

**Best for North Carolina,
Best for State Employees:**
Analysis of Options for North Carolina's
State Employee Pension Plan

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To: Retirement Systems Division
Department of State Treasurer
State of North Carolina

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EXECUTIVE SUMMARY

This report presents the analysis of three plans for North Carolina's pension system: 1) maintaining the state's current defined benefit (DB) system, 2) switching to a defined contribution (DC) system for new employees and current employees who wish to change, and 3) constructing a hybrid plan incorporating features of the DB and DC plans.

Recently, several states restructured their pension plans by either adding DC plans to their established DB plans or by switching plans entirely. States argue that such changes will stabilize and possibly lower state costs, and may yield greater benefits for retirees. While North Carolina's DB plan is one of the largest and most stable public pension systems in the country and thus seemingly faces no immediate pressure for reform, the state and its employees may benefit from adjustments to the current system. This report analyzes whether the state, its employees, and its citizens would benefit by converting the current DB pension system to either a DC or hybrid DB/DC plan.

Criteria

We identified two quantitative and three qualitative criteria against which we evaluated the outcomes of our options:

Quantitative Criteria

1. Maintain or increase retirement benefits
2. Maintain or decrease state contributions to a pension system

Qualitative Criteria

3. Minimize risk to employees
4. Increase certainty of state cost
5. Improve recruitment and retention of state employees

While this analysis does consider broad political considerations, it does not discuss specific political strategies for plan implementation, or the legal and administrative considerations of starting a new plan. Additionally, we do not consider the local pension systems that the state administers, as they are numerous and varied in design.

Methodology

To compare the three plans, we designed models examining the experiences of various hypothetical individuals within each plan. To evaluate the current DB plan, we used the same calculations used in the current DB system to determine replacement rates and state costs. We based our hypothetical DC plan on the plan currently used by the state of Michigan, as that system is similar in enrollment and total assets to North Carolina's pension system. Finally, our hybrid model is a "safety-net" system, made up of two components: a DB component, which provides one-third the benefit received under the current DB plan, and a DC add-on account. We then modeled the experiences of nine hypothetical employees who differ in job starting age, length of job tenure, and number of career interruptions. We

calculated and compared the state costs and employee benefits for these employees if they were to enroll in each plan.

Analysis

The results for the quantitative criteria are ambiguous and depend on the circumstances of the individual employee. Much of our quantitative results are dependent upon the assumptions used and how representative the individual hypothetical employee types are of the actual North Carolina workforce.

- For workers with medium- and long-term careers with the state, the DB system yields higher replacement rates. For short-term workers who start at a young age, the DC model yields higher replacement rates.
- The costs of the DB system depend principally on the market performance of state pension funds. With the historically demonstrated performance, the DB system always generates the lowest state cost. With lower market performance, the cost rises significantly and the DC system becomes increasingly attractive for the state. Under the DC system, however, lower state costs are accompanied by substantially lower replacement ratios for employees with medium- and long-term careers with the state.

As a whole the DB plan best satisfies the three qualitative criteria. The DB plan clearly minimizes the risk to employees of poor investment return, but fails to increase the certainty of state costs and minimize the risk of not meeting strict vesting requirements. A DC plan shifts the risk of poor investment performance from the state to individuals. As a result, the DC plan fails to reduce risk to employees of poor investment returns, but increases the certainty of state costs. The hybrid model would provide only an imperfect compromise between the DB and DC models for these two criteria.

Due to demonstrated employee preferences for guaranteed benefits, the DB system has intrinsic advantages concerning employee recruitment and retention. The DB system could better compete with the portability advantage of a DC plan, and therefore further improve recruitment and retention. The effect of a hybrid or DC model on recruitment and retention remains uncertain due to the absence of survey data on North Carolina state employee preferences. Experiences from other states, however, show that employees prefer a DB system.

Recommendation

We recommend that the state maintain its current defined benefit structure for the state employees' retirement system until more data is available. Because of sensitivity to model assumptions, workforce representation, and employee preferences, a complete analysis is not feasible. We recommend the state take two additional actions that, by allowing a more complete analysis, may improve the system:

1. Compile five years of age, service time, and salary data from exiting employees to better understand trends in employee tenure. The Retirement Systems Division could use that data to reevaluate the pension type for the state employees' retirement system.
2. Conduct a scientifically controlled survey of current and prospective state employees to determine their preferences for different pension plan types.

Chapter I

BACKGROUND

Policy Question

The Retirement Systems Division of the Office of the State Treasurer of North Carolina asked us to answer the following question:

From which of the following options does the State of North Carolina benefit more: retaining its current Defined Benefit pension plan, or converting to a Defined Contribution plan or DB/DC hybrid plan?

In completing our analysis, we considered the state government, its employees, and the citizens of North Carolina as stakeholders in the pension plan for state employees.

Definition of Topic and Scope

Over the past 10 years, five states have modified or replaced their pension systems to incorporate defined contribution (DC) systems.¹ Thirty-eight state pension systems remain defined benefit (DB) plans. On the other hand, 48 states offer some form of defined contribution plan, often as a supplement to the main system. Pension reforms aim to either increase the benefits received by retirees, decrease the liabilities faced by states, or both.

This report analyzes North Carolina's pension system, which is the 11th largest and most stable public pension system in the country.² We analyze three options for North Carolina's pension system:

1. Maintain the current DB system
2. Switch to a DC system
3. Construct a hybrid plan incorporating features of both DB and DC plans

We analyze these options using a set of criteria to determine the system most beneficial to North Carolina's state government, its employees, and its citizens. Such an assessment requires a set of explicit definitions of actors and scope.

Any pension plan has a direct impact on both employees and employer. In the case of public systems, however, the employer is an agent of the public at large, which has a vested interest in the pension system. As such, we do not analyze the pension system from the limited perspective of the state's budget, nor do we solely assess the options from the perspective of the employees. Rather, our criteria will help us evaluate the options based on the interests of the state as an agent of the public as well as the employees, noting that the employees themselves are also members of the public.

¹ The five states are Florida, Michigan, North Dakota, Ohio, and Washington.

² Bonafede, Julia D., et al, *2004 Wilshire Report on State Retirement Systems: Funding Levels and Asset Allocation*, Wilshire Associates Incorporated, March 2004.

We defined three considerations as beyond the scope of our analysis:

1. Consideration of local government pension systems

Because local government pension systems vary greatly within the state, we exclude these systems from our analysis. Many local governments offer supplemental DC plans, while others do not. Further differentiating these systems is the funding of such supplemental plans: some local government fund the contributions, while others are employee-funded. Given such differences among the local systems administered by the state, we limit our analysis to pensions for state employees.

2. Legal and administrative considerations of plan implementation

Any switch from the current DB plan will incur significant amounts of planning including, but not limited to, legal, political, and administrative preparation. Such considerations are beyond the scope of the analysis in this report. Transition costs directly related to the pension system's liabilities, however, are included in this analysis.

3. Definition of specific proponents and opponents of different options

We do not delineate between the interests of advocacy groups and political organizations in terms of preferences for one plan over another. This report does not consider, for example, the interests of groups such as the banking community in Charlotte. We only assess the political feasibility in a broad sense by evaluating how the different options will affect the main stakeholders: the state, the government employees, and the general public.

Overview of the Three Types of Plans

Defined Benefit Pension (DB) Plans

A defined benefit (DB) pension plan guarantees eligible retirees a benefit paid from employer and employee contributions and the returns these contributions earn. Annual pension benefits are calculated from a formula: the annual benefit is the product of years of service, final average compensation, and a multiplier. In North Carolina, the multiplier is 1.82%, and final average compensation is the average of an employee's salary from the four highest-paid consecutive years.

Defined Contribution (DC) Plans

A defined contribution (DC) plan guarantees a fixed annual contribution rather than a final benefit calculated from a formula. For employers, this means that their annual contributions to the plan will be fixed and predictable, unlike under DB plans. DC plans offer employees both account ownership and portability, but also require employees to assume the risk of investing contributions.

Hybrid DB/DC Plans

Hybrid DB/DC plans offer a middle ground between DB and DC plans, sharing the risk of investment across both employer and employee. Hybrid plans generally take two forms: cash balance plans, which offer employees a portable, guaranteed return on low-risk investments, and “safety-net” plans, which create both DB and DC accounts for employees. Our analysis focuses on the latter.

Further details on public pension plans can be found in Appendix 1.

Present Condition of Pension Systems Nationwide

Private Sector

Pension trends in the private sector may provide some insight for policies in the public sector. The total number of private pension plans more than doubled in the last 30 years. DC plans drive this expansion, as changes to the tax code such as the creation of 401(k) accounts allow employers to lower costs by making pre-tax contributions and let employees defer tax burdens, thereby permitting more firms to offer pension plans. Due to employer preference for DC plans, DB plans now comprise only 8% of all private plans, compared to 33% thirty years ago.³

Employee participation in private plans, meanwhile, has fallen. In firms with over 100 employees, pension participation has dropped from over 90% in the mid-1980s to less than 70% in 2001. The fall has been particularly sharp with DB plans, with participation dropping from 80% of employees in firms offering DB plans in 1985 to 36% in 2000.⁴

Public Sector

Public pension systems, meanwhile, have primarily remained as DB plans. In the last 15 years, twenty states modified their pension systems to include either a DC or hybrid plan. Only West Virginia and Michigan made the new plans mandatory for any group of employees.

While DC accounts are used in the public sector, such plans are usually offered as an optional supplement to the DB pension. In 1998, only 14% of public employees participated in a DC plan, while over 90% participated in a DB plan.⁵

³ Employee Benefit Research Institute, *Private Pension Plans, Participation, and Assets 2003 Update*, compiled from U.S. Department of Labor data. Accessed at <http://www.ebri.org/facts/0103fact.htm>.

⁴ U.S. Department of Labor, Bureau of Labor Statistics, *Employee Participation in Defined Benefit and Defined Contribution Plans, 1985-2000*.

⁵ Rajnes, David. *State and Local Retirement Plans: Innovation and Renovation*, Issue Brief Number 235, Employee Benefit Research Institute, July 2001.

Total participation exceeds 100% as some states offer optional DC plans in addition to mandatory DB plans.

States have three justifications for modifying pension systems. First and most common, DC plans could save states money and offer certainty of costs. States contribute less to these plans than to traditional DB accounts. Additionally, DC plans offer states more certainty in terms of what amounts they will be contributing to the system every year. Second, some believe DC accounts will offer higher benefits, on average, to employees than DB accounts, based on data from the private sector.⁶ Third, some believe DC plans offer employees greater flexibility and personal freedom in financial planning.⁷

Three states, Nebraska, Michigan, and Florida have statewide DC pension plans. (A detailed description of these plans, as well as an overview of North Carolina's DB system, can be found in Appendix 2.) Nebraska used a DC structure for its state employee pension system beginning in 1964. Individual accounts under this DC system averaged a 6% annual return, compared to the 11% annual return for employees such as teachers who held DB accounts under a separate pension system.⁸ In 2003, Nebraska reformed its system, and all new employees are now enrolled in a "cash-balance" pension system, one type of DB/DC hybrid.⁹

Michigan changed its DB pension system to a DC plan in 1997. While all new hires are automatically enrolled into the DC plan, employees enrolled in the DB system were offered a one-time option to join the new DC system, an option which 5% of employees accepted.¹⁰ Data is not available on the performance of individual DC accounts since the system change in 1997. The DC plan is less expensive to the state government, as the *maximum* employer contribution is 7% of payroll, compared to the *average* annual contribution of 10% of payroll under the DB plan.¹¹

Florida created a DC system in 2002 that would operate alongside its DB system, offering all employees (current and new) a one-time choice in pension plan. A second election option was added in 2003 to allow an additional opportunity to switch between plans. Under both plans, employees contribute nothing; all contributions are made by the state. During the first year of plan choice, 3.5% of employees vested in the DB system switched to the DC plan, and 9.2% of new hires opted into the DC plan. A sluggish investment market at the time may have negatively affected these figures, and in 2004, nearly 20% of new employees selected the DC system.¹²

While these three states serve as competing examples for the usefulness of DC plans for public pensions, the current state-level debate is dominated by a proposal to change California's pension system (CalPERS) from DB to DC. The proposed system is similar to

⁶ EBRI 2003.

⁷ Rajnes, 2001.

⁸ Anderson, Gary W. and Brainard, Keith. *Profitable Prudence: The Case for Public Sector Defined Benefit Plans*, Pension Research Council Working Paper, 2004.

⁹ Nebraska Public Employees Retirement System (NPERS) Website, <http://www.npers.ne.gov/public/planInformation/state/statePlanInfo.jsp>.

¹⁰ Papke, 2004.

¹¹ Michigan's ORS website: <http://www.michigan.gov/orsstatedb/>.

¹² Florida Retirement System, "2004 Update on Choice in the Florida Retirement System: Fact Sheet", January 12, 2005.

that of Michigan. In the debate surrounding it, supporters emphasize cost savings to the state rather than benefits to employees.¹³

North Carolina differs from other states that have considered reforms to their public pension plans as its DB system is fully funded; its DB system currently holds more assets than liabilities and is funded at 108%. This differs from many state pension plans, which rely on one generation of workers and taxpayers to provide benefits for the generation of workers that preceded them. As the state faced budget crises in each of the last four years, with projected spending more than \$1 billion greater than projected annual revenue, the state would still benefit from a reduction in spending on its employee pension system.

¹³ “Securing California's Fiscal Future: A Fiscal Responsible Plan for Public Pension Reform.” Assemblyman Keith Richman, Assembly District 38, California. 2005.

Chapter II

DISCUSSION OF THREE PENSION PLAN MODELS

To analyze the costs and benefits of hypothetical DC and hybrid DB/DC plans in North Carolina, we created three pension plan models: the current DB system, a hypothetical DC system, and a hypothetical hybrid DB/DC system. Analysis of the three models provides the basis for our quantitative comparisons between the three pension plan systems.

These models follow prototype employees, and examine how the three pension plan types affect them. The models allow us to see how changes in a number of input variables affect results. Replacement rate and total state cost are the main output variables we examine.

Model #1: North Carolina's Current Defined Benefit (DB) System

The DB model is based on the Teachers' and State Employees' Retirement System of North Carolina (TSERS), the plan covering all full-time employees in North Carolina's public school systems, universities, departments, institutions, and agencies.

Under the North Carolina DB system, an employee contributes 6% of his or her salary or wages. The state's mandated contribution of 6.5% per year can come from two sources: a direct appropriation from General Fund tax revenues, or an application of investment returns toward the required annual 6.5% contribution. Pension fund investment returns can also be used to pay cost of living adjustments (COLAs) to current retirees. As a result, the required annual contribution from the employer varies from year to year. Historically, the employer contribution has ranged between 6.5% and 8.5%, covering mandatory contributions and negative returns on the pension fund, as well as providing COLAs approximating inflation. Based on the actuary's latest report, the Board of Trustees set the employer normal contribution rate at 4.80% of covered payroll for general employees and at 5.27% of covered payroll for law enforcement officers, effective July 1, 2004.¹⁴

Annual retirement benefits are calculated using a simple formula. The average salary of the four highest-paid consecutive years is multiplied by 0.0182. This number is then multiplied by the retiree's years of creditable service to determine the annual benefit. Replacement rates vary based on years of service, but have averaged 45% to 55% over the last several years. For the model, we assume that retired beneficiaries receive COLAs every year equal to the rate of inflation.¹⁵ By assuming different years of service, employment histories, and entry ages, we were able to compare results of the DB system against the results of the other modeled plans.

¹⁴ "The State Treasurer's Annual Report to the People of North Carolina, Fiscal Year 2003 - 2004"

¹⁵ While COLAs are up to the discretion of the NC State Legislature, they have historically been granted to track inflation.

Model #2: A Defined Contribution (DC) Model

We developed a model of a hypothetical DC plan based largely on Michigan's plan. We selected Michigan's plan because it has a 62-year history of performance and because it is similar to North Carolina's pension system in terms of amount of assets and number of participants. For our model, the state contributes 4% of payroll to each employee's account. In addition to this mandatory contribution, employees elect to contribute 0%-4% of their wages, which the state then matches dollar-for-dollar. (In Michigan's DC plan, employees actually make voluntary contributions of up to 3% of salary, which the state matches. We use 4% in our DC model, however, so that under all three models, up to about 12% of employees' salaries can be contributed.) In the hypothetical model, the state would thus contribute 4%-8% percent of payroll. In effect, employees could have as much as 12% of their salaries and wages contributed to the system (the 4% mandatory state contribution, the 4% maximum voluntary employee contribution, and a 4% match from the state). At retirement, we assume that retirees purchase an annuity offering annual payments indexed to inflation. This assumption enables us to compare against the inflation-indexed benefits of the DB plan.

Model #3: The Hybrid "Safety Net" DB/DC Model

Our hybrid DB/DC model has a "safety net" DB component and an additional DC component. Employees would receive a DB benefit equal to one-third of the current DB benefit. This DB benefit provides retirees a minimum guaranteed benefit in the event that their DC component perform poorly. As such, our model requires employees to contribute 2% of payroll (one-third of 6%) toward the DB portion of the hybrid system in order to receive the safety net benefit. State contributions for the DB portion would likewise be one-third of those under the current DB plan.

For the DC component of the hybrid plan, employees would elect to contribute 0%-4% of their wages, which the state matches dollar-for-dollar. Thus, in this hybrid model, the state pays 2%-6% of payroll (the approximately 2% mandatory contribution for the DB component plus 0%-4% of employees' salaries and wages depending on how much they elect to contribute). As with the DC model, employees could have as much as 12% of their wages contributed to the system (the 2% mandatory employee contribution to the safety net portion, the 2% employer contribution to the safety net portion, the 4% maximum voluntary employee contribution, and a 4% match from the state).

Table 1, on the next page, summarizes the features of the three pension plan models.

Table 1: Percentages of Salaries and Wages Contributed to Alternative Pension Systems

	Current Defined Benefit (DB) System	Defined Contribution (DC) Model	Hybrid DB/DC Model
Employee Contribution	6% mandatory	0% -4%, voluntary	2% mandatory, 0% -4%, voluntary
Mandatory State Contribution	6.5%	4%	2%
Matching State Contribution	not applicable	0% -4%	0% -4%
Total Percentage of Salaries and Wages	12.5%	4% -12%	4% -12%

Methodology for Evaluation of Models

We evaluated the performance of the DB, DC, and hybrid models against our quantitative criteria (criteria 1 and 2) by analyzing various scenarios for nine prototypical workers. See Appendix 3 for a detailed explanation of our methodology.

- Three workers spend a full career working for the state, without interruption. They differ by starting age and retirement age.
- Two workers take a five-year break in employment with the state, once again using different starting ages and retirement ages. The first of these two workers takes early retirement and receives reduced DB benefits.
- Two workers each have two interruptions in service: a two-year break and a six-year break. Once again, we examine different starting ages and years of service, so that one of the workers draws a reduced DB benefit due to early retirement.
- The final two workers leave the state system after six and 15 years of service, respectively. Each of these workers leaves his or her contributions in the state retirement system and begins drawing benefits at age 65.

Starting salary is kept constant across all employees, since it has no effect on replacement rates. It is important to note, however, that starting salary does affect the size of total state costs. We also assume that all employees make the maximum voluntary contribution under the DC and hybrid plans in order to have approximately equal total contribution rates of 12%.

For each employee, we examine how the three plans affect the replacement rate and state costs under two scenarios. The first, the Expected Scenario, reflects our best estimates of inflation, salary growth of state employees, and market performance of DB and DC funds. The second, the Conservative Scenario, reflects the assumptions used by the North Carolina State Treasury’s consulting actuary in determining the appropriate employer contribution each year. As the names imply, we believe the expected scenario to be a more accurate

predictor of future results. The conservative scenario, however, provides a basis for comparison and demonstrates how changes in variables can lead to varying results.

Transition Costs

If the state were to initiate a DC system, the switch would create several new costs. These can be divided into organizational costs and so-called “transition costs.” The organizational costs derive from setting up an organization which would create and administer the DC system. To quantify these costs is beyond the scope of this analysis. Transition costs refer to the funds which the state would have to transfer into the individual DC account of an employee who switches from DB to DC.

We consider three scenarios for transition costs below. The first provides an estimate for the upper bound transition cost, in which all employees shift from a DB system to a DC system (For a detailed description of how we calculated this upper bound transition cost, see Appendix 4).

- *Scenario 1.* At an appointed date the state switches all members of the current DB system into the new DC system. All individual employee and employer contributions plus the accrued interest must be transferred. Therefore, the transition cost under this scenario represents an upper bound estimate of what the transition cost could be.
- *Scenario 2.* The active members in the DB system have the option to switch voluntarily. Those who opt to switch will likely be employees who plan to leave government employment before becoming vested. Such employees usually provide the DB system with extra revenue, as they do not withdraw full contributions. Loss of this revenue in addition to costs of managing two systems (DB and DC) will add extra burden to the pension system.
- *Scenario 3.* The DC system is set up and is mandatory for new incoming employees. Current employees remain in the DB system. Under this scenario, there would be no transition cost. The DB system remains in existence until its last member dies. The two systems would coexist for at least 50 years, which adds overhead costs.

Chapter III

KEY CRITERIA FOR ANALYSIS

Our analysis attempts to determine whether pension reform is appropriate specifically for the state government, the employees, and the citizens of North Carolina. To do this, we use two approaches. The first is quantitative: we create models to estimate the financial costs to the state as an employer, and benefits to retirees, under the current system and DC and hybrid models. The second is qualitative, applying the lessons learned from other states that implemented pension changes. This two-pronged approach involves evaluating the current defined benefit (DB) system and defined contribution (DC) and hybrid models against two quantitative and three qualitative criteria, listed below.

Quantitative Criteria

1. Maintain or increase retirement benefits
2. Maintain or decrease state contributions to a pension system

Qualitative Criteria

3. Minimize risk to employees
4. Increase certainty of state cost
5. Improve recruitment and retention of state employees

Criterion #1: Maintain or Increase Retirement Benefits

Since state employees are the stakeholders most directly affected by any change to the retirement system, it is important that alternatives maintain or increase current retirement benefits. The evaluation of this criterion will largely be a product of the results of our empirical models. The traditional measure of pension benefits is the replacement rate—the ratio of annual retirement benefits to final average compensation. In addition to comparing replacement rates, we will look at what returns on individual DC accounts would have to be in order to match the replacement rate of the DB plan. Additionally, we will discuss administrative costs and their effect on investment returns.

Criterion #2: Maintain or Decrease State Contributions to a Pension System

Different pension systems will have distinct effects on state, or employer, costs. State costs vary widely across systems depending on the level of state and employee contributions, and the size of the benefits promised under the systems. Given the recent budget difficulties faced by the state, it is important that alternatives either maintain or reduce state costs when compared to the status quo.

This criterion is evaluated simply as an output of our empirical models. That is, by adjusting certain parameters, we are able to see how state costs are affected.

Criterion #3: Minimize Risk to Employees

When comparing the relative risk to employees of DB, DC, and hybrid plans, we consider four important types of employee risk:

1. the risk in forgoing a guaranteed, defined benefit in favor of uncertain returns in markets;
2. the risk of forgoing potentially higher returns available in markets, in favor of accepting a guaranteed benefit;
3. the risk of forgoing future retirement benefits altogether because the employee leaves state employment before achieving eligibility to receive benefits, either before becoming fully vested or before reaching retirement age; and
4. the risk of an employee, under a DC plan, outliving his or her retirement benefits.

For the employee, these relative risks are ultimately translated into the amount of monthly benefits he or she receives in retirement. Employees naturally prefer to forgo as much risk as possible in terms of potential loss of future benefits, and to maximize both the amount and certainty of their retirement benefit. Studies of public pension plans, however, show that employees tend to be far more concerned with the potential downside risks than upside benefits.¹⁶ In other words, employees generally value the guarantee of baseline benefits more than the potential for larger returns available through investing retirement savings, as demonstrated by their propensity to remain in DB plans even when provided a DC option.

Critics of DB plans, however, suggest that employees are simply trading one type of risk for another. By overvaluing a guaranteed benefit, employees are risking the loss of better returns potentially available to them were they to invest their retirement savings directly.¹⁷ Advocates of DB systems respond by arguing that higher market returns are rarely, in practice, realized by employees under DC plans. Studies cite two primary causes for the lower performance of DC accounts compared to DB plans. First, employees tend to place DC contributions in exceptionally low-risk, low-yield investments. Second, employees regularly cash in their account balances rather than maintain them as retirement savings, a problem known as leakage.¹⁸ While there is significant debate about relative rates of return, it nevertheless remains an important component of risk to employees, and, therefore, we consider it in our analysis.

We assess the risk of failing to “vest” or qualify for pension benefits under each of the three plans. For younger workers with more mobile lifestyles, the possibility of having pay withheld for pension purposes and yet never realizing a later gain from this investment is

¹⁶ NASRA White Paper, *Myths and Misperceptions of Defined Benefit and Defined Contribution Plans*, updated 2005.

¹⁷ Ferrara, Peter J. , *Pension Liberation for Florida*, April, 2000.

¹⁸ Anderson, Gary W. and Brainard, Keith. *Profitable Prudence: The Case for Public Sector Defined Benefit Plans*, Pension Research Council Working Paper, 2004.

a significant risk.¹⁹ Different pension designs can reduce or exacerbate this risk, and we consider these factors when evaluating our different models.

Finally, we assess the risk of an employee outliving his or her retirement benefits. Under DB plans, retirement benefits are guaranteed for life. Under DC plans, retirees must find alternative income sources should they spend the assets available in their retirement account. This is particularly disadvantageous to employees with long life expectancies.

No single type of employee risk automatically defines a plan as unacceptably risky. Instead we look at the interaction of all four types in our analysis of the relative merits of the three plan types.

Criterion #4: Increase Certainty of State Cost

For sound long-term state budget planning, certainty about future expenditures is always preferable. The state's contribution to its pension system totals hundreds of millions of dollars annually, with over \$200 million, or 1.37% of its General Fund, contributed in 2003. These contributions vary year to year since they depend on the overall state budget and the actuarial needs of the fund, as determined by investment performance and pension liabilities.

The ability to plan for consistent state costs may alleviate much of the strain on the budgetary process for the state government by presenting predictable contributions. On the other hand, consistent state costs may restrict the short-term flexibility of being able to reduce state contributions when needed, as was the case in 2001 when the state made no contribution to the fund due to fiscal challenges and impressive fund performance. In the end, stabilizing state contributions will allow the state to incorporate its contributions into long-term budget planning.

Criterion #5: Improve Recruitment and Retention of State Employees

The final measure for consideration is the effect the state's pension system has on the recruitment and retention of state employees. All other things equal, it is in the interest of the state, as both an employer and as a proxy for taxpayers, to hire and retain the best employees to provide high quality public service.

The effects of pension plans on recruitment and retention will be influenced in part by factors already discussed. First, employees will naturally prefer the pension system that offers them the greatest return on investments. Second, employees seek to minimize risk to themselves. As discussed earlier, risk has four components: lower investment returns, potential for reduced benefits, failure to vest, and outliving retirement benefits.

¹⁹ Childs, Paul, et al. *Defined Benefit vs. Defined Contribution? Determining the Optimal Benefit Plan Choice Using a Real Options Framework*, TIAA-CREF Institute, 2002.

Analysis of this criterion focuses on two measures by which pension systems can impact recruitment and retention. First is plan portability. Employees will generally favor plans that give them full ownership of their funds, regardless of whether they remain employed with the state. Employees may also prefer portable plans, since upon termination such plans can be either “rolled over” into another retirement system or “cashed out” at current value. While beneficial in recruiting, portability may negatively impact retention, as portable pensions would remove an incentive for employees to continue working for the state.

Second, employees may have personal preferences for different types of pension plans. These preferences are exhibited in two ways. The first, and more difficult to study, is job selection. By selecting a specific job and employer, employees reveal the preference they hold for some components of employment, among them pension plans. Our research found no significant studies examining employment selection as measured by pension plan type. Further, interpreting such data would be difficult, as employees will consider many factors besides pensions in choosing a job.

A better source for revealed employee preferences is pension selection. Systems that offer employees a choice between DB and DC plans force employees to reveal their pension preference. Case studies from three employee choice systems, Michigan’s, and Florida’s, and North Carolina’s (for faculty at the University of North Carolina) will be used to analyze employee preferences.

Chapter IV

ANALYSIS OF RETIREMENT SYSTEM OPTIONS

This chapter presents our analysis of the outcomes of the three pension plan options using five criteria:

1. Maintain or Increase Retirement Benefits
2. Maintain or Decrease State Contributions to Pension Plan
3. Minimize Risk to Employees
 - Guarantee of Benefits
 - Potential of Reduced Returns
 - Requirements of Vesting
4. Increase Certainty of State Cost
5. Improve Recruitment and Retention of State Employees
 - Portability
 - Employee Preference

Model # 1: North Carolina's Current Defined Benefit (DB) System

Criterion #1: Maintain or Increase Retirement Benefits

The North Carolina DB system maintains the replacement rate for current employees.

Criterion #2: Maintain or Decrease State Contributions to a Pension Plan

The North Carolina DB system maintains the current state contributions.

Criterion #3: Minimize Risk to Employees

Guarantee of Benefits. One of the principal strengths of a DB system is that employees are guaranteed predictable retirement benefits. After 30 years of creditable service, career employees in the NC system will receive a retirement benefit that is approximately 55% of the average of their salaries from the four highest-paid consecutive years. Given the adversity to risk demonstrated by most employees, a guaranteed benefit that provides over half of their working salaries represents a clearly desirable feature of the current DB system.

Potential for Reduced Returns. The risk of low investment returns is not applicable.

Requirements for Vesting. The DB system does not do well in minimizing the risk of failing to vest. Vesting requirements have long been seen as one of the greatest weaknesses of DB systems in terms of employee risk. The North Carolina DB system requires five years for an employee to become fully vested and eligible for retirement benefits.

Lifetime Benefits. Under the DB system, retirees are guaranteed a retirement benefit for as long as they live.

Criterion #4: Increase Certainty of State Cost

DB plans create widely varying costs for the state, and on Criterion 4 North Carolina’s DB system fares poorly. Because North Carolina makes annual contributions based on fund performance, projected outlays, and budgetary constraints, each year presents a new decision for state government. Recently, state contributions have ranged from zero in 2001, to over \$650 million in 1998.²⁰ Because the yearly contribution is undefined, funds are susceptible to political pressures and budgetary constraints. Diane Swonk, the Chief Economist for Bank One, explained to the Illinois Governor’s Commission on State Pensions in 2004 that two key economic principles affect state funding of DB plans:²¹

1. The dynamic-scoring principle suggests that states must consider the relationship between their tax and spending decisions with respect to economic growth. Because capital and labor are mobile, states compete with one another for employees and investment. States with tax and spending policies that encourage investment will experience greater growth than neighboring states.
2. States face cyclical revenue streams that fluctuate with the business cycle, creating times of above- and below-average revenues. Table 2 below identifies pension-funding choices made by states during the business cycle:

Table 2: Economic Principles and Pension-funding Choices

	Years with Above-Average Revenues	Years with Below-Average Revenues
Rational Funding Strategy	Over-fund	Under-fund
Common Mistake	Use relatively good times to increase benefits	Change tax or spending policies in ways that reduce the state's capacity to support growth in living standards

Source: Interim Report on Near-Term Funding by the Governor’s Commission on State Pensions (Illinois, 2004).

North Carolina’s DB plan gives decision makers the flexibility to adjust annual state contributions. As shown in Table 2, in the case of years with above-average revenue and high investment performance, over-funded plans may tempt decision makers to increase benefits to retirees. North Carolina, however, has largely avoided this temptation. Though the state’s retirement system was over-funded from 1999 to 2002, the state only minimally increased the multiplier used in calculating benefits, from 1.73% in 1993 to 1.82% a decade later in 2003.

²⁰ See Appendix 2 for contribution amounts from 1993 to 2003.

²¹ Annable, James, et al. Governor's Commission on State Pensions: The Interim Report on Near-Term Funding (and Civic Federation dissent). May 2004.

Criterion #5: Improve Recruitment and Retention of State Employees

Portability. On this criterion, the DB plan does not fare well. Employees enjoy very little plan portability. Employees cannot transfer the value of any other pension plan into the state's DB system, nor can they transfer funds out of the system when they leave the state's employment. Furthermore, DB accounts do not gain value if an employee leaves and then returns to the state workforce. This policy is especially troubling for women, who are more likely to leave the workforce for extended periods of time.²² Employees are offered portability under the supplemental 401(k) deferred compensation plan for state employees, but too few participate to count this program toward the current system's overall portability.

Options are available to the state to increase the portability of the current DB system. North Carolina allows employees to purchase credited years of service with additional employee payroll contributions. If an employee has at least five years of service time, he or she can purchase additional service time at the full actuarial value of the liability incurred on account of the extra service time purchased. This value will vary with an individual's salary and service time. As of January 2003, employees can use pre-tax balances in retirement plans and IRAs to purchase additional service time.

The state could also allow employees to purchase service time through other measures, such as applicable service in the private sector. Additionally, maternity leave or time away from work for family purposes could be credited as years of service, improving the retention of women.²³ Additionally, the state could improve recruitment by allowing potential employees to purchase credited service based on previous public sector work or the balance of an existing retirement account. Many of these options would be costly, and ultimately the current DB plan cannot be viewed to be as portable as the proposed DC and hybrid plans.

Employee Preference. Case studies show that public employees prefer DB plans to alternatives. In Florida, less than 5% of eligible state employees in 2002 elected to switch their pension plans from the DB system to the newly created DC structure.²⁴ Furthermore, the rate of new employees selecting the DB system, while shrinking in each of the last three years, is currently about 80%.²⁵ These figures imply that employees, when given the option between two programs of equal cost to them (Florida requires no employee contribution for either plan), strongly prefer DB.

²² Childs, Paul, et. al. *Defined Benefit vs. Defined Contribution? Determining the Optimal Benefit Plan Choice Using a Real Options Framework*, TIAA-CREF Institute, 2002.

²³ Hajnes 2001.

²⁴ 2004 Update on Choice in the Florida Pension System. *Fact Sheet*. January, 12, 2005. www.sbafla.com/pdf/news/2004%20Update%20on%20Choice.pdf.

Additional research did not reveal whether employees opting into the DC plan differed by race, gender, salary, or job class from employees choosing to enter the DB plan.

²⁵ Ibid.

Employees in Michigan's system exhibit similar preferences. While new employees are required to join the DC plan, those employed as of March 1997 could switch into the new system from the traditional DB. Only 5.5% of existing employees switched.²⁶

For the University of North Carolina (UNC) faculty, a different story emerges. In a study examining trends from 1983 to 2001, only 12% of new UNC faculty chose the state's DB system in 2001, down from 23% in 1983. While some groups, especially African Americans, preferred the DB system in the past, by 2001 the preference for the DC plan held true for both sexes and all age and racial groups.²⁷ Some differences persist, however, and new faculty who are older,²⁸ female, or racial minorities hold a weaker preference for DC.²⁹ Also, this data cannot be applied to the employee population as a whole for the state, as UNC professors are not representative of the entire state workforce.

Based on these studies, employees appear to prefer DB systems to DC plans. Given the rising preference for DC in Florida and the UNC system, however, this conclusion may not be certain. Additional information should be collected about the specific preferences of state employees.

Model #2: The Defined Contribution (DC) Model

Criterion #1: Maintain or Increase Retirement Benefits

Whether the DC model maintains the replacement rate for employees depends on the starting age and years of service of a given employee. Our models show, however, that the DC model is unable to match the replacement rate of the current DB system for most types of employees in either the expected or conservative scenarios. The only employees for whom the DC model provides a better replacement rate than the DB system are those who leave state employment after a short period of service. More specifically, the DC system outperformed the DB system only for employees who started work at age 25, left work after 6 or 15 years, and then began to draw benefits at age 65. This would not hold true for employees who worked the same period of time but began employment at an older age. The DC system is only favorable for young, short-term employees because the contributions have a long period of time to accrue compound interest prior to retirement.

For all other scenarios, the DC system is unable to equal the replacement rate of the DB system. Only by earning returns in the range of 9.10% to 12.45% could the DC model

²⁶ Papke 2004.

²⁷ Clark, Robert et al, *Pension Plan Choice Among University Faculty*, NC State University, December 2004.

²⁸ *Older* means they are less likely to relocate, and thus portability is not a problem. They make their choice when they *enter* the UNC faculty, so it has nothing to do with years of service or vestment in DB.

²⁹ The study's authors suggest that employee preference between the plans is largely governed by each employee's perceived likelihood of changing jobs before retirement. Employee mobility favors the DC option, where benefits travel more easily. It is the authors' belief that differing career plans explain the differing preferences seen between age, gender, and racial groups.

equal the replacement rate of the DB system.³⁰ Appendix 5 contains a full comparison of model results.

Investment savvy individuals might believe their investment ability is sufficient to earn the 9% to 12% needed to match DB replacement rates. However, one must consider the effects of higher administrative costs under a DC system. Often, administrative fees under a DB plan range from 1%-2% of assets under management.³¹ By contrast, administrative expenses for North Carolina's Teachers' and State Employees' Retirement System (TSERS) was only 0.09% for 2003.³²

Criterion #2: Maintain or Decrease State Contributions to Pension System

While the DC model shows a general inability to outperform the DB system in terms of replacement ratios under either the expected or conservative scenarios, the situation regarding state costs is more ambiguous. Turning to the prototypical employees in our models, under the expected scenario there is a consistent pattern: state costs are lowest with the DB system.

Under the conservative scenario, though, state costs for longer-serving employees are lowest under the DC model. (For the shorter-term prototype employees with 6 and 15 years service, it is the DB system that generates the lowest state costs.) In all cases under the conservative model, lower state costs are achieved because of significantly reduced replacement ratios.

The assumption about market performance rates is the principal factor driving the shift in results between the expected and conservative scenarios is. In the expected scenario, we assume a historically demonstrated 11% return for the DB system and 6% for the DC model.³³ In the conservative scenario, the assumption of market performance remains at 6% for the DC model, but is lowered to 7.25% for the DB system. Given the assumed return on investment of 11% for the DB system, state contributions are largely provided through investment gains, rather than the appropriation of general funds. The advantage of the DC model is that state costs are unaffected by market performance. This, however, has the effect that the replacement ratios for employees are in most cases significantly lower.

In considering the DC model's effect on state costs, one must also consider transition costs. In a rough approximation, we calculated the one time transition costs under this scenario to be about \$14.26, billion, which is about twice as much as the value of the assets

³⁰ It is likely that the DC model would require even higher returns to match the replacement rate of the DB system. Our model assumes the retiree purchases an annuity indexed to inflation at the time of retirement, but does not incorporate the transaction costs of purchasing such an annuity. According to the National Association of Variable Annuities, industry fees averaged 1.97% of the value of the investment in 1997 ("Annuity Fees and Expenses" <http://www.fool.com/retirement/annuities/annuities02.htm>). These transaction costs will be detrimental to the replacement rate of the DC system under all scenarios.

³¹ Findlay, Gary. "In Defense of the Defined Benefit Plan." *Government Finance Review*, December 1997.

³² "The State Treasurer's Annual Report to the People of North Carolina, Fiscal Year 2003 – 2004."

³³ Anderson, Gary W. and Brainard, Keith. *Profitable Prudence: The Case for Public Sector Defined Benefit Plans*, Pension Research Council Working Paper, 2004, p. 5.

held by the pension fund (Refer to Appendix 4).³⁴ This number is based on the assumption that all employees are switched immediately from the DB to the DC plan. The state would not administer two plans simultaneously.

Criterion #3: Minimize Risk to Employees

Guarantee of Benefits. Using a guaranteed benefit as a measure, the DC and hybrid models fall short of the current DB system. In the typical DC structure, contributions can be guaranteed, but retirement benefits are not. Instead, final benefits depend on stock and bond performance both during the 30 years leading up to retirement, and, most importantly, at the time of retirement.³⁵ If the stock and bond markets are in a cyclical downturn, it may not be possible for would-be retirees to afford to stop working.³⁶ The accrued contributions and fund performance determine the net value of the account at retirement and hence the amount available to fund the retiree's monthly benefits. Clearly the guaranteed benefit of the DB system is absent from the DC model.

Potential for Reduced Returns. While DC proponents argue that direct investment of a portion of a retirement account in the market could substantially enhance benefits, the evidence suggests that this is not the likely outcome. Historically, returns from the stock market have averaged 8% since 1926.³⁷ Bonds have returned 3% to 4% on average, and an equally balanced portfolio could thus be expected to return an amount somewhere between these two, perhaps 5% to 7%, depending on the mix.³⁸ The relative rate of return for employees who assume responsibility for their own retirement investment decisions has been shown to average approximately 6% from 1982 to 1999.³⁹ In the case of Nebraska, an employee retiring under the DB system after 30 years received an annuity of \$16,797, while a comparable employee in the DC system received \$11,230.⁴⁰

Requirements for Vesting. In terms of vesting risk, the DC model is more desirable than the DB system. While DC plans commonly have short or nonexistent vesting periods, we have structured our model after Michigan's: employees become fully vested after four years for that portion of their account originating from employer contributions.⁴¹ Employees are immediately vested in the portion of their account originating from their own voluntary contributions.

³⁴ This gap does not mean that the pension fund has hidden liabilities or is unhealthy. It is like a bank which gets into trouble if all customers are withdrawing their savings on the same day.

³⁵ Utah Retirement System, *Defined Benefit (DB) vs. Defined Contribution (DC) Plans*.

³⁶ Ibid.

³⁷ Ferrera, Peter. "Pension Liberation for Florida." *Policy Briefs*. Americans for Tax Reform, 2000.

³⁸ Ibid.

³⁹ Anderson, Gary W. and Brainard, Keith. *Profitable Prudence: The Case for Public Sector Defined Benefit Plans*, Pension Research Council Working Paper, 2004.

Anderson and Brainard cite a study conducted by Buck Consultants in 2000 assessing Nebraska's Public Employee Retirement System (PERS) from 1983 to 1999.

⁴⁰ Utah Retirement System, *Defined Benefit (DB) vs. Defined Contribution (DC) Plans*

⁴¹ Nebraska's DC vesting period is 2 years, and Florida's DC vesting period is one year.

Lifetime Benefits. Under the DC system, retirees must find alternative income sources should they deplete the assets available in their retirement account. This is particularly disadvantageous to employees with long life expectancies. If they take their accrued assets at retirement in a lump-sum rather than an annuity, they must also avoid the temptation to over-spend retirement funds early in their retirement years.

Criterion #4: Increase Certainty of State Cost

Under the DC model, the state has to make a relatively constant contribution to the pension fund rather than being susceptible to market fluctuations and budgetary constraints. The DC model, however, denies the state the flexibility of reducing contributions when needed, as was the case in 2001 when the state made no contribution to the fund due to fiscal challenges and impressive fund performance.

Though our DC model includes a state contribution that varies from 4% to 8% of payroll, the state will be able to anticipate its contribution as a function of payroll. For example, if employees on average contribute 2%, the state can expect to fund 6% of payroll (the 2% matching contribution and 4% mandatory contribution).

Criterion #5: Improve Recruitment and Retention of State Employees

Portability. Unlike the current DB system, employees would enjoy almost complete plan portability under the modeled DC system. This portability would apply to both new employees entering the system and those state employees leaving it. Employees joining the state workforce from another field could roll a previous DC pension account into the state's DC system. Employees leaving state employment could do the opposite, either rolling their account over into another retirement account or cashing out the account's current value.⁴² Additionally, any DC account will continue to accrue value even when an employee is out of the workforce. The effects will be greater for younger employees who are more likely to seek future employment outside the public sector, and for workers (especially women) who spend significant periods of time out of the workforce.⁴³ These factors make DC accounts highly preferable for employees on the basis of portability.

While extremely beneficial for employees with a low preference for retirement savings, the cash-out option may be of particular concern for the state as an employer. Evidence from Nebraska suggests that nearly 70% of employees in a DC plan cash out their accounts upon leaving state employment.⁴⁴ The state may not be comfortable investing funds into a retirement system that will not go towards employee retirement. Additionally, states with DB systems often benefit from the contributions of employees who never become vested. They keep the contributions of employees who left the system before vesting. With DC systems, the ability to withdraw contributions after a shorter vesting period creates a loss of cash flow from abandoned un-vested DB accounts. This factor, together with the cash-out option of DC plans, would not lead the state to favor DC accounts.

⁴² Cashing out a retirement account usually results in a tax penalty.

⁴³ Childs 2002.

⁴⁴ Brainard 2003.

Employee Preference. Conclusions from our chosen case studies show that employees have mixed preferences for DC systems. In Florida, during the system's first two years of operation (2002 and 2003), less than 8% of new employees selected the DC option, most likely due to a sluggish stock market and limited knowledge of the plan.⁴⁵ This figure increased to 19% in 2004, and is expected to rise again this year.⁴⁶ Because stock market performance has improved at the same time that Florida has increased its efforts to educate employees about their plan options, it remains unclear which of these factors is most responsible for the rise seen in DC enrollments.

In Michigan, employee preference is more clearly against DC plans. Employees who were vested in the DB system, however, were more likely to switch, as were employees who planned to seek early retirement.⁴⁷ Employees who switched their accounts, though, were just as likely to remain in state employment the following year, implying that there exists no strong relationship between DC preference and *intentions* to seek alternative employment.⁴⁸

Finally, the UNC faculty strongly prefers DC systems. This fact, however, requires two important caveats. First, there are variations by age, race, and gender. Faculty hired in their 50s selected the DB plan at a rate four times greater than faculty hired in their 30s. African-Americans selected the DB plan at a rate three times greater than Caucasians, and women had a slight preference for the DB plan compared to men, though this was not statistically significant.⁴⁹ Second, the UNC faculty is not representative of all state employees, so it is difficult to apply this data to the entire pension system.

The sum of evidence seems to show that state employees would not prefer to switch their pension system to a DC one. The increasing rate of DC participation in Florida, however, coupled with the high rate of DC participation among UNC faculty, may call this finding into question. As explained earlier, a survey of state employees would yield more information on specific employee preferences.

Model #3: A Hybrid “Safety Net” DB/DC Model

Criterion #1: Maintain or Increase Retirement Benefits

As the hybrid model combines elements of the DB and DC models, its performance falls between the two. The hybrid model is unable to match the replacement rate of the DB system for the majority of scenarios. Like the DC system, the hybrid model only outperforms the DB system for employees who start work at age 25, leave work after 6 or 15

⁴⁵ SBA Florida (Ed.) 2004 Update on Choice in the Florida Pension System. *Fact Sheet*. January, 12, 2005. www.sbafla.com/pdf/news/2004%20Update%20on%20Choice.pdf.

⁴⁶ Ibid.

⁴⁷ The cited reason why people heavily vested in the DB system were more likely to switch is that they would have more money to invest.

⁴⁸ Papke 2004.

⁴⁹ Ibid.

years, and then draw benefits beginning at age 65. In all other scenarios, the hybrid model was unable to match the replacement rates of the DB system. Equaling the replacement rates of the DB system would require returns on the DC portion of the hybrid system of 9% to 12.5%, depending on the scenario, Expected or Conservative. As is the case in the DC model, one must also consider the cost of converting the DC portion of the hybrid model into an annuity in order to determine the true replacement rate.

Criterion #2: Maintain or Decrease State Contributions to Pension System

As with the replacement rate, the hybrid model is always between the DC and the DB model. Under the expected scenario the hybrid model is generally unable to reduce state costs. The hybrid system only leads to lower state costs if the employee leaves work after 6 to 15 years, and then draws benefits at age 65. For the conservative scenario it is reducing the state costs but still not as much as the DC model does.

Criterion #3: Minimize Risk to Employees

Guarantee of Benefits. The hybrid “safety net” system falls between the pure DB and DC models in terms of benefit certainty. Our model provides a guaranteed benefit equal to one-third of the benefits guaranteed under the current DB system. While this is preferable to a pure DC system, it provides less certainty than does the existing DB system.

Potential for Reduced Returns. As explained in the analysis of Model #2, the relative rate of return for employees who assume responsibility for their own retirement investment decisions has been shown to average approximately 6% from 1982 to 1999.⁵⁰ This is lower than the historically demonstrated 11% return obtained with the DB system.

Requirements for Vesting. For ease of comparison, we chose to have the hybrid system mimic the DC model, with employer contributions and guaranteed benefits requiring a four-year vesting period, and employee contributions requiring no period for vesting. Given this design, in terms of vesting risk, the hybrid model is more desirable than the DB model.

Lifetime Benefits. Under the hybrid system, the retiree is only guaranteed the “safety net” portion of benefits over his or her entire lifetime. As this benefit is one-third of the traditional DB benefit, it is unlikely to be sufficient to provide an adequate standard of living should the DC portion of retirement funds become exhausted. It does, however, provide at least provide a minimal, life-long guaranteed benefit.

⁵⁰ Anderson, Gary W. and Brainard, Keith. *Profitable Prudence: The Case for Public Sector Defined Benefit Plans*, Pension Research Council Working Paper, 2004.

Anderson and Brainard cite a study conducted by Buck Consultants in 2000 assessing Nebraska’s Public Employee Retirement System (PERS) from 1983 to 1999.

Criterion 4: Increase Certainty of State Cost

A hybrid model would limit the respective benefits and shortcomings of the DB and DC plans in terms of increasing the certainty of state costs. North Carolina would still face the same funding decisions when it came to the DB component of the model as it does with its current DB system, though the amounts would be far smaller—approximately one-third of the amounts contributed under the current DB system. Further, the state would annually contribute a predetermined amount to cover the DC contributions, much as would be the case in a pure DC plan.

The variance of state costs would be less than with the DB system, but not to the same degree as with the DC model. Decision makers would face the same temptation to adjust funding based on the fund's investment performance, the state's budgetary constraints, and predictions of future liabilities. Because the DB portion of the safety net plan is much smaller than in the full DB system, however, the risks posed to the state by lower investment returns would be less. The state would still benefit from the flexibility in annual funding that DB plans enjoy, while still contributing a fixed amount to a DC plan. In sum, the hybrid model lessens the risks for the state posed by lower investment returns of fund contributions, while increasing the certainty of funding obligations through the DC portion.

Criterion 5: Improve Recruitment and Retention of State Employees

Portability. The model hybrid plan has some portability for employees since at least two-thirds of total contributions in this system would go to individual DC accounts. Alternatively, the DB portion of the hybrid could include purchase measures as discussed earlier to make that portion of the plan more portable. Ultimately, the effects of portability on recruitment and retention would be addressed in the DC portion of the hybrid, making a more portable DB portion unnecessary. Furthermore, the state may be unwilling to sacrifice potential savings from abandoned un-vested DB accounts by adding portability measures to the DB component.

Employee Preference. Since our case studies do not discuss a hybrid system, it is difficult to determine the effect such a plan would have on recruitment and retention. While presumably more employees would be willing to convert pensions to the hybrid system than to a pure DC one, it is impossible to ascertain from these cases whether employees would prefer a hybrid or a DB account.

CHAPTER V

FINDINGS

Based on our analysis, we conclude that no plan is clearly advantageous for either the state or its employees for three reasons:

1. ***Sensitivity to Workforce Representation:*** Our analysis assumes each prototypical worker is equally representative of the state workforce. The actual composition of the state workforce could differ, changing the evaluation of which plan offers the greatest retirement benefits and lowest state cost.
2. ***Sensitivity to Model Assumptions:*** State costs fluctuate greatly when assumed values for salary growth, fund performance, annuity rate of return, and inflation/discount rates are changed. In different variations of these assumptions, different plans emerged as preferable to the state in terms of present value cost.
3. ***Sensitivity to Employee Preferences:*** The plan offering the lowest risk to employees and greatest improvement in recruitment and retention depends greatly on employee preferences, which cannot be specifically determined by case study.

Below, we synthesize the performance of the pension plans across our five criteria, highlighting how these sensitivity effects might change our evaluation of each plan. Table 3 on the next page summarizes these findings.

Model #1: North Carolina's Current Defined Benefit (DB) System

Maintain or Increase Retirement Benefits: Maintains

Maintain or Decrease State Contributions: Maintains

The current DB system maintains retirement benefits and state contributions at their current levels. When it comes to retirement benefits, the DB system offers the greatest retirement benefits for seven of the nine prototypical workers under both sets of analytical assumptions, expected and conservative. For the plan to offer the greatest benefit, the majority of state workers must be similar to these seven prototypes.

When it comes to state contributions, the system's performance varies based on both the composition of the state workforce and the analytical assumptions applied. In the expected scenario, the current system offers lower costs for all nine prototypes. In the more conservative scenario, though, the plan becomes more expensive for seven of the nine workers.

Minimize risk to employees: AMBIGUOUS

Improve recruitment and retention: AMBIGUOUS

We evaluate the DB system as ambiguous in terms of minimizing risk to employees and improving recruitment and retention. While the DB system minimizes the risk of a lower

retirement benefit by guaranteeing the benefit, employees retain the risk of not becoming vested in the system, in part due to lack of portability. It is unclear, however, that the state could increase DB portability without sacrificing its cost advantage. Further, while case studies show a general preference for DB plans in systems offering plan choice to employees, the percentage of employees choosing DC plans in these cases is increasing.

Increase certainty of state cost: POOR

We evaluate the DB system as when it comes to increasing the certainty of state cost. By keeping the current DB system, the state also keeps its current funding formula, which relies on annual contribution estimates based on actuarial analysis. Additionally, our quantitative analysis shows that state costs under the current system fluctuate greatly on an annual basis.

Model #2: A Defined Contribution (DC) Model

Maintain or Increase Retirement Benefits: POOR

We evaluate the DC model as poor for when it comes to maintaining or increasing retirement benefits, as it offers the lowest replacement rate for seven of the nine prototypical workers under both analytical scenarios. If, however, the majority of the state workforce were comprised of workers similar to the two prototypes for whom the DC model offers the highest replacement rate, the plan would receive a favorable rating for this criterion of maintaining or increasing retirement benefits.

Maintain or Decrease State Contributions: AMBIGUOUS

We evaluate the DC model as ambiguous in terms of state contributions, as the system's performance varies based on the analytical assumptions applied. In the expected scenario, the DC model has a higher state cost for all nine prototypes. Using more conservative assumptions, all but two of the prototypes produce *lower* state costs under the DC model, leaving the overall cost impact of the plan unclear.

Minimize risk to employees: AMBIGUOUS

Improve recruitment and retention: AMBIGUOUS

The DC model does not unequivocally minimize risk to employees or unequivocally improve recruitment and retention. Though the Retirement Systems Division could limit employees' investment options, the risk of low investment return is ultimately the employees' responsibility. Employees, however, would have a lower risk of failing to vest in the system. Further, the DC plan's effect on recruitment and retention is unclear. While DC plans are more portable, employees do not prefer DC plans relative to DB plans in the majority of cases studied.

Increase certainty of state cost: GOOD

We evaluate the DC plan as good for increasing the certainty of state costs. A DC plan allows the state to predict outlays for pension contributions as a direct function of payroll, regardless of a fund's market performance.

Model #3: A Hybrid “Safety Net” DB/DC Model

Maintain or Increase Retirement Benefits: POOR

We evaluate the hybrid model as poor in terms of maintaining or increasing retirement benefits as the plan generally offers a replacement rate much lower than that of the current DB system. In the two prototypes where the DC model outperforms the DB system—under both sets of assumptions, expected and conservative—the hybrid model also outperforms the DB system. For the seven other prototypes, the hybrid plan produces smaller retirement benefits than the current system.

Maintain or Decrease State Contributions: AMBIGUOUS

We evaluate the hybrid model as ambiguous with respect to state contributions because in seven of the nine prototypes, the hybrid model creates lower state costs than the DB system when using our conservative scenario. Using the expected scenario, the hybrid model costs more than the DB system in all nine prototypes.

Minimize risk to employees: AMBIGUOUS

Improve recruitment and retention: AMBIGUOUS

We evaluate the hybrid model as ambiguous when it comes to minimizing risk to employees and improving recruitment and retention. Compared to the DB system, the hybrid model may lose the guarantee of specific benefit, but it gains greater flexibility in vesting by limiting the risk of an employee not vesting. The hybrid model is also unclear in its effect on recruitment and retention because no case study exists to test such a plan.

Increase certainty of state cost: FAIR

The hybrid model does increase certainty of state cost, though not as much as the DC model. By construction, the hybrid plan retains the fluctuation of state costs in its DB portion while establishing easily predictable state expenses for its DC portion.

Table 3: Outcomes Matrix of Evaluation of Three Pension Plans

	Maintain or Increase Retirement Benefits ¹	Maintain or Decrease State Contributions ^{1,2}	Minimize Risk to Employees ³	Increase Certainty of State Cost	Improve Recruitment and Retention ³
Current DB System	Maintains	Maintains	Ambiguous	Poor	Ambiguous
DC Model	Poor	Ambiguous	Ambiguous	Good	Ambiguous
Hybrid Model	Poor	Ambiguous	Ambiguous	Fair	Ambiguous

Notes:

¹ These evaluations are based on the assumption that the prototypical workers are equally representative of the state workforce, and thus change based on the percentage of the actual workforce similar to each prototype.

² These evaluations are subject to change based on assumptions used in our quantitative analysis.

³ These evaluations are subject to change based on employee preferences.

Employee Choice Plan

Though we did not analyze an employee choice pension system, such as that of Florida (see Appendix 2), our findings suggest that such a plan could offer benefits to both the state and its employees. Employees could opt into the plan that offers them the highest retirement benefits, which may offer cost savings to the state. Additionally, offering an employee choice model would allow employees to minimize risk according to their preferences, while the state would be able to recruit employees interested in both pension systems.

Our analysis, on the other hand, does not clearly show that such a system would be advantageous for either employees or the state for two reasons. First, the state will incur significant administrative costs in operating two pension systems. In order for an employee choice system to be preferable to a single-plan system, the benefits incurred, either by one or both parties, would need to exceed the costs of system administration. Our analysis does not clearly find this to be the case. Second, the composition of the workforce may show that one plan clearly offers greater retirement benefits and lower state costs than the alternatives. Under an employee choice system, employees may not choose the preferable system, reducing the net benefits both for the employee and the state. This could occur if employees do not receive adequate information and education regarding pension options.

CHAPTER VI

RECOMMENDATIONS

In response to our findings, we offer three recommendations.

1. ***The state should maintain the current defined benefit structure for the state employees' retirement system.***

As neither the DC nor hybrid plans present clear benefits over the current plan for either the state or its employees, the transition costs associated with changing to an alternative system are not warranted. To be clear, our analysis does not offer definitive evidence that the DB structure is preferable to the alternative plans. It does provide, however, enough support for the DB system to justify its maintenance.

Should the state reconsider pension system change in the future, we recommend two further actions to provide a more definitive recommendation:

2. ***The Retirement Systems Division (RSD) should compile five years of exiting employee data including age, service time, and salary history, to better understand trends in employee tenure.***

Currently, RSD does not gather information about employees as they leave the state workforce. Other state offices may have this data, but RSD does not have access to this information in a manageable form. Such data would be instrumental in determining actual trends in employee tenure, and understanding how well the prototypical workers used in our models represent the actual workforce. Compiling five years of age, service credit, and salary information from exiting employees would generate enough data to weight accurately each of our prototypical workers, providing more thorough analysis.

3. ***RSD should conduct a scientifically controlled survey of current and prospective state employees to determine their preferences for pension plans and risk.***

Since case study analysis can provide only limited insight to the preferences of North Carolina's state employees, RSD should conduct a survey of both current employees and job applicants in line with accepted social science standards. The survey should educate participants about all pension system proposals, and solicit responses to determine the employees' preference for plan type, risk acceptance, and potential recruitment and retention effects of a change to the pension system.

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Appendix 1: Public Pension Plans

Defined Benefit (DB) Pension Plans

Defined benefit (DB) plans are funded through employer and/or employee contributions, and benefits to retirees are paid from these contributions and the investment returns that they earn. Typically, the summed rate of contribution is between 8% and 12% of salary and wages. The employer then manages and invests contributed funds and guarantees pension payments for the employee. Employer contributions will often vary greatly depending on annual fund performance. In North Carolina, employee contributions are 6.5% of salary by statute, while state contributions have varied between 6.5% and 10% over the last 10 years.

Upon retirement, employees receive pension benefits based on three factors:

1. **Years of service by the employee.** These are the number of years the employee worked, but some systems allow employees to “purchase” additional years of service through higher contributions to the pension plan.
2. **A multiplier.** The multiplier, when multiplied by the years of service, produces the replacement ratio, or percentage of salary that retirees will receive.
3. **Average final compensation.** Some plans use only the salary from the final year of employment, while others use the average of several years’ salaries.

Employees are ineligible to receive any retirement benefits until they become fully vested in the pension system. For public DB plans, vesting usually occurs after either five or 10 years of employment.⁵¹ North Carolina state employees become fully vested after five years. Additionally, DB plans often set minimum years of service and/or age requirements to determine retirement eligibility.

Defined Contribution (DC) Pension Plans

The basic structure of a defined contribution (DC) plan is that the employer guarantees a fixed contribution rather than a fixed benefit. Under this model, the employer will fund an employee’s account⁵² at a set percentage each pay period. Similar to DB plans, individual accounts in DC plans are funded through a combination of employer and employee contributions. As an example, the Michigan DC system (which we use as a template for our DC model in this analysis) contributes at a rate of 4% of gross pay, and will match up to an additional 3%.⁵³ The money is then invested according to employee preference, usually in one of several funds designated by the employer.

⁵¹ Rajnes 2001.

⁵² Individual accounts under DC plans can fall under a number of tax code sections, but are primarily classified as either 401(a) or 401(k) accounts. While minor differences exist between these account types, all DC plans share the same basic structure of having individual accounts.

⁵³ From the website of the Michigan Department of Management and Budget, Office of Retirement Services, <http://www.michigan.gov/ors/>.

There are two principal advantages of the DC system. The first is its direct connection to, and ownership by, the employee. Though some vesting period may be required for full employee ownership of the account, the account is highly mobile. Should the employee change jobs, the account can travel with the employee. Portability is considered a major advantage of the DC system.⁵⁴ The second is the low variability in employer cost. Unlike the DB system, where future costs are hard to predict, with a DC system, the employer can determine the exact percentage of payroll to contribute to individual accounts and discharge this liability in the present.

The principal disadvantage to the DC system is that the employee must assume the risk for unpredictable future investment returns. The employer contributes regularly, but provides no guarantees of future retirement income. If the investments do well, the employee may even be able to retire early. If the investments perform poorly, the employee may have insufficient savings to fund retirement.

Hybrid DB/DC Plans

Hybrid plans integrate features of both traditional DB and DC plans. These hybrid plans can take a wide variety of forms. The principle feature, though, is that overall risk is shared between employer and employee. Hybrid plans can thus incorporate attractive features of both the DB and DC systems, depending on their design. While assuring a basic “safety net” for the employee, hybrid systems can still provide a higher degree of portability to employees, as well as the potential for realizing the greater gains available through direct investment in the markets.

There are two standard types of hybrid plans.

1. In the first, employers contribute a percentage of each employee’s pay to a retirement account. Employees may be permitted to augment these accounts with additional contributions, and employers may match employee contributions up to a pre-set amount. The money is then invested, either directly by the employer or in funds selected by the employee from a set specified by the employer.⁵⁵ At any point, the employee can determine the exact “cash balance” in this account, and hence, these plans are also known as “cash balance” plans. If the employee is vested and separates from the employer, the cash (both employer and employee contributions) travels with the employee. This provides a significant increase in portability relative to traditional DB accounts.⁵⁶

The way in which “cash balance” plans differ from the typical DC plan is that the employer accepts investment responsibility, and guarantees a fixed return on the invested

⁵⁴ Clark, Robert and Pitts, M. “Faculty Choice of a Pension Plan: Defined Benefit vs. Defined Contribution,” in *Industrial Relations: A Journal of Economy and Society*, Vol. 38, No. 1, January 1999.

⁵⁵ Francis, David, “As Pensions Fade, Some Firms Try Hybrids.” *Christian Science Monitor*, 10-25-2004.

⁵⁶ Ibid.

monies.⁵⁷ This guaranteed rate of return is either set according to long-term market averages, or varies according to an index such as federal bond issues.⁵⁸ Thus, the employer still assumes the risk by providing a guaranteed future benefit to employees, but the benefits are more transparent and directly linked to predictable market performance. Technically considered a DB plan, the cash account system nevertheless incorporates elements of both DB and DC plans.

2. In the other common form of the hybrid system, the employer provides *both* a minimum basic benefit package (similar to a DB plan) *and* establishes a cash balance account for the employee. Sometimes referred to as a “safety net” plan, this is the structure for the hybrid model we use for our analysis.

As under a DB plan, the employer provides a guaranteed benefit at retirement according to a formula that incorporates variables such as the employee’s length of service and average pay during the final years of employment. Employers again withhold a percentage of employee pay to fund these future benefits. The guaranteed benefits are lower than those of a typical DB plan, however, and are not expected to provide fully for the employee’s retirement. Instead, as with a DC plan, employees augment their future retirement income by contributing a portion of their pay to an individual investment account that may be matched by employer contributions. In this model, the investment account portion of the retirement package may be invested by the employee or employer, or be guaranteed a set return by the employer.

⁵⁷ Rajnes, David, *Defined Contribution Plans With Rate-of-Return Guarantees*, Employee Benefit Research Institute, Vol 23, No. 25, May 2002.

⁵⁸ *Ibid.*

APPENDIX 2: EXPERIENCES OF NORTH CAROLINA AND THREE OTHER STATES

The purpose of this report is to examine North Carolina's current defined benefit (DB) plan and consider the possible benefits and costs of switching to a defined contribution (DC) plan or hybrid DB/DC plan. Other states have undertaken similar analyses of their pension systems, and have opted to switch their pension plans from a DB one. The experiences of these states can offer useful insights into both the motivations for, and outcomes of, these shifts. We have chosen three states, Nebraska, Florida, and Michigan, that provide an applicable array of experiences relevant to the questions we examine in the current study. Prior to describing the DC plans of these states, we provide an overview of North Carolina's DB system for comparison purposes.

*Principal Features of North Carolina's DB System*⁵⁹

- Employees contribute 6% of salary.
- State contributes an amount determined each year by the state actuary. For the 2003-2004 fiscal year this amounted to 3.42% for each employee.
- Final benefit for all employees is calculated based on the following formula:

Average Final Compensation (AFC) x 1.82% x Years of Creditable Service

AFC is the average pay for the four highest-paid, consecutively worked years.
- Employees are 100% vested after five years of membership service.
- Members are eligible for full benefits at age 65 with five years service, age 60 with 25 years service, or at any age with 30 years service. State law enforcement officers are eligible for full benefits at age 55 with five years service, or at any age with 30 years service.
- Vested members who leave employment for any reason other than retirement⁶⁰ or death have several options. They may choose to receive benefits when they later retire, or they may receive a refund of their contributions with interest accrued at a fixed 4%. Non-vested employees may also receive a refund of their contributions, but without additional interest.

⁵⁹ Employee Benefits Handbook, Department of State Treasurer, 2004
http://www.treasurer.state.nc.us/dsthome/RetirementSystems/Benefits_Handbook.htm.

⁶⁰ Retirement here includes both standard retirement, and early retirement with reduced benefits.

- Cost of Living Adjustments (COLAs) may be made to benefits at the discretion of the state legislature, but have largely mirrored changes in the Consumer Price Index.

Table 4: State Contributions to North Carolina’s Defined Benefit (DB) Pension System, 1993-2003

	State Contribution (\$)	State General Fund Budget (in millions)	Pension Funding as Percent of State General Fund	Total State Payroll (TSERS)	Pension Funding as Percent of State Payroll
1993	500,759,314	9405.4	5.32%	5,975,648,138	8.38%
1994	515,357,932	10268.4	5.02%	6,323,410,209	8.15%
1995	537,542,879	10055.5	5.35%	6,595,618,150	8.15%
1996	557,882,551	11,252.6	4.96%	6,845,184,671	8.15%
1997	600,957,576	12,015.3	5.00%	7,373,712,592	8.15%
1998	651,578,293	13,561.6	4.80%	7,994,825,684	8.15%
1999	449,726,707	14,561.7	3.09%	8,437,649,280	5.33%
2000	177,326,666	14,350.1	1.24%	9,001,353,605	1.97%
2001	0	15,135.3	0.00%	9,494,602,568	0.00%
2002	199,556,179	15,205.1	1.31%	9,734,447,779	2.05%
2003	218,782,720	15,930.8	1.37%	10,082,153,001	2.17%

Source: General Fund data from State Legislative Budget Summary
State Contribution and Payroll from Actuarial Reports

1. Nebraska

Background

Nebraska offers a frequently cited case study of the comparative returns from DB vs. DC plans. The public pension system in Nebraska is composed of five separate systems for various groups of employees, including school employees, judges, state patrol officers, county employees, and state employees. Three of the five systems were established as DB plans. Two systems functioned as DC plans from the early 1960s until 2002.

By the late 1990s, mounting evidence raised concerns that the DC plans were underperforming relative to the DB system, leaving retirees with inadequate resources and underutilizing taxpayer money contributed as matching funds. In 2000, the Nebraska Public Employees Retirement System (PERS) commissioned a study of the pension system in order to determine what changes, if any, should be made to ensure its future solvency. The particular value of the resulting study is that the 36-year time horizon provides an opportunity to chart the long-term outcomes of different pension plan types.

Study Findings

The PERS study found that Nebraska achieved an average annual return of 11% on the funds invested under its DB plans.⁶¹ By contrast, those individuals covered by the state's DC plan averaged 6% annual returns over the same period.⁶² The study identified a number of reasons for this significantly lower rate of return. Chief among them was the adversity to risk demonstrated by employees. Given 11 funds into which employees could place their money, three of the most conservative funds accounted for 90% of the invested money.⁶³ (Half of all employee money went into a low-risk/ low-yield "default" account used when the employees failed to make a selection on their own.) These low-yield options were overwhelmingly selected despite many opportunities to acquire basic investing skills, including paid time-off to attend investment education workshops.

The choice of low-risk options was only one of the causes identified for the poor performance of the DC pension funds. Another important factor was the higher administrative costs associated with the DC funds. On average, DC funds had a 1.4% associated administrative cost compared to a 0.3% cost for the DB funds administered by the state.⁶⁴ The increased administrative costs of the DC funds therefore accounted for over 20% of the difference in returns between the DB and the DC systems.

Still another problem with Nebraska's DC plan arose due to a phenomenon termed "leakage," or the tendency for employees to cash in their investment portfolios early. As a later treatment of the Nebraska case reveals, "68% of terminating participants cashed out their assets rather than rolling them over into another retirement plan."⁶⁵ It can be argued that this is a problem not with DC plans themselves, but rather with the choices made by employees within the plan. As seen with the overly cautious investing strategy of most employees though, leakage is a problem of the DC system as it functions in the real world. The overall result in the Nebraska case was that employees in the DC system retired with far lower benefits than did employees in the DB system, despite similar per-employee contributions from the state. An employee retiring under the DB system after 30 years received an annuity of \$16,797, while a comparable employee in the DC system received \$11,230.⁶⁶

⁶¹ Anderson, Gary W. and Brainard, Keith. *Profitable Prudence: The Case for Public Sector Defined Benefit Plans*, Pension Research Council Working Paper, 2004.

⁶² Ibid.

⁶³ NASRA White Paper, Myths and Misperceptions of Defined Benefit and Defined Contribution Plans, updated 2005.

⁶⁴ Utah Retirement System, Defined Benefit (DB) vs. Defined Contribution (DC) Plans.

⁶⁵ NASRA White Paper, Myths and Misperceptions of Defined Benefit and Defined Contribution Plans, updated 2005.

It is unclear whether these assets included both employer and employee contributions. In the North Carolina DB plan, employees may in fact cash out their assets, but are entitled only to their own contributions.

⁶⁶ Utah Retirement System, Defined Benefit (DB) vs. Defined Contribution (DC) Plans.

Current System⁶⁷

As a result of the PERS study, in 2002 the Nebraska Legislature switched the DC plans to a cash balance model for all new employees. Current employees were offered an option to switch to the cash balance model or remain in the previous DC plan. A cash balance model is considered a form of DB plan, though it functions as a hybrid DB/DC model, incorporating elements of both plan types.

The DB Systems

- Employees contribute 7.25% of payroll (11% for State Patrol).
- Employer (school district, for example) matches employee contributions at 101%, and the State contributes the equivalent of 0.7% of payroll plus additional amount as recommended by the state actuary (11% for State Patrol).
- Final benefits are calculated according to the formula:
(Average of highest 3 consecutive years of pay) x (Creditable Service Years) x (Formula Factor)
The Formula Factor for most employees is 2%, but for State Patrol is 3%.
- Employees are fully vested after five years; State Patrol after six years.
- If employees leave before vesting they are entitled to a lump sum payment equal to their contributions plus interest. They do not receive benefits.
- Normal retirement age is 65, but the “Rule of 85” applies, whereby any employee 55 years or older may retire with full benefits if their age plus years of service add to 85.
- State Patrol employees may retire at age 50 with 25 years service.
- Employees may retire early with reduced benefits if they have at least five years of creditable service and are 60 years or older.
- Cost of Living Adjustment (COLA) is possible dependent on changes in the Consumer Price Index, capped at 2.5% of benefits per year.
- Employees retiring at age 65 with 30 years service would receive a monthly benefit equal to 60% of their monthly pay during the three highest-paid years of employment. For an employee retiring at age 65 with 20 years of service, the figure would be 40% of their monthly pay during the three highest-paid years of employment.

For Both the DC and Hybrid DB/DC Systems

- Employees contribute 4.33% of salary and wages below \$19,954 and 4.8% thereafter.
- State matches employee contributions at a rate of 156%.
- Employees are fully vested after two years.

The DC System

- Employees choose among 11 state-selected mixes of equity and bond funds, and receive whatever returns these investments provide.

The Hybrid DC/DB System

- Employees enrolled in the DC system were offered an option to switch to the cash balance model or remain in the previous DC system.

⁶⁷ Nebraska Public Employees Retirement System (NPERS) Website,
<http://www.npers.ne.gov/public/planInformation/state/statePlanInfo.jsp>.

- The funds receive a rate of return equal to the Federal Midterm rate plus 1.5%.⁶⁸ (This portion of the plan design is essentially equivalent to the standard DC model. It is the final portion of the state's cash balance plan that introduces a component more typical of DB designs.)
- The state *guarantees* employees a minimum annual return of 5% regardless of account investment performance.

2. Florida

Background

Efforts to reform the Florida Retirement System (FRS) gained momentum in late 2001, as Governor Jeb Bush championed reform even as the system faced no immediate threats to solvency. During the debate over pension reform, the FRS lost significant portions of its investment in the Enron collapse of late 2001 (\$300 million) and the WorldCom collapse in 2002 (\$92 million).⁶⁹ These two shocks helped reduce the solvency of the FRS from \$98.2 billion at the end of FY 2001 to \$95.8 billion by the spring of 2002, and added to the financial problems facing the state.⁷⁰ Nevertheless, the pension system itself remained fully funded. Funded at a high of 118% in FY 1999-2000, by FY 2003-2004 the system was funded at 112%.⁷¹

In 2002, Florida created a DC system that would operate alongside its DB system, offering all employees (current and new) a one-time choice in pension plan. A second election option was added in 2003 to allow an additional opportunity to switch between plans. Starting in 2002, many state and local government employees in Florida were given three choices:

1. Stay in their DB plan
2. Move their balance to a new DC plan
3. Leave their balance in the DB plan, but put future contributions in the DC plan

Study Findings

A survey conducted by Watson Wyatt before the transition reported that employees' preferences were evenly split between DB and DC plans.⁷² Negative public perception of the stock market, however, led only 3.5% of existing employees to choose the

⁶⁸ The Federal Midterm Rate is reported monthly by the Treasury Department, and establishes rates for the loan of money over a 3-9 year period.

⁶⁹ James, Joni. "New Florida Retirement Plan May Include Market Option." *Miami Herald*. November 21, 2001.

⁷⁰ Ferrera, Peter. "Pension Liberation for Florida." *Policy Briefs*. Americans for Tax Reform. April 18, 2000. http://www.atr.org/policybriefs/041800pb_fl.html.

⁷¹ Office of Program Policy Analysis and Government Accountability, "Florida Retirement System Fully Funded and Valuation Met Standards", Report No. 05-25, April 2005

⁷² Ferrera, Peter. "Pension Liberation for Florida." *Policy Briefs*. Americans for Tax Reform. April 18, 2000. http://www.atr.org/policybriefs/041800pb_fl.html

new accounts between June 2002 and February 2003, moving \$280 million in assets.⁷³ Premiering at the end of the bear market limited the popularity of the new accounts, but they are gaining, as 18% of new hires during 2004 enrolled in the DC plan.⁷⁴ Significantly, since September 2002, new-hire active enrollments in the DC plan have outpaced active enrollment in the DB plan. “Active enrollments,” however, only account for 31% of all enrollments, as 69% of new employees in 2004 did not select a plan and were therefore placed in the DB plan by default.⁷⁵

Current System

Under both plans, employees contribute nothing; all contributions are made by the state. Existing employees were given a one-time, 90-day period during which to choose a plan. New hires are permitted a 180-day grace period before being required to name their choice of plan.

The DB System

- For 2004, employers paid 9.21% of payroll into the DB plan plus 0.94% into the Retiree Health Insurance Subsidy, totaling 10.15% of salary for Regular Class employees (90% of employees are Regular Class).
 - Special-Risk classes (fire and police) have a slightly higher payment for disability insurance.
- Vesting period is 10 years for Regular Class and Special-Risk employees; full benefits after 30 years with standard retirement age of 62 (or 25 years for Special-Risk employees with standard retirement age of 55).
 - Senior Management Class vested after 7 years; Elected Class vested after 8 years.
- 3% cost of living adjustment (COLA) made each July.
- The benefit amount is calculated based on the formula:
(Average of highest five years’ pay) x (creditable service years) x (Formula Factor),
Formula factor is currently 1.6% for Regular Class, and 3% for Special-Risk employees.
- A Regular Class worker retiring at age 62 with 30 years of service would receive a monthly benefit equal to 48% of the pay he or she received monthly during his or her highest-paid five years of employment.

The DC System

- Contribution (9%) paid in full by employer.
- Cannot be supplemented by employee contributions, though workers can contribute to employee-sponsored Section 457 deferred-compensation plans.
- Vested after 12 months.
- Transition: If employee has eight years of service or more, he or she can transfer present value of future benefits under DB to a DC account.

⁷³ SBA Florida (Ed.) *2004 Update on Choice in the Florida Pension System. Fact Sheet.* January, 12, 2005. www.sbafla.com/pdf/news/2004%20Update%20on%20Choice.pdf.

⁷⁴ Ibid.

⁷⁵ Ibid.

3. Michigan

Background

In 1996, Michigan moved its DB system to a DC model. Employees who began work before March 31, 1997, could remain in the state's DB program, but could opt into the DC system. Employees hired after that date were automatically enrolled in the DC system. Employees who left state work but returned would have the option of re-enrolling in the DB plan only if, when they were last employed by the state, they were enrolled and fully vested in the DB plan. In order to gain the support of workers, the state offered early retirement as a benefit of the DC system. Union officials estimate this brought a transition cost of \$270 million.

Beyond these two systems, teachers, state judges, and police officers have their own independent pension systems. The teachers' system is very similar in structure to the DB system, while the judges' system parallels the DC system. The police officers' plan represents a middle ground, with shorter vesting periods, earlier retirement, and a different formula for benefit calculation.

Only 5% of employees eligible to stay in the DB system have switched to DC. Like many other DC systems, account performance has mirrored the sluggish market. There are no noteworthy studies showing the difference in benefits that people have actually received.

The state is saving some money on the DC plan. The average employer contribution for the DB system is 10% of salary (ranging from 4%-10%); under the DC plan, the maximum contribution is 7%. If all employees enrolled in the DC plan rather than the DB plan, the state would save 3%-6% of payroll annually.

The DB System

- About two-thirds of state employees participate.
- The employer makes all contributions, averaging about 10% annually.
- Full vesting period is 10 years.
- Employees can retire in one of two situations:
 - 1) 55 years of age with 30 years of service, or 2) 60 years of age with 10 years of service
 - Early retirement is available, but only to employees with 15 to 30 years of service and age 55; employee accepts reduced benefits.
 - Special-risk employees may retire with full benefits after 25 years of service at any age, or at age 50 with at least 10 years of service.
- Annual benefits are determined by the formula:
 - Years of service x 1.5% x final average compensation
 - Final average compensation is the average salary of the employee's three highest-paid consecutive years.

- Formula for Special-risk employees varies slightly:
 - Multiplier is 2.0%.
 - Final average compensation is average salary of last two years, including overtime, and bonuses.
- As there is no employee contribution, employees who leave before vesting (10 years of full-time service) receive no pension whatsoever.
- A Regular Class worker retiring at age 55 with 30 years of service credit would receive a monthly benefit equal to 45% of his or her final average compensation.
- Members of this plan can also opt into a 401(k) or 457 Deferred Compensation plan for additional retirement savings.

The DC System

- About one-third of state employees participate.
- The state contributes 4% gross pay to an individual 401(k) account for each employee.
- Employees can choose to contribute up to an additional 20% of their salary to their account. The state will match the first 3% of these contributions.
- Employees are immediately vested for their contributions, and after four years are fully vested and own state contributions.
- The state offers free classes to employees on plan details, basic and advanced investing, and other topics in financial literacy.
- Employees can choose among a state-selected family of funds, or can opt to manage the accounts themselves.

Table 5: DB and DC Systems: Nebraska, Florida, Michigan, and North Carolina

	Nebraska	Florida	Michigan	North Carolina
<i>The DB Systems:</i>				
State Contribution	Employer = 7.25% State = 0.7% + actuarial recommendation	9.21%	4%-10% depending on employee and matching contributions	Determined by State Actuary (In FY 2003 = 3.42%)
Employee Contribution	7.25%	Employer makes all contributions	0%-3%	6%
Vesting Period	5 years	10 years	10 years	5 years
Retirement with Full Benefits	Rule of 85*	Rule of 85*	Rule of 85*	Rule of 85*
Approximate Replacement Rate**	60%	48%	45%	55%
<i>The DC Systems:</i>				
State Contribution	156% of employee contribution	9%	4% plus up to 3% matching	
Employee Contribution	4.33%-4.8% depending on pay level	Employer makes all contributions	Optional 20% total	
Vesting Period for Ownership of State Contributions	2 years	1 year	4 years	

*Employees 55 years or older may retire with full benefits if their age plus years of service equals 85.

**Based on retirement with full benefits under state plan.

APPENDIX 3: METHODOLOGY FOR CONSTRUCTING MODELS

1. Prototypical Workers

Our models examine nine prototypical employees. All starting salaries were kept constant at \$30,000.

<p><u>Spends Entire Career as State Employee.</u> <u>No Interruptions</u> Starting Salary \$30,000 Starting Age 25 Years of Service 30 Retirement Age 55 Years Receiving Benefits 28</p>	<p><u>Interrupts State Service on Two Occassions: 2-Year Break & 6-Year Break</u> Starting Salary \$30,000 Starting Age 25 Years of Service 22 Retirement Age 55 Years Receiving Benefits 28</p>
<p><u>Spends Entire Career as State Employee.</u> <u>No Interruptions</u> Starting Salary \$30,000 Starting Age 30 Years of Service 30 Retirement Age 60 Years Receiving Benefits 23</p>	<p><u>Interrupts State Service on Two Occassions: 2-Year Break & 6-Year Break</u> Starting Salary \$30,000 Starting Age 27 Years of Service 25 Retirement Age 60 Years Receiving Benefits 23</p>
<p><u>Spends Entire Career as State Employee.</u> <u>No Interruptions</u> Starting Salary \$30,000 Starting Age 35 Years of Service 30 Retirement Age 65 Years Receiving Benefits 18</p>	<p><u>Leaves State Employment After 6 Years</u> Starting Salary \$30,000 Starting Age 25 Years of Service 6 Retirement Age 65 Years Receiving Benefits 18</p>
<p><u>Interrupts Career for 5 Years</u> Starting Salary \$30,000 Starting Age 25 Years of Service 25 Retirement Age 55 Years Receiving Benefits 28</p>	<p><u>Leaves State Employment After 15 Years</u> Starting Salary \$30,000 Starting Age 25 Years of Service 15 Retirement Age 65 Years Receiving Benefits 18</p>
<p><u>Interrupts Career for 5 Years</u> Starting Salary \$30,000 Starting Age 30 Years of Service 25 Retirement Age 60 Years Receiving Benefits 23</p>	

2. Assumptions and Scenarios

All employees were assumed to maximize their voluntary contributions to DC and hybrid accounts. Table 6, on the following page, summarizes the contribution rates under each system.

Table 6: Common Assumption Used in Creating Models

Common Assumptions	
Employee Contribution: DB System	6.00%
Employee Contribution: DC System	4.00%
Employer Contribution: DC System	8.00%
Employee Contribution: Hybrid System	6.00%
Employer Contribution: Hybrid System	6.00%
Starting Salary	\$30,000

It is important to note that starting salary does affect the size of total state costs.

For each of the nine prototypical workers, we examine their experiences in the three plans under two distinct scenarios: an Expected Scenario and a Conservative Scenario. In the Expected Scenario, our assumptions are based on historical precedent.

Under the Expected Scenario, the assumed rates of return on the DB and DC systems are based on the historical nominal returns of Nebraska’s DB and DC systems. Salaries are assumed to increase at a pace slightly faster than inflation.

Under the Conservative Scenario, inflation rate, salary growth rate, and market performance of the DB system match the assumptions used by the North Carolina State Treasury’s consulting actuary. The actuary uses a range of 5.45% to 12.08% for salary growth rates to approximate how salaries change over an average career. Our model is unable to incorporate a dynamic salary growth rate. We chose the lower bound in order to minimize the differences between the scenarios. Future analysis might examine how dynamic salary growth rates would affect results.

Table 7 summarizes the two scenarios:

Table 7: Employee Scenarios

	Expected Scenario	Conservative Scenario
Inflation Rate	3.50%	3.75%
Salary Growth Rate	3.70%	5.50%
Market Performances of DB System	11.00%	7.25%
Market Performance of DC Accounts	6.00%	6.00%
Rate of Return on Annuity Principal*	4.00%	5.25%
Discount Rate for Employer Contributions*	3.50%	3.75%

*Used to determine costs of annuity at retirement

3. Defined Benefit (DB) Model

The annual benefit under the DB model is calculated as follows. First, we average the last four years' salaries based off of years of service and assumed salary increases. The average is then multiplied by the appropriate multiplier (0.0182 if eligible for full benefits), and by the years of service.

The annual benefit is guaranteed over the life of the retiree. Since everyone dies, on average, at their life expectancy, we assume that all of our prototypical workers die at their life expectancy as well. Like the State Treasury's consulting actuary, we refer to the 1983 Group Annuity Mortality Tables set forward one year to determine the number of years that the beneficiary will be receiving benefits. Given the number of years benefits are likely to be paid, and the size of the annual benefit, it is possible to calculate the cost of an annuity. We used the following formula to calculate that cost:

$$PV = \frac{C}{r-g} - \frac{C(1+g)^T}{r-g} \frac{1}{(1+r)^T} = C \left[\frac{1}{r-g} - \frac{(1+g)^T}{(r-g)(1+r)^T} \right]$$

where PV is the present value of the annuity, C is the annual retirement payment, r is the real rate of return on annuity principal, g is the growth rate of payments (inflation), and T is the number of years the retiree receives benefits.

Because North Carolina has traditionally granted COLAs consistent with inflation, our annuity increases the guaranteed annual benefit by the inflation rate each year. To determine total state cost, we subtract the value of the employee contributions at the year of retirement from the cost of the required annuity, and then discount for inflation to put the number in present dollar terms.

The end result is illustrated in Table 8 on the following page.

Table 8: Sample Output of DB Model

Variables			
Initial Salary		\$30,000	
Starting Age		25 years	
Years of Service		30 years	
Retirement Age		55 years	
Years Receiving Benefits		28 years	
 <u>DB Benefits</u>		<u>DB Costs</u>	
Last Four Years' Compensation (\$77,156 + \$80,011 + \$82,971 + \$86,041)	\$326,178.46	Required Annuity (Retirement Year Dollars)	\$509,927.91
Average Final Comp	\$81,544.61	Employee Contributions (Retirement Year Dollars)	\$515,893.67
Multiplier	0.0182	Cost of Annuity (Retirement Year Dollars)	(\$5,965.76)
Multiplier x Average Final Comp	\$1,484.11	Cost of Annuity (Current Dollars)	(\$2,125.47)
Annual Benefit	\$44,523.36		
Monthly Benefit	\$3,710.28		
Replacement Ratio	0.52		

4. Defined Contribution (DC) Model

The DC model examines the annual performance of an employee in the system, tracking wages, employee contributions, employer contributions, and assets in the DC retirement account. Table 9, on the next page, is an example of the model output for a hypothetical employee.

Table 9: Sample Output of DC Model

Variables						
	Initial Salary	\$30,000				
	Starting Age	25 years				
	Years of Service	30 years				
	Retirement Age	55 years				
	Years Receiving Benefits	28 years				
Year	Wage	Employee Contribution (%)	Employee Contribution (\$)	Employer Contribution (4% + matching)	Rate of Return	Assets at Year End
2007	\$30,000.00	4.00%	\$1,200.00	\$2,400.00	6.00%	\$3,699.00
2008	\$31,110.00	4.00%	\$1,244.40	\$2,488.80	6.00%	\$7,756.80
2009	\$32,261.07	4.00%	\$1,290.44	\$2,580.89	6.00%	\$12,200.00
2010	\$33,454.73	4.00%	\$1,338.19	\$2,676.38	6.00%	\$17,056.97
2011	\$34,692.55	4.00%	\$1,387.70	\$2,775.40	6.00%	\$22,357.98
2012	\$35,976.18	4.00%	\$1,439.05	\$2,878.09	6.00%	\$28,135.32
2013	\$37,307.30	4.00%	\$1,492.29	\$2,984.58	6.00%	\$34,423.43
2014	\$38,687.67	4.00%	\$1,547.51	\$3,095.01	6.00%	\$41,259.03
2015	\$40,119.11	4.00%	\$1,604.76	\$3,209.53	6.00%	\$48,681.25
2016	\$41,603.52	4.00%	\$1,664.14	\$3,328.28	6.00%	\$56,731.84
2017	\$43,142.85	4.00%	\$1,725.71	\$3,451.43	6.00%	\$65,455.27
2018	\$44,739.13	4.00%	\$1,789.57	\$3,579.13	6.00%	\$74,898.92
2019	\$46,394.48	4.00%	\$1,855.78	\$3,711.56	6.00%	\$85,113.29
2020	\$48,111.08	4.00%	\$1,924.44	\$3,848.89	6.00%	\$96,152.19
2021	\$49,891.19	4.00%	\$1,995.65	\$3,991.30	6.00%	\$108,072.90
2022	\$51,737.16	4.00%	\$2,069.49	\$4,138.97	6.00%	\$120,936.47
2023	\$53,651.44	4.00%	\$2,146.06	\$4,292.11	6.00%	\$134,807.88
2024	\$55,636.54	4.00%	\$2,225.46	\$4,450.92	6.00%	\$149,756.33
2025	\$57,695.09	4.00%	\$2,307.80	\$4,615.61	6.00%	\$165,855.52
2026	\$59,829.81	4.00%	\$2,393.19	\$4,786.38	6.00%	\$183,183.87
2027	\$62,043.51	4.00%	\$2,481.74	\$4,963.48	6.00%	\$201,824.86
2028	\$64,339.12	4.00%	\$2,573.56	\$5,147.13	6.00%	\$221,867.37
2029	\$66,719.67	4.00%	\$2,668.79	\$5,337.57	6.00%	\$243,405.95
2030	\$69,188.30	4.00%	\$2,767.53	\$5,535.06	6.00%	\$266,541.22
2031	\$71,748.27	4.00%	\$2,869.93	\$5,739.86	6.00%	\$291,380.25
2032	\$74,402.95	4.00%	\$2,976.12	\$5,952.24	6.00%	\$318,036.95
2033	\$77,155.86	4.00%	\$3,086.23	\$6,172.47	6.00%	\$346,632.49
2034	\$80,010.63	4.00%	\$3,200.43	\$6,400.85	6.00%	\$377,295.75
2035	\$82,971.02	4.00%	\$3,318.84	\$6,637.68	6.00%	\$410,163.82
2036	\$86,040.95	4.00%	\$3,441.64	\$6,883.28	6.00%	\$445,382.50

To determine the annual benefit, we use the following annuity formula:

$$PV = \frac{C}{r-g} - \frac{C(1+g)^T}{r-g} \frac{1}{(1+r)^T} = C \left[\frac{1}{r-g} - \frac{(1+g)^T}{(r-g)(1+r)^T} \right]$$

In this example, we solve for C (the annual retirement payment) instead of PV . PV is known by the employee's final "Assets at End of Year" (in this case, \$445,382.50).

Total state costs under the DC system are determined by discounting the annual contributions for inflation, and summing them.

In the models presented in Appendix 5, we determine the rate of return required on the DC accounts that would result in a replacement rate equal to the DB system. This is a process of deduction. The assumed market performance for DC accounts is raised until the replacement rate of the DC or hybrid system equals the replacement rate of the DB system. The state contribution percentage required to make replacement rates of the DC system equal to the DB replacement rate (see Appendix 5) is determined in the same manner.

5. Hybrid Model

As our hybrid system is a "safety net" system, it promises a guaranteed retirement benefit equal to one-third of what the employee would have received under a traditional DB plan. It also features an add-on DC-style account. As such, our hybrid model largely builds upon the results of our DB and DC models.

To determine the size of the DB portion of the hybrid system, the annual benefit calculated in the DB model is multiplied by one-third. As with the DB system, we then determine the total annuity size required to pay the guaranteed annual benefit. Next, we determine total state costs of the DB portion by subtracting the value of the employee contributions at the year of retirement from the cost of the required annuity, and then discounting for inflation to put the number in present dollar terms.

The DC portion of the hybrid system is calculated using the same methodology as in our DC model. Table 10, on the following page, provides an example of the model output for a hypothetical employee (same one used in the DC example).

Table 10: Sample Output of Hybrid DB/DC Model

Variables

Initial Salary	\$30,000
Starting Age	25 years
Years of Service	30 years
Retirement Age	55 years
Years Receiving Benefits	28 years

<u>DB Portion</u>					<u>DC Portion</u>					
Year	Wage	Employee Contribution (%)	Employee Contribution (\$)	Rate of Return	Assets at Year End	Employee Contribution (%)	Employee Contribution (\$)	Employer Contribution (matching)	Rate of Return	Assets at Year End
2007	\$30,000.00	2.00%	\$600.00	11.00%	\$630.25	4.00%	\$1,200.00	\$1,200.00	6.00%	\$2,466.00
2008	\$31,110.00	2.00%	\$622.20	11.00%	\$1,353.15	4.00%	\$1,244.40	\$1,244.40	6.00%	\$5,171.20
2009	\$32,261.07	2.00%	\$645.22	11.00%	\$2,179.74	4.00%	\$1,290.44	\$1,290.44	6.00%	\$8,133.33
2010	\$33,454.73	2.00%	\$669.09	11.00%	\$3,122.34	4.00%	\$1,338.19	\$1,338.19	6.00%	\$11,371.31
2011	\$34,692.55	2.00%	\$693.85	11.00%	\$4,194.63	4.00%	\$1,387.70	\$1,387.70	6.00%	\$14,905.32
2012	\$35,976.18	2.00%	\$719.52	11.00%	\$5,411.84	4.00%	\$1,439.05	\$1,439.05	6.00%	\$18,756.88
2013	\$37,307.30	2.00%	\$746.15	11.00%	\$6,790.91	4.00%	\$1,492.29	\$1,492.29	6.00%	\$22,948.95
2014	\$38,687.67	2.00%	\$773.75	11.00%	\$8,350.67	4.00%	\$1,547.51	\$1,547.51	6.00%	\$27,506.02
2015	\$40,119.11	2.00%	\$802.38	11.00%	\$10,112.08	4.00%	\$1,604.76	\$1,604.76	6.00%	\$32,454.17
2016	\$41,603.52	2.00%	\$832.07	11.00%	\$12,098.43	4.00%	\$1,664.14	\$1,664.14	6.00%	\$37,821.23
2017	\$43,142.85	2.00%	\$862.86	11.00%	\$14,335.62	4.00%	\$1,725.71	\$1,725.71	6.00%	\$43,636.84
2018	\$44,739.13	2.00%	\$894.78	11.00%	\$16,852.43	4.00%	\$1,789.57	\$1,789.57	6.00%	\$49,932.61
2019	\$46,394.48	2.00%	\$927.89	11.00%	\$19,680.87	4.00%	\$1,855.78	\$1,855.78	6.00%	\$56,742.19
2020	\$48,111.08	2.00%	\$962.22	11.00%	\$22,856.50	4.00%	\$1,924.44	\$1,924.44	6.00%	\$64,101.46
2021	\$49,891.19	2.00%	\$997.82	11.00%	\$26,418.85	4.00%	\$1,995.65	\$1,995.65	6.00%	\$72,048.60
2022	\$51,737.16	2.00%	\$1,034.74	11.00%	\$30,411.83	4.00%	\$2,069.49	\$2,069.49	6.00%	\$80,624.31
2023	\$53,651.44	2.00%	\$1,073.03	11.00%	\$34,884.26	4.00%	\$2,146.06	\$2,146.06	6.00%	\$89,871.92
2024	\$55,636.54	2.00%	\$1,112.73	11.00%	\$39,890.36	4.00%	\$2,225.46	\$2,225.46	6.00%	\$99,837.56
2025	\$57,695.09	2.00%	\$1,153.90	11.00%	\$45,490.38	4.00%	\$2,307.80	\$2,307.80	6.00%	\$110,570.35
2026	\$59,829.81	2.00%	\$1,196.60	11.00%	\$51,751.25	4.00%	\$2,393.19	\$2,393.19	6.00%	\$122,122.58
2027	\$62,043.51	2.00%	\$1,240.87	11.00%	\$58,747.32	4.00%	\$2,481.74	\$2,481.74	6.00%	\$134,549.91
2028	\$64,339.12	2.00%	\$1,286.78	11.00%	\$66,561.18	4.00%	\$2,573.56	\$2,573.56	6.00%	\$147,911.58
2029	\$66,719.67	2.00%	\$1,334.39	11.00%	\$75,284.58	4.00%	\$2,668.79	\$2,668.79	6.00%	\$162,270.63
2030	\$69,188.30	2.00%	\$1,383.77	11.00%	\$85,019.41	4.00%	\$2,767.53	\$2,767.53	6.00%	\$177,694.15
2031	\$71,748.27	2.00%	\$1,434.97	11.00%	\$95,878.86	4.00%	\$2,869.93	\$2,869.93	6.00%	\$194,253.50
2032	\$74,402.95	2.00%	\$1,488.06	11.00%	\$107,988.61	4.00%	\$2,976.12	\$2,976.12	6.00%	\$212,024.64
2033	\$77,155.86	2.00%	\$1,543.12	11.00%	\$121,488.28	4.00%	\$3,086.23	\$3,086.23	6.00%	\$231,088.33
2034	\$80,010.63	2.00%	\$1,600.21	11.00%	\$136,532.88	4.00%	\$3,200.43	\$3,200.43	6.00%	\$251,530.50
2035	\$82,971.02	2.00%	\$1,659.42	11.00%	\$153,294.58	4.00%	\$3,318.84	\$3,318.84	6.00%	\$273,442.55
2036	\$86,040.95	2.00%	\$1,720.82	11.00%	\$171,964.56	4.00%	\$3,441.64	\$3,441.64	6.00%	\$296,921.67

Note that in the hybrid model, the Employer Contribution to the DC portion matches the Employee Contribution. We follow the same steps as in the DC model to determine annual benefits and total state costs for the DC portion of the hybrid system.

Following these steps, the benefits and costs of each portion of the hybrid system are summed in order to provide the total annual benefit, total employee contributions, and total state costs under the hybrid system.

Appendix 4: Transition Cost Estimate

In determining the transition cost, we used a simple though functional model. The analysis is severely limited, however, by the amount of available data.

In this calculation, we assumed that the switch from defined benefit to defined contribution was mandatory for all employees. Doing so provides an upper bound on the transition cost. We treat the past contributions of the total workforce as if they would have been matched by the state and placed in individual DC accounts. We use the average career length (10.4 years) of all current state employees in 2004⁷⁶ and their average salary⁷⁷ to determine the amount which would have been put into their individual DC accounts. We use a compound interest formula to simulate the worth of these accounts. The value of these accounts is used as the initial value of each employee's DC account. The total transition cost for the system is then determined by multiplying this amount with the number of active employees (see Table 11).

Table 11: Transition Costs for State to Switch from a DB to DC System*

Parameter	State Employees	State Teachers
Number of Employees (2002)	159,265	134,480
Average Annual Salary	\$34,979	\$35,140
Contribution Rate	10%	10%
Rate of Return	7.25%	7.25%
Cost for Individual Employee	\$45,570	\$52,077
Subtotal Costs	\$7.26 billion	\$7.00 billion
Total Approximate Cost	\$14.26 billion	

*Source: Actuarial Reports, State of North Carolina, 2003.

The calculated costs total \$14.3 billion. The projected costs are twice as high as the \$7.1 billion of assets currently in the DB funds.⁷⁸ This gap can be explained best with an analogy to a saving and loans bank. Although a bank might be financially healthy, it would not be able satisfy all the claims if all of its customers withdrew their savings at once. In a case of a switch of all employees, the state has to value all claims immediately instead of paying yearly instalments to the newly retired.

One can assume that the actual accrued claims are higher. First, employees at the end of a 30-year career have higher benefits under a DB system than under a DC system. Although the legal implications are not clear, it is likely that this economic loss must be balanced if the state is making the switch mandatory. Our calculations do not account for this factor. Second, the existing DB system includes survivor and disability benefits, and additionally, guarantees payments until the death of retirees. These promises have a quantifiable value, and would have to be included in the initial DC accounts.

⁷⁶ North Carolina Office of State Employees (<http://www.osp.state.nc.us/data/stats/start.htm>).

We assume the average career length for teachers is the same.

⁷⁷ Own calculation based on the Report of the State Actuary.

⁷⁸ State Actuary Report 2003.

APPENDIX 5: RESULTS OF MODELING PENSION PLANS

Our models examine a series of prototypical workers. For each prototypical worker, we examine their experiences in the three plans under two distinct scenarios: an Expected Scenario and a Conservative Scenario. In the Expected Scenario, our assumptions are based on historical precedent. In the Conservative Scenario, we use North Carolina's actuarial assumptions. Both scenarios are summarized below:

<u>Assumptions</u>	Expected Scenario	Conservative Scenario
Inflation Rate	3.50%	3.75%
Salary Growth Rate	3.70%	5.50%
Market Performances of DB System	11.00%	7.25%
Market Performance of DC Accounts	6.00%	6.00%
Rate of Return on Annuity Principal*	4.00%	5.25%
Discount Rate for Employer Contributions*	3.50%	3.75%

*Used to determine costs of annuity at retirement

Criterion 1: Maintain or Increase Retirement Benefits

Prototypical Worker Who Spends Entire Career as State Employee, No Interruptions

Starting Salary \$30,000
 Starting Age 25
 Years of Service 30
 Retirement Age 55
 Years Receiving Benefits 28

	Expected Scenario			Conservative Scenario		
	<u>DB System</u>	<u>DC System</u>	<u>Hybrid System</u>	<u>DB System</u>	<u>DC System</u>	<u>Hybrid System</u>
Last Income	\$86,041	\$86,041	\$86,041	\$141,724	\$141,724	\$141,724
Annual Benefit	\$44,523	\$17,641	\$26,602	\$71,538	\$25,467	\$40,824
Replacement Rate	0.52	0.21	0.31	0.50	0.18	0.29
Total Nominal Employee Contributions	\$96,040	\$64,026	\$96,040	\$130,384	\$86,923	\$130,384
Assumed Return on Contributions	11.00%	6.00%	7.67%	7.25%	6.00%	6.42%
Required Return on DC Portion ¹	N/A	11.50%	11.50%	N/A	12.45%	12.45%

¹ Return on DC accounts required to make replacement rates of DC and Hybrid systems equal to DB replacement rate.

Prototypical Worker Who Spends Entire Career as State Employee, No Interruptions

Starting Salary \$30,000
 Starting Age 30
 Years of Service 30
 Retirement Age 60
 Years Receiving Benefits 23

	Expected Scenario			Conservative Scenario		
	<u>DB System</u>	<u>DC System</u>	<u>Hybrid System</u>	<u>DB System</u>	<u>DC System</u>	<u>Hybrid System</u>
Last Income	\$86,041	\$86,041	\$86,041	\$141,724	\$141,724	\$141,724
Annual Benefit	\$44,523	\$21,225	\$28,991	\$71,538	\$29,975	\$43,830
Replacement Rate	0.52	0.25	0.34	0.50	0.21	0.31
Total Nominal Employee Contributions	\$96,040	\$64,026	\$96,040	\$130,384	\$86,923	\$130,384
Assumed Return on Contributions	11.00%	6.00%	7.67%	7.25%	6.00%	6.42%
Required Return on DC Portion ¹	N/A	10.50%	10.50%	N/A	11.50%	11.50%

¹ Return on DC accounts required to make replacement rates of DC and Hybrid systems equal to DB replacement rate.

Prototypical Worker Who Spends Entire Career as State Employee, No Interruptions

Starting Salary \$30,000
 Starting Age 35
 Years of Service 30
 Retirement Age 65
 Years Receiving Benefits 18

Expected Scenario

Conservative Scenario

	<u>DB System</u>	<u>DC System</u>	<u>Hybrid System</u>	<u>DB System</u>	<u>DC System</u>	<u>Hybrid System</u>
Last Income	\$86,041	\$86,041	\$86,041	\$141,724	\$141,724	\$141,724
Annual Benefit	\$44,523	\$26,801	\$32,708	\$71,538	\$37,017	\$48,524
Replacement Rate	0.52	0.31	0.38	0.50	0.26	0.34
Total Nominal Employee Contributions	\$96,040	\$64,026	\$96,040	\$130,384	\$86,923	\$130,384
Assumed Return on Contributions	11.00%	6.00%	7.67%	7.25%	6.00%	6.42%
Required Return on DC Portion ¹	N/A	9.10%	9.10%	N/A	10.20%	10.20%

¹ Return on DC accounts required to make replacement rates of DC and Hybrid systems equal to DB replacement rate.

Prototypical Worker Who Interrupts Career for 5 Years

Starting Salary **\$30,000**
 Starting Age **25**
 Years of Service **25**
 Retirement Age **55**
 Years Receiving Benefits **28**

	Expected Scenario			Conservative Scenario		
	<u>DB System¹</u>	<u>DC System</u>	<u>Hybrid System</u>	<u>DB System¹</u>	<u>DC System</u>	<u>Hybrid System</u>
Last Income	\$86,041	\$86,041	\$86,041	\$141,724	\$141,724	\$141,724
Annual Benefit	\$25,972	\$14,235	\$18,148	\$41,730	\$21,073	\$27,958
Replacement Rate	0.30	0.17	0.21	0.29	0.15	0.20
Total Nominal Employee Contributions	\$84,418	\$56,279	\$84,418	\$117,254	\$78,169	\$117,254
Assumed Return on Contributions	11.00%	6.00%	7.67%	7.25%	6.00%	6.42%
Required Return on DC Portion ²	N/A	9.90%	9.90%	N/A	10.70%	10.70%

¹ Benefit reduced due to early retirement (multiplier reduced from 0.0182 to 0.01274).

² Return on DC accounts required to make replacement rates of DC and Hybrid systems equal to DB replacement rate.

Prototypical Worker Who Interrupts Career for 5 Years

Starting Salary **\$30,000**
 Starting Age **30**
 Years of Service **25**
 Retirement Age **60**
 Years Receiving Benefits **23**

	Expected Scenario			Conservative Scenario		
	<u>DB System</u>	<u>DC System</u>	<u>Hybrid System</u>	<u>DB System</u>	<u>DC System</u>	<u>Hybrid System</u>
Last Income	\$86,041	\$86,041	\$86,041	\$141,724	\$141,724	\$141,724
Annual Benefit	\$37,103	\$17,127	\$23,785	\$59,615	\$24,803	\$36,407
Replacement Rate	0.43	0.20	0.28	0.42	0.18	0.26
Total Nominal Employee Contributions	\$84,418	\$56,279	\$84,418	\$117,254	\$78,169	\$117,254
Assumed Return on Contributions	11.00%	6.00%	7.67%	7.25%	6.00%	6.42%
Required Return on DC Portion ¹	N/A	10.90%	10.90%	N/A	12.00%	12.00%

¹ Return on DC accounts required to make replacement rates of DC and Hybrid systems equal to DB replacement rate.

Prototypical Worker Who Interrupts State Service on Two Occassions: 2-Year Break & 6-Year Break

Starting Salary **\$30,000**
 Starting Age **25**
 Years of Service **22**
 Retirement Age **55**
 Years Receiving Benefits **28**

	Expected Scenario			Conservative Scenario		
	<u>DB System¹</u>	<u>DC System</u>	<u>Hybrid System</u>	<u>DB System¹</u>	<u>DC System</u>	<u>Hybrid System</u>
Last Income	\$86,041	\$86,041	\$86,041	\$141,724	\$141,724	\$141,724
Annual Benefit	\$22,855	\$12,301	\$15,819	\$36,723	\$18,469	\$24,553
Replacement Rate	0.27	0.14	0.18	0.26	0.13	0.17
Total Nominal Employee Contributions	\$76,670	\$51,113	\$76,670	\$108,005	\$72,003	\$108,005
Assumed Return on Contributions	11.00%	6.00%	7.67%	7.25%	6.00%	6.42%
Required Return on DC Portion ²	N/A	10.20%	10.20%	N/A	11.00%	11.00%

¹ Benefit reduced due to early retirement (multiplier reduced from 0.0182 to 0.01274).

² Return on DC accounts required to make replacement rates of DC and Hybrid systems equal to DB replacement rate.

Prototypical Worker Who Interrupts State Service on Two Occassions: 2-Year Break & 6-Year Break

Starting Salary **\$30,000**
 Starting Age **27**
 Years of Service **25**
 Retirement Age **60**
 Years Receiving Benefits **23**

	Expected Scenario			Conservative Scenario		
	<u>DB System</u>	<u>DC System</u>	<u>Hybrid System</u>	<u>DB System</u>	<u>DC System</u>	<u>Hybrid System</u>
Last Income	\$95,949	\$95,949	\$95,949	\$166,418	\$166,418	\$166,418
Annual Benefit	\$41,375	\$19,356	\$26,696	\$70,002	\$29,190	\$42,794
Replacement Rate	0.43	0.20	0.28	0.42	0.18	0.26
Total Nominal Employee Contributions	\$93,332	\$62,221	\$93,332	\$136,425	\$90,950	\$136,425
Assumed Return on Contributions	11.00%	6.00%	7.67%	7.25%	6.00%	6.42%
Required Return on DC Portion ¹	N/A	10.50%	10.50%	N/A	11.60%	11.60%

¹ Return on DC accounts required to make replacement rates of DC and Hybrid systems equal to DB replacement rate.

Prototypical Worker Who Leaves State Employment After 6 Years

Starting Salary **\$30,000**
 Starting Age **25**
 Years of Service **6**
 Retirement Age **65**
 Years Receiving Benefits **18**

	Expected Scenario			Conservative Scenario		
	<u>DB System</u>	<u>DC System</u>	<u>Hybrid System</u>	<u>DB System</u>	<u>DC System</u>	<u>Hybrid System</u>
Last Income	\$35,976	\$35,976	\$35,976	\$39,209	\$39,209	\$39,209
Annual Benefit	\$3,723	\$12,276	\$9,425	\$3,958	\$14,021	\$10,667
Replacement Rate	0.10	0.34	0.26	0.10	0.36	0.27
Total Nominal Employee Contributions	\$11,850	\$7,900	\$11,850	\$12,398	\$8,266	\$12,398
Assumed Return on Contributions	11.00%	6.00%	7.67%	7.25%	6.00%	6.42%
Required Return on DC Portion ¹	N/A	N/A	N/A	N/A	N/A	N/A

¹ Return on DC accounts required to make replacement rates of DC and Hybrid systems equal to DB replacement rate.

Prototypical Worker Who Leaves State Employment After 15 Years

Starting Salary **\$30,000**
 Starting Age **25**
 Years of Service **15**
 Retirement Age **65**
 Years Receiving Benefits **18**

	Expected Scenario			Conservative Scenario		
	<u>DB System</u>	<u>DC System</u>	<u>Hybrid System</u>	<u>DB System</u>	<u>DC System</u>	<u>Hybrid System</u>
Last Income	\$49,891	\$49,891	\$49,891	\$63,483	\$63,483	\$63,483
Annual Benefit	\$12,909	\$27,911	\$22,910	\$16,022	\$34,321	\$28,221
Replacement Rate	0.26	0.56	0.46	0.25	0.54	0.44
Total Nominal Employee Contributions	\$35,249	\$23,500	\$35,249	\$40,336	\$26,890	\$40,336
Assumed Return on Contributions	11.00%	6.00%	7.67%	7.25%	6.00%	6.42%
Required Return on DC Portion ¹	N/A	N/A	N/A	N/A	N/A	N/A

¹ Return on DC accounts required to make replacement rates of DC and Hybrid systems equal to DB replacement rate.

Criterion 2: Maintain or Reduce State Contributions to a Pension System

Prototypical Worker Who Spends Entire Career as State Employee, No Interruptions

Starting Salary \$30,000
 Starting Age 25
 Years of Service 30
 Retirement Age 55
 Years Receiving Benefits 28

Expected Scenario

Conservative Scenario

	<u>DB System</u>	<u>DC System</u>	<u>Hybrid System</u>	<u>DB System</u>	<u>DC System</u>	<u>Hybrid System</u>
Last Income	\$86,041	\$86,041	\$86,041	\$141,724	\$141,724	\$141,724
Annual Benefit	\$44,523	\$17,641	\$26,602	\$71,538	\$25,467	\$40,824
Replacement Rate	0.52	0.21	0.31	0.50	0.18	0.29
Total State Cost (Present Value) ¹	-\$2,125	\$71,550	\$35,067	\$297,828	\$89,376	\$143,964
State Contribution Rate	6.50%	8.00%	6.00%	6.50%	8.00%	6.00%
Level Replacement Rate State Contribution (%) ²	N/A	26.50%	18.30%	N/A	29.50%	20.50%

¹ Difference between employee contributions and annuity cost (DB), or present value of employer contributions (DC).

² State contribution required to make replacement rates of DC and Hybrid systems equal to DB replacement rate.

Prototypical Worker Who Spends Entire Career as State Employee, No Interruptions

Starting Salary \$30,000
 Starting Age 30
 Years of Service 30
 Retirement Age 60
 Years Receiving Benefits 23

Expected Scenario

Conservative Scenario

	<u>DB System</u>	<u>DC System</u>	<u>Hybrid System</u>	<u>DB System</u>	<u>DC System</u>	<u>Hybrid System</u>
Last Income	\$86,041	\$86,041	\$86,041	\$141,724	\$141,724	\$141,724
Annual Benefit	\$44,523	\$21,225	\$28,991	\$71,538	\$29,975	\$43,830
Replacement Rate	0.52	0.25	0.34	0.50	0.21	0.31
Total State Cost (Present Value) ¹	-\$14,616	\$71,550	\$30,903	\$249,554	\$89,376	\$127,873
State Contribution Rate	6.50%	8.00%	6.00%	6.50%	8.00%	6.00%
Level Replacement Rate State Contribution (%) ²	N/A	21.50%	14.80%	N/A	24.50%	17.10%

¹ Difference between employee contributions and annuity cost (DB), or present value of employer contributions (DC).

² State contribution required to make replacement rates of DC and Hybrid systems equal to DB replacement rate.

Prototypical Worker Who Spends Entire Career as State Employee, No Interruptions

Starting Salary **\$30,000**
 Starting Age **35**
 Years of Service **30**
 Retirement Age **65**
 Years Receiving Benefits **18**

Expected Scenario

Conservative Scenario

	<u>DB System</u>	<u>DC System</u>	<u>Hybrid System</u>	<u>DB System</u>	<u>DC System</u>	<u>Hybrid System</u>
Last Income	\$86,041	\$86,041	\$86,041	\$141,724	\$141,724	\$141,724
Annual Benefit	\$44,523	\$26,801	\$32,708	\$71,538	\$37,017	\$48,524
Replacement Rate	0.52	0.31	0.38	0.50	0.26	0.34
Total State Cost (Present Value)¹	-\$32,337	\$71,550	\$24,996	\$192,570	\$89,376	\$108,878
State Contribution Rate	6.50%	8.00%	6.00%	6.50%	8.00%	6.00%
Level Replacement Rate State Contribution (%)²	N/A	16.00%	11.30%	N/A	19.20%	13.40%

¹ Difference between employee contributions and annuity cost (DB), or present value of employer contributions (DC).

² State contribution required to make replacement rates of DC and Hybrid systems equal to DB replacement rate.

Prototypical Worker Who Interrupts Career for 5 Years

Starting Salary \$30,000
 Starting Age 25
 Years of Service 25
 Retirement Age 55
 Years Receiving Benefits 28

Expected Scenario

Conservative Scenario

	<u>DB System¹</u>	<u>DC System</u>	<u>Hybrid System</u>	<u>DB System¹</u>	<u>DC System</u>	<u>Hybrid System</u>
Last Income	\$86,041	\$86,041	\$86,041	\$141,724	\$141,724	\$141,724
Annual Benefit	\$25,972	\$14,235	\$18,148	\$41,730	\$21,073	\$27,958
Replacement Rate	0.30	0.17	0.21	0.29	0.15	0.20
Total State Cost (Present Value) ²	-\$34,477	\$59,798	\$18,407	\$147,975	\$76,369	\$87,509
State Contribution Rate	6.50%	8.00%	6.00%	6.50%	8.00%	6.00%
Level Replacement Rate State Contribution (%) ³	N/A	18.00%	12.60%	N/A	19.70%	13.80%

¹ Benefit reduced due to early retirement (multiplier reduced from 0.0182 to 0.01274).

² Difference between employee contributions and annuity cost (DB), or present value of employer contributions (DC).

³ State contribution required to make replacement rates of DC and Hybrid systems equal to DB replacement rate.

Prototypical Worker Who Interrupts Career for 5 Years

Starting Salary \$30,000
 Starting Age 30
 Years of Service 25
 Retirement Age 60
 Years Receiving Benefits 23

Expected Scenario

Conservative Scenario

	<u>DB System</u>	<u>DC System</u>	<u>Hybrid System</u>	<u>DB System</u>	<u>DC System</u>	<u>Hybrid System</u>
Last Income	\$86,041	\$86,041	\$86,041	\$141,724	\$141,724	\$141,724
Annual Benefit	\$37,103	\$17,127	\$23,785	\$59,615	\$24,803	\$36,407
Replacement Rate	0.43	0.20	0.28	0.42	0.18	0.26
Total State Cost (Present Value) ¹	\$533	\$59,798	\$30,077	\$210,207	\$76,369	\$108,253
State Contribution Rate	6.50%	8.00%	6.00%	6.50%	8.00%	6.00%
Level Replacement Rate State Contribution (%) ²	N/A	22.00%	15.30%	N/A	24.90%	17.20%

¹ Difference between employee contributions and annuity cost (DB), or present value of employer contributions (DC).

² State contribution required to make replacement rates of DC and Hybrid systems equal to DB replacement rate.

Prototypical Worker Who Interrupts State Service on Two Occassions: 2-Year Break & 6-Year Break

Starting Salary \$30,000
 Starting Age 25
 Years of Service 22
 Retirement Age 55
 Years Receiving Benefits 28

Expected Scenario

Conservative Scenario

	<u>DB System¹</u>	<u>DC System</u>	<u>Hybrid System</u>	<u>DB System¹</u>	<u>DC System</u>	<u>Hybrid System</u>
Last Income	\$86,041	\$86,041	\$86,041	\$141,724	\$141,724	\$141,724
Annual Benefit	\$22,855	\$12,301	\$15,819	\$36,723	\$18,469	\$24,553
Replacement Rate	0.27	0.14	0.18	0.26	0.13	0.17
Total State Cost (Present Value) ²	-\$24,656	\$52,710	\$18,137	\$131,320	\$68,194	\$77,870
State Contribution Rate	6.50%	8.00%	6.00%	6.50%	8.00%	6.00%
Level Replacement Rate State Contribution (%) ³	N/A	18.50%	12.90%	N/A	19.90%	13.90%

¹ Benefit reduced due to early retirement (multiplier reduced from 0.0182 to 0.01274).

² Difference between employee contributions and annuity cost (DB), or present value of employer contributions (DC).

³ State contribution required to make replacement rates of DC and Hybrid systems equal to DB replacement rate.

Prototypical Worker Who Interrupts State Service on Two Occassions: 2-Year Break & 6-Year Break

Starting Salary \$30,000
 Starting Age 27
 Years of Service 25
 Retirement Age 60
 Years Receiving Benefits 23

Expected Scenario

Conservative Scenario

	<u>DB System</u>	<u>DC System</u>	<u>Hybrid System</u>	<u>DB System</u>	<u>DC System</u>	<u>Hybrid System</u>
Last Income	\$95,949	\$95,949	\$95,949	\$166,418	\$166,418	\$166,418
Annual Benefit	\$41,375	\$19,356	\$26,696	\$70,002	\$29,190	\$42,794
Replacement Rate	0.43	0.20	0.28	0.42	0.18	0.26
Total State Cost (Present Value) ¹	-\$9,895	\$60,096	\$26,749	\$220,133	\$79,850	\$113,303
State Contribution Rate	6.50%	8.00%	6.00%	6.50%	8.00%	6.00%
Level Replacement Rate State Contribution (%) ²	N/A	21.50%	15.10%	N/A	24.80%	17.20%

¹ Difference between employee contributions and annuity cost (DB), or present value of employer contributions (DC).

² State contribution required to make replacement rates of DC and Hybrid systems equal to DB replacement rate.

Prototypical Worker Who Leaves State Employment After 6 Years

Starting Salary \$30,000
 Starting Age 25
 Years of Service 6
 Retirement Age 65
 Years Receiving Benefits 18

Expected Scenario

Conservative Scenario

	<u>DB System</u>	<u>DC System</u>	<u>Hybrid System</u>	<u>DB System</u>	<u>DC System</u>	<u>Hybrid System</u>
Last Income	\$35,976	\$35,976	\$35,976	\$39,209	\$39,209	\$39,209
Annual Benefit	\$3,723	\$12,276	\$9,425	\$3,958	\$14,021	\$10,667
Replacement Rate	0.10	0.34	0.26	0.10	0.36	0.27
Total State Cost (Present Value) ¹	-\$133,527	\$13,980	-\$37,519	-\$25,999	\$14,478	-\$1,427
State Contribution Rate	6.50%	8.00%	6.00%	6.50%	8.00%	6.00%
Level Replacement Rate State Contribution (%) ²	N/A	N/A	N/A	N/A	N/A	N/A

¹ Difference between employee contributions and annuity cost (DB), or present value of employer contributions (DC).

² State contribution required to make replacement rates of DC and Hybrid systems equal to DB replacement rate.

Prototypical Worker Who Leaves State Employment After 15 Years

Starting Salary \$30,000
 Starting Age 25
 Years of Service 15
 Retirement Age 65
 Years Receiving Benefits 18

Expected Scenario

Conservative Scenario

	<u>DB System</u>	<u>DC System</u>	<u>Hybrid System</u>	<u>DB System</u>	<u>DC System</u>	<u>Hybrid System</u>
Last Income	\$49,891	\$49,891	\$49,891	\$63,483	\$63,483	\$63,483
Annual Benefit	\$12,909	\$27,911	\$22,910	\$16,022	\$34,321	\$28,221
Replacement Rate	0.26	0.56	0.46	0.25	0.54	0.44
Total State Cost (Present Value) ¹	-\$240,823	\$35,257	-\$62,646	-\$40,415	\$39,111	\$6,084
State Contribution Rate	6.50%	8.00%	6.00%	6.50%	8.00%	6.00%
Level Replacement Rate State Contribution (%) ²	N/A	N/A	N/A	N/A	N/A	N/A

¹ Difference between employee contributions and annuity cost (DB), or present value of employer contributions (DC).

² State contribution required to make replacement rates of DC and Hybrid systems equal to DB replacement rate.