumptions:  2006-2007 Columbus Public Schools Salary Schedule, all cells assumed to grow at 2.5% inflation,
COLA = 3%, interest rate = 5%, unisex 2003 Mortality Table from IRS Revenue Ruling 2002-62 Appendix B.)

**Figure B4.  Annual Deferred Income:  Ohio vs. California**



age at separation (entry age = 25)
(Assumptions:  2006-2007 Columbus Public Schools Salary Schedule, all cells assumed to grow at 2.5% inflation,
COLA = 3%, interest rate = 5%, unisex 2003 Mortality Table from IRS Revenue Ruling 2002-62 Appendix B.)

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come drops off to near zero at age fifty-four in Arkansas, about two years earlier than in Ohio. Ohio is also somewhat unusual in having added the third peak at age sixty, though, as discussed in the text, there are reasons to doubt its efficacy.

Missouri's system is comparable to Ohio's in that it spreads the bulk of deferred income over several years, rather than concentrating it in one large peak, as shown in figure B2. In Missouri, the years of rapid accumulation are a bit earlier, beginning in the late forties and ending in the early fifties.

By contrast, Massachusetts's system seems a bit less tilted toward early retirement than Ohio's, as illustrated in figure B3. Accruals during one's early fifties are lower in Massachusetts than in Ohio. Also, following their respective peaks at age fifty-five, the drop in accruals in Massachusetts is less precipitous than that in Ohio, remaining at around 90 percent of salary for another three years.

California also seems less tilted toward early retirement than Ohio. Figure B4 shows that the comparison is similar in some ways to that shown for Massachusetts in figure B3. One difference is that following the peak at age fifty-five, California's accruals do not go negative until age sixty-three.

# APPENDIX C

## Pension Accrual Patterns for Entry at Ages 22, 25, and 30

The analysis in the text was all predicated on entry at age twenty-five. This entry age is representative: we have estimated from a national sample of new retirees that their median entry age was twenty-five to twenty-six.[30] However, one may be wonder how sensitive the accrual patterns are to entry age. For this purpose, we have also calculated the accrual patterns for entry ages twenty-two and thirty. This span for entry age covers two-thirds of the sample of new retirees.

Figure C1 shows the pension-wealth trajectory in inflation-adjusted dollars for entrants at ages twenty-two, twenty-five, and thirty. Naturally, the earlier one enters, the more pension wealth one accumulates by any given age. The graph also allows us to compare the shapes of these trajectories. In no case is pension-wealth growth smooth and steady – once the years for early pension eligibility arrive, pension wealth grows by fits and starts. The most irregular growth is for the twenty-two-year-old entrant, followed by the twenty-five-year-old, and the least irregular growth is for the thirty-year-old entrant.

Figure C2 shows the pattern of deferred income over the careers of the three entrant groups. The red curve is the three-peaked pattern of the twenty-five-year-old entrant that has appeared repeatedly in this paper. The blue

**Figure C1.  Pension Wealth, Entry Ages 22, 25, 30**



age at separation (entry age = 25)
(Assumptions:  2006-2007 Columbus Public Schools Salary Schedule, all cells assumed to grow at 2.5% inflation,
COLA = 3%, interest rate = 5%, unisex 2003 Mortality Table from IRS Revenue Ruling 2002-62 Appendix B.)

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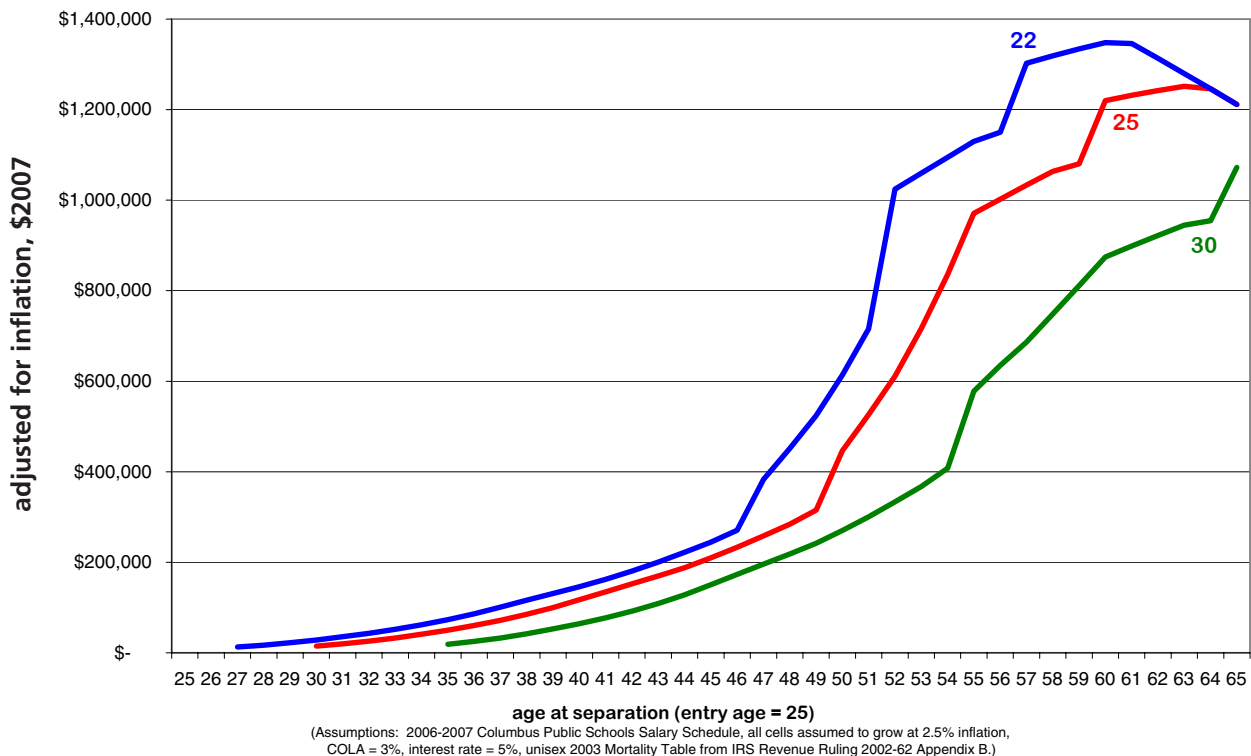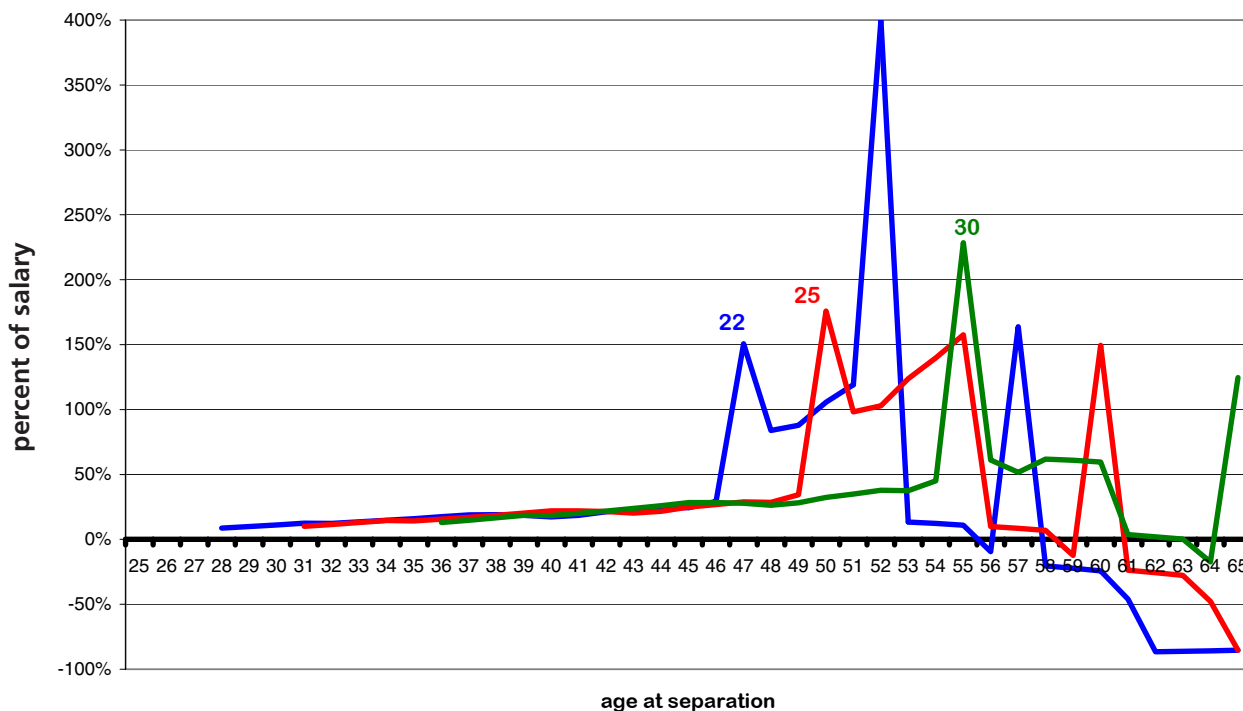
**Figure C2. Deferred Income, as Percentage of Salary: Entry Ages 22, 25, 30**



age at separation
(Assumptions: 2006-2007 Columbus Public Schools Salary Schedule, all cells assumed to grow at 2.5% inflation,
COLA = 3%, interest rate = 5%, unisex 2003 Mortality Table from IRS Revenue Ruling 2002-62 Appendix B.)

curve represents the pattern for an individual entering at twenty-two – an entry age that is actually a bit more common than age twenty-five. It, too, has three peaks, but they are moved three years to the left, appearing at ages forty-seven, fifty-two, and fifty-seven. The peak at age fifty-two is particularly pronounced: a twenty-two-year-old entrant will, in her thirtieth year of service, raise her pension wealth by the equivalent of *four times her salary*. Finally, the green curve represents the pattern for the thirty-year-old entrant. For her, the first two peaks collapse into one at age fifty-five, and the final peak occurs ten years later.

This analysis indicates that the text's choice of accrual curves for twenty-five-year-old entrants is, in fact, indicative of the patterns for entry at the most common entry ages. The accrual patterns for older entrants, such as those age thirty, are not quite as striking, but the patterns for younger entrants, such as those age twenty-two, are even more idiosyncratic and more strongly tilted toward early retirement.

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# APPENDIX D

## Money-Purchase Component of Ohio's Defined-Benefit Plan

When members of Ohio's DB plan retire, their benefit is calculated as the greater of the formula-based pension that has been analyzed in this paper and a payment from the money-purchase plan. The money-purchase plan payment is calculated from a notional account based on the employee's contributions, matched equally by the employer's. A plan-defined interest rate is applied, on a compound basis, to the notional contributions to arrive at a lump sum as of the date of retirement. This lump sum is converted by an actuarially determined annuity factor to determine the monthly payment. If this exceeds the formula-based payment, that is what the retiree receives. STRS claims that "this calculation is often more beneficial to an STRS Ohio member who has not taught for a number of years" (i.e., an individual who has separated prior to retirement).[31]

In general outline, the money-purchase plan has some features in common with a CB plan: a notional balance and a plan-defined return. One big difference, however, is that if an employee is vested but separates before she is eligible to receive a pension, the notional account must be left in the system – the plan lacks portability. If an individual leaves with less than twenty-five years of service, the account would have to be left in the system until age sixty, which could be a very long time.

Another big difference, of course, is that a pure CB plan would not have a DB alternative – everyone would be in the CB plan. By contrast, Ohio's money-purchase plan is structured in such a way that almost no one benefits from it. For one thing, the employer's contribution is only 10 percent (matching the employee's), as opposed to the 14 percent contributed to the formula-based benefit. Moreover, the interest rate applied to the notional account is only 3 percent. This rate (which also applies to cash withdrawals from the system) was cut from 5 percent last year to help defray the DB system's unfunded liability.

There are two ways the employee benefit is depressed by applying a below-market interest rate to the money-purchase plan. First, and most obvious, the notional account does not grow as rapidly during one's service, resulting in a smaller balance upon separation. Second, the employee is hurt by the depressed interest rate going forward from separation, since she must leave the account in the system until she is eligible to receive the pension, typically at age sixty. This creates a serious negative impact on pension wealth. The annuity she will receive at age sixty has a present value as of the date of separation, just like all the wealth calculations we have done for deferred pensions, but it is calculated with the market discount rate. Since the discount rate going backwards exceeds the rate at which the account grows going forward, one's pension wealth at separation falls below the value of the balance at separation.[32] If the notional account were portable, this would not be a problem.

For instance, consider an individual entering service at age twenty-five and separating at age forty. Under the wage scales we have been using, her notional balance would have accumulated to $224,000, about $30,000 less than with a 5 percent rate. However, she cannot take that lump sum, but must let it grow at 3 percent and convert it to a pension at age sixty. Her pension wealth at age forty – the discounted value of that annuity – is only $152,000. The decision of STRS last year to reduce the interest rate from 5 to 3 percent costs this individual $100,000, *a 40 percent reduction in her pension wealth*. The state's use of a below-market interest rate here is, in effect, a heavy tax levied on employees with low service years – to help fund the pensions of those with high service years.

**Figure D1. Pension Wealth Under Ohio's "Money-Purchase" Plan**



(Assumptions: 2006-2007 Columbus Public Schools Salary Schedule, all cells assumed to grow at 2.5% inflation,
COLA = 3%, interest rate = 5%, unisex 2003 Mortality Table from IRS Revenue Ruling 2002-62 Appendix B.)
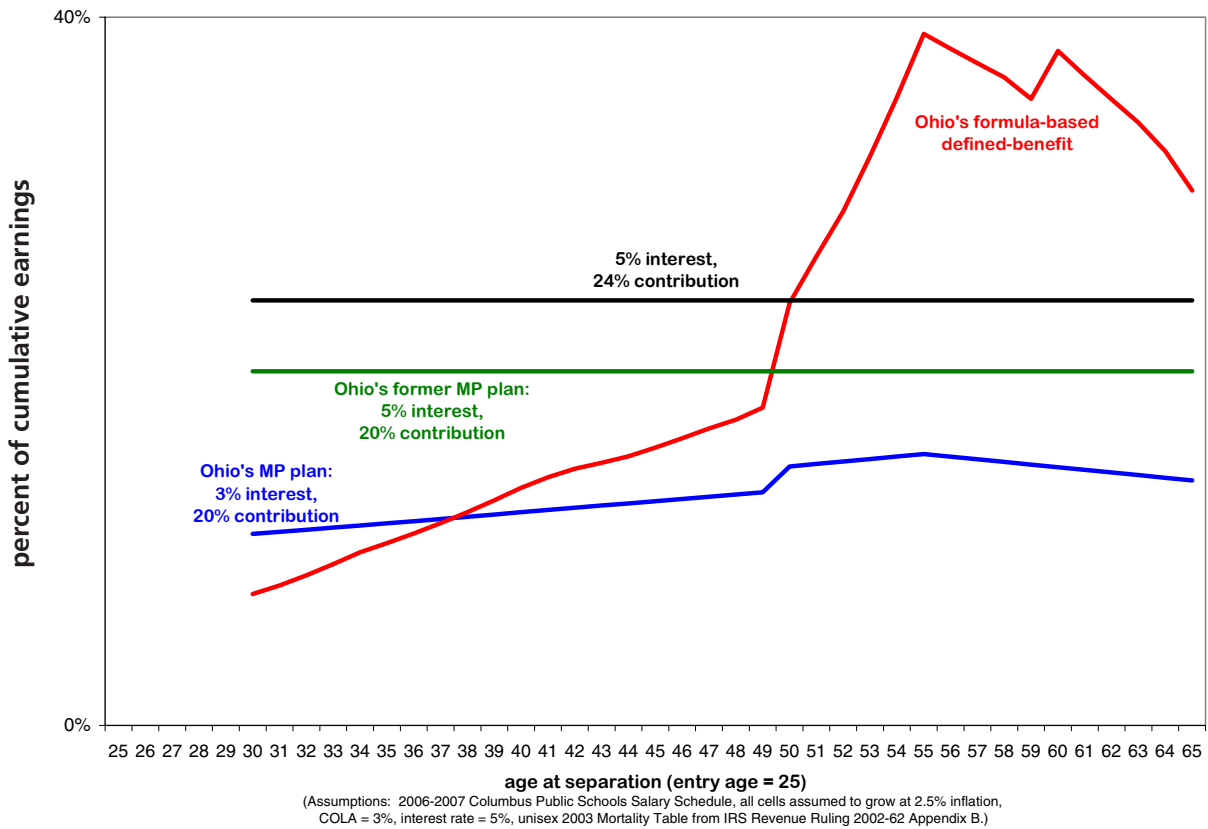
Figure D1 illustrates the pension wealth generated by the money-purchase plan. Pension wealth from the formula-based benefit, as a percentage of cumulative earnings, is reproduced from figure 4, as the red curve. Prior to the rate reduction last year, the wealth from Ohio's money-purchase plan amounted to a flat 20 percent of cumulative earnings, illustrated by the green line. It was less than the 24 percent joint contributions to the defined-benefit plan (depicted by the black line), but it was still beneficial to individuals of the type depicted, for separation before age fifty. With the below-market rate currently in effect, the situation is very different. Even someone leaving as young as forty is better off receiving the formula-based annuity at age sixty, despite the fact that the starting pension will be based on salaries from twenty years earlier. Only those departing by age thirty-eight might do better under Ohio's money-purchase plan.

In fact, not even these individuals would benefit from the current money-purchase plan. They would benefit more under the pension system's withdrawal option, which allows an individual to cash out her contributions, along with an employer match of one-half. That is, the system does offer portability, but only for contributions of 15 percent, as opposed to 20 percent under the money-purchase plan (and 24 percent for the formula-based benefit). Yet this withdrawal trumps the money-purchase option, because the cash-out avoids the "whipsaw effect" of projecting forward at 3 percent and then discounting back at 5 percent. As a result, Ohio's money-purchase plan is now of little or no value to anyone.

Despite its current configuration, Ohio's money-purchase plan, which has been in statute for decades, could very well provide the vehicle to start transitioning to a true cash-balance plan. This would require the establishment of portability, the restoration of market interest rates, and, ultimately, the phaseout of the outdated pension formula.

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# ENDNOTES

[1] A complete list of the STRS trustees can be found at http://www.strsoh.org/about/1.html.

[2] This figure does not count the payroll costs of other benefits (e.g. health insurance) or payroll taxes such as Medicare, workers' compensation, and unemployment insurance, not to mention state and federal income taxes.

[3] A defined-benefit pension guarantees a teacher a fixed monthly payment (annuity) upon retirement. A defined-contribution pension system guarantees the employee a fixed annual contribution into an employee retirement saving account which is owned by the employee. It does not guarantee the employee any particular level of income at retirement age.

[4] Assumptions for Figures B-D: 2006-2007 Columbus Public Schools Salary Schedule, all cells assumed to grow at 2.5% inflation, interest rate = 5%, unisex 2003 Mortality Table from IRS Revenue Ruling 2002-62 Appendix B. The figures also include Ohio's 3% COLA after retirement. Further details about the calculations are provided in the full report.

[5] The calculation of the change in pension wealth due to an additional year of work nets out the interest on the previous year's pension wealth.

[6] This total includes some higher education retirees as well. Districts are not required to rehire retiring teachers, and, if they are rehired, their health insurance is often provided through the STRS retiree health plan rather than the district. Pay may be reduced to a lower level on the salary schedule, although this is up to the reemploying district.

[7] "Retirement is short for 13,000 teachers," *Akron Beacon Journal*, December 29, 2006.

[8] For example, DC participants are not eligible for subsidized retiree health insurance. As compared to the DB plan, combined-plan members have a disadvantageous replacement factor and do not receive cost-of-living adjustments on their annuity after retirement. For the money-purchase option of the DB plan, STRS recently cut the interest rate well below market. These disadvantages are explained in more detail in the full report.

[9] National Education Association 1995, p. 3.

[10] See Friedburg and Webb 2005; Asch, Haider, and Zissimopoulos 2005; Ippolito 1997; and Stock and Wise 1990. Unfortunately, little of this literature pertains to teacher pensions. While there have been many studies of the effect of current compensation on teacher turnover (e.g., Murnane and Olsen 1990; Stinebrickner 2001; Hanushek, Kain, and Rivkin 2004; and Podgursky, Monroe, and Watson 2004, the econometric literature on teacher pensions is very slender. The only published econometric study to date is Furgeson et. al. 2006, which finds that Pennsylvania teachers' retirement decisions were highly responsive to incentives for early retirement. See also Brown 2006.

[11] Faculty can choose to opt out of STRS in favor of TIAA-CREF or another system. Of 175,000 active STRS members, roughly 70 percent are K-12 teachers and professional staff.

[12] Mitchell et.al. 2001.

[13] One percent of the 14 percent employer contribution is used to finance retiree health insurance. This rate leaves the retiree health insurance fund seriously underfunded. This point is discussed at greater length below.

[14] See note 2 above.

[15] As in most states, the size of the deferred pension is based on the salary at separation, with no inflation adjustment until after the pension draw begins.

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[16] Formally, consider an individual's pension wealth, P, at some potential age of separation, $a_s$. The present value of those payments is:

$$P(a_s) = \sum_{a \geq a_s}(1+r)^{(a_s-a)} f(a \mid a_s)B(a \mid a_s),$$

where $B(a \mid a_s)$ is the defined benefit one will receive at age a, given that one has separated at age $a_s$, and $f(a \mid a_s)$ is the conditional probability of survival to that age. For more details see Costrell and Podgursky 2007.

[17] For analysis of individuals entering service at different ages, see appendix C.

[18] The table, for 2003, is drawn from IRS Revenue Ruling 2002-62, appendix B.

[19] Since the dollar amounts in Figure 3 are inflation-adjusted, the discount rate is effectively 2.5 percent, rather than 5 percent.

[20] To be more precise, it is the contribution that would be required at a discount rate of 5 percent. Ohio's actuaries use a rate of 8 percent to discount liabilities, which is typical of most public pensions, but which is viewed skeptically by finance economists, who favor a lower rate.

[21] This calculation is well established in the pension economics literature. It is worth noting that this concept is different from the actuarial calculation of pension accrual. The actuarial concept is based on the assumption that the individual will work to a given "normal" retirement age, independent of the actual age of separation. It is calculated to guide the employer in providing prudent reserves, and it results in smooth curves. The economist's concept, depicted here, is based on the individual's actual year of separation; it is calculated to depict the incentives for individual decisions about separation. As has been previously established in the economics literature, these curves have sharp kinks, leading to strong incentives to stay or leave at various ages.

[22] See Costrell and Podgursky 2007 for a more formal decomposition.

[23] National Education Association 1995, p. 3.

[24] See note 6 above.

[25] Employee Benefit Research Institute 2006

[26] CB plans are legally considered (for tax and regulatory purposes) to be another variety of defined benefit, since the plan defines the rate of return. The employer is required to establish a trust to fund the plan's obligations, but there is not a specific fund in the individual employee's name. Rather, there is an individual claim to a bookkeeping entry, which may or may not be fully backed with existing funds at any given moment. Once the individual is vested, the notional account is payable upon separation or retirement, either as a lump sum, or convertible to an annuity, or some combination of the two. Restrictions on these choices can vary from plan to plan.

[27] It is assumed throughout this paper that the retiree chooses the initial pension draw to maximize present value. Thus, in figure A1, the individual at age fifty defers the pension to age fifty-seven instead of fifty-five.

[28] See Ohio Retirement Study Council 2000.

[29] For further explanation of the deferred income patterns in Arkansas, California, Massachusetts, and Missouri, see Costrell and Podgursky 2007.

[30] We tabulated the ages of first year teachers from the 2003-04 Schools and Staffing Surveys.

[31] STRS, "Service Retirement and Plans of Payment, 2006-2007," p. 6.

[32] This phenomenon is known in the pension literature as the "whipsaw" effect. See General Accounting Office 2000.

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