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The key issue in this report is the impact of a proposed new retirement system on the retention of Navy civilian employees. The second issue discussed is the linkage of micro and mainframe computers in the overall decision modeling process. Finally, the paper reviews the relationship of these studies to the planned development of more comprehensive human resource supply-demand planning systems.

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RESEARCH REPORT NO. 45

DECISION INFORMATION SUPPORT FOR A COMPREHENSIVE RETIREMENT SYSTEM CONVERSION

BY

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OFFICE OF CHIEF OF NAVAL OPERATIONS, (OP-16H)

WASHINGTON, D.C. 20350

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Washington, DC 20350

14 February 1986

FORWARD

Research Report No. 45 was prepared as part of the activities
of the Assistant for Human Resources Analysis (OP-16H). The key
issue discussed in this report is the impact of a proposed new
retirement system on the retention of Navy civilian employees.
The paper reviews the relationship of these studies to the planned
development of more comprehensive human resource supply-demand
planning systems.

This report is approved for public release.

RICHARD J. NIEHAUS
Assistant for Human
Resources Analysis (OP-16H)

I. INTRODUCTION

There are a number of simultaneous events which are increasing the awareness of the Federal work force toward private sector opportunities. Among these are: Congressional review of the Civil Service Retirement System (CSRS), the development of a new portable retirement system linked with Social Security, a compensation system which lags private sector comparability, and the rapid growth of new technology. (In order to assist the reader, a glossery of terms is provided as Table 1.)

The Federal retirement program, a major component of the compensation system, is designed to promote and reward career service. Significant changes to the Federal retirement program are being considered by Congress. These proposed changes include reducing current CSRS benefits and designing a new three tier retirement system (Social Security, defined benefit plan, and a thrift plan) for employees hired since January 1984. This paper will discuss the development and use of large scale modeling systems to evaluate the impacts of the proposed three tier retirement system on Navy's civilian work force. These impacts are of high level concern since the Navy employs over 325,000 civil servants, many of whom are in high technology jobs.

This paper will address three research issues. The key issue is the impact of the proposed new retirement system on the retention of Navy civilian employees. The influences of uncertain and cyclical labor markets and the tastes and preferences of the Navy work force are key factors in this analysis. The second issue is the linkage of micro and mainframe

GLOSSARY OF TERMS

Annual Cost of Leaving Model	ACOL
Civil Service Retirement System	CSRS
Consumer Price Index	CPI
Cost of Living Allowance	COLA
Current Population Survey	CPS
Gross National Product	GNP
Individual Retirement Account	IRA
Navy's Availability Dynamics Model	NAVDYN
Navy's Civilian Decision Support System	CIVDSS
Navy's Civilian Occupational Planning Estimate System	COPES
Navy's Computer Assisted Manpower Analysis System	CAMAS
Navy's Retirement Calculation Model	RETCALC

TABLE 1

computers in the overall decision modeling process. The third issue reviews the relationship of these studies to the planned development of more comprehensive human resource supply-demand planning systems to provide continuing long term information support.

The use of large-scale human resource supply-demand modeling systems for corporate planning is a recent phenomenon. For example, see Niehaus (1985) for a collection of papers discussing emerging applications of such systems for human resource policy analysis. In addition to the work reported in this paper, there have been extensive efforts, particularly in the area of military personnel retention. For example, see Fernandez, Gotz and Bell (1985), who provide a management review of the Annual Cost of Leaving (ACOL) regression models and suggest improvements to include the behavioral characteristics of the members who choose military service. This latter model (also see Gotz and McCall (1984)) departs from the ACOL approach by using a dynamic programming model to make projections of the retention of U.S. Air Force officers. Further, Arnold, Black and Warner (1985) have developed an ACOL II model concerned with the long term retention of Department of Defense civilians.

The work reported in this paper has its roots in the combination of internal personnel planning methods developed by the U.S. Navy (Charnes, Cooper, and Niehaus (1972), Niehaus (1979)) with external labor market models orginating in the American Telephone and Telegraph Company (Atwater and Sheridan (1980)). The result of this work has been named the Civilian Occupational Planning Estimate System (COPES). An earlier paper

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by Atwater, Bres, and Niehaus (1985) provided a programmatic description of the external labor market portions of this system. That paper includes a prototype application of one of the models needed for analysis of the impact of proposed Federal civilian retirement policies on the Navy's civilian work force.

II. MANAGEMENT ISSUES

One of the key management issues in assessing retirement options is determining the impact on employee turnover. Fundamentally, this involves the individuals choice of whether he is better off staying in the organization, retiring, or pursuing another job opportunity in the labor market. Other management issues include cost control, resource allocation, and productivity. The dynamic nature of these issues makes assessment of retirement options difficult.

Models and forecasting systems are useful analytical tools that can assist management in quantifying the impact of alternative retirement options. The feasibility of developing these models include the: (1) availability of personnel data, (2) software to support the analysis, (3) ability to define the issues, and (4) timing and cost to produce the required analysis. Both quantative and nonquantative analysis are necessary to address the management issues involved in assessing retirement options.

III. APPROACH

Two approaches are addressed in this paper. One at the employee level and one at the corporate level. These approaches are then merged in developing the results presented in the case

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study. A microcomputer system using data base management software (dBase III) provides the means to quantify and capture key decision making values at the individual participant levels. The results are use to identify the "flex" points in the stay/leave decision for different employee groups and to calibrate the mainframe computer modeling system for simulating and forecasting overall retention decisions under alternative retirement options. The employee level model has been named the Retirement Calculation (RETCALC) model. The RETCALC model is a subsystem of COPES. The corporate level retention model has been named the Navy Availability Dynamics (NAVDYN) model. The RETCALC/NAVDYN models consist of two separate but interrelated components as shown in Figure 1. Both subsystems will be extended to allow on-line interactive use.

The RETCALC model compares an individual's retirement annuity under the current CSRS, an alternative CSRS, and a new multiple part retirement program. The alternative CSRS and the new multiple part retirement program have flexible elements that allow the comparison of monetary benefits under different retirement scenarios. The flexible elements in the alternative CSRS option elements include: accrual rates, minimum retirement age limits, penalty amounts for early retirement, and contribution rate elements. The new multiple part retirement program consists of a defined benefit plan (employer contribution only), Social Security, and a thrift plan. The multiple part program includes flexible minimum retirement age limits, penalty levels for early retirement, flexible accrual rates, employee and employer contribution rates to the thrift plan, and thrift

RETCALC/NAVDYN MODELS

RETCALC

(INDIVIDUAL)

	INPUT	OUTPUT
RETIREMENT	– CSRS → ANNUITY	– AGE
	CSRS PROPOSALS	LENGTH OF SERVICE
	NEW CSRS	

NAVDYN

(NAVY-WIDE)

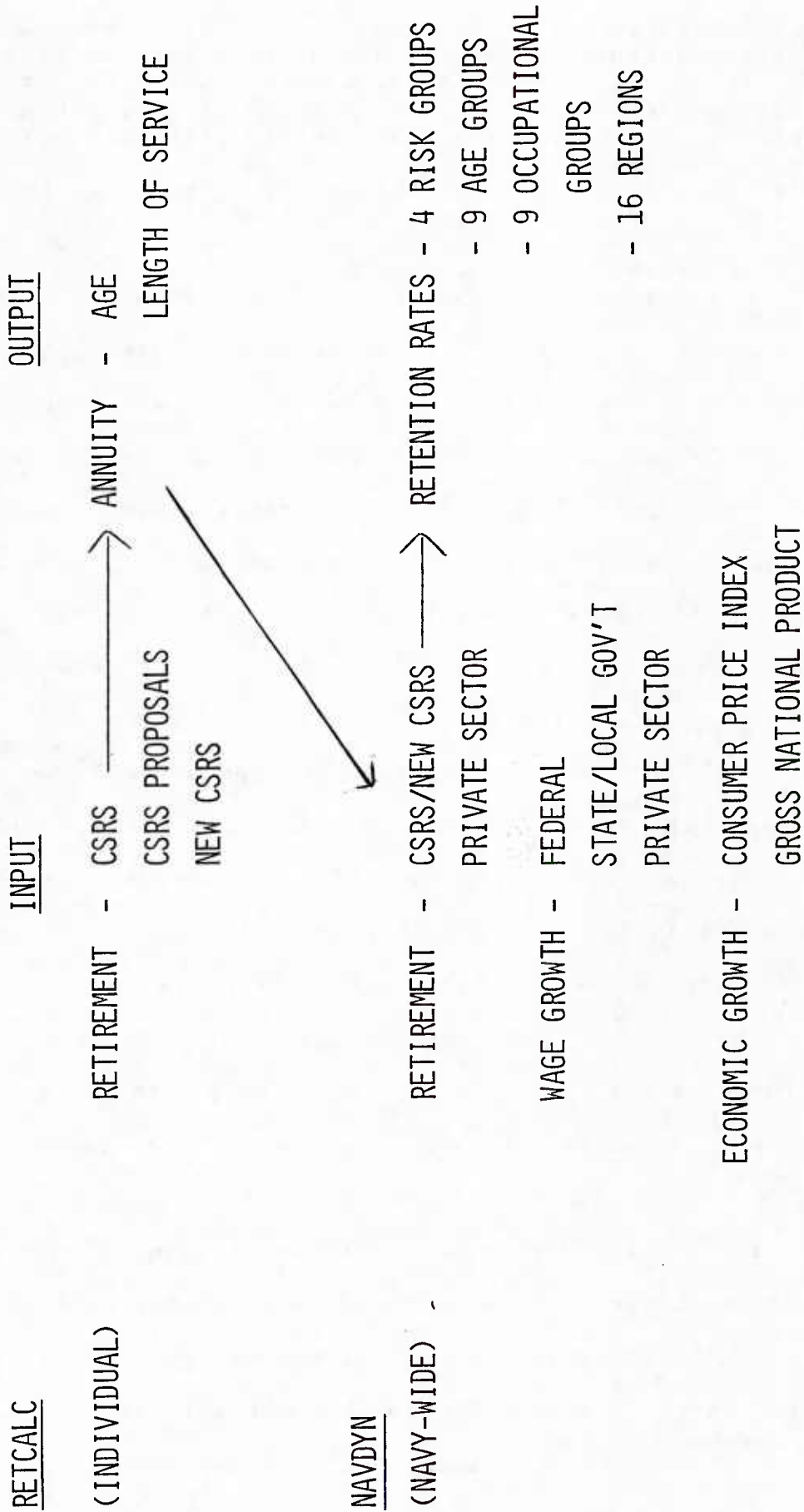|	INPUT	OUTPUT
RETIREMENT	– CSRS/NEW CSRS → RETENTION RATES	– 4 RISK GROUPS
	PRIVATE SECTOR	– 9 AGE GROUPS
WAGE GROWTH	– FEDERAL	– 9 OCCUPATIONAL GROUPS
	STATE/LOCAL GOV'T	– 16 REGIONS
	PRIVATE SECTOR	
ECONOMIC GROWTH	– CONSUMER PRICE INDEX	
	GROSS NATIONAL PRODUCT	

FIGURE 1

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plan growth elements. The annuity amounts are computed by age and length of service. Multiple reports are printed and files are retained so that comparisons of an individual's contributions and benefits under alternative retirement programs can be graphed and analyzed.

The NAVDYN model is a labor supply model which identifies choices for employee groups and determines the impact of retirement program changes in terms of external loss rates. NAVDYN compare outside job opportunities to employee's current job opportunities. This model approaches the problem of choice between job opportunities from a monetary perspective. Unlike other models, it also incorporates both non-monetary choices and uncertainty about the future. A key factor in the identification of the "best" job opportunity is compensation. In this paper, compensation includes both salary and benefits. Other factors include non-monetary characteristics of jobs, such as work environment, personal (non-task) considerations, and technology. All these factors are dynamic in nature. Compensation levels and relative job opportunities change over time. (See the earlier papers by Atwater, et.al. (1980), (1982), (1984) for a discussion of how non-monetary characteristics can be included in the models.)

NAVDYN uses employee salary and annuity comparisons developed by the RETCALC model as the data base for determining the stay/leave behavior for nine major occupational groups. NAVDYN compares Navy salary and retirement annuity data to both other government and private sector salary and retirement

opportunities.This comparison also includes economic factors such as the Consumer Price Index and the Gross National Product. The model uses estimated salaries for Navy, other government, and the private sector for each occupational group by region to separate employees into four risk groups. The risk groups range from the most susceptible to least likely to leave Navy civilian service. External loss rates are then projected for each risk group.

The RETCALC/NAVDYN models identify those employee groups most susceptible to leave in the aggregate and broken down by occupational group, region and length of service. In addition, the models address the retention issue for future career civil servants without a CSRS contribution lock. The CSRS contribution lock is the effect of the unavailability of cumulative Government contributions until retirement eligibility. This contribution lock has historically penalized mid and late career civil servants who leave the Federal sector by only refunding the employees' contributions. The CSRS contribution lock is a disincentive for civilian employees to seek alternative opportunities in the private sector.

The RETCALC/NAVDYN models also address the issue of portable retirement benefits. Unlike the current retirement system, the new retirement system will be portable since Social Security is transferrable to the private sector and the thrift plan can be converted to an individual retirement account (IRA) or certain private sector retirement systems. The proposed new retirement program will increase the civilian work forces sensitivity to relative changes in private and public sector employment conditions.

IV. MODEL INPUT DATA

Two extensive data bases were constructed to develop, validate, and use the RETCALC/NAVDYN models. The RETCALC models data base includes 175 individual cases. The data for each case includes an individual's age, length of service, and career salary pattern. These cases represent the current demographics of the Navy's civilian work force. The RETCALC output consists of an evaluation of four different retirement programs for each case consistent with the types of programs under review by Congress. Thus, a total of 700 different combinations were used to calibrate the coefficients used in the overall NAVDYN modeling analysis.

The data base for the NAVDYN consists of several very large data files covering both the internal Navy work force and the external labor markets throughout the United States. The internal Navy work force data were developed using the Computer-Assisted Manpower Analyses System (CAMAS). Two cohort files were constructed by occupation, career level group, and length-of-service for the sixteen regional areas in which the Navy employs civilians. These files consist of data for a beginning cohort and its remainder at the end of each subsequent year. The first file which covers 1975-1983, includes an initial population of 247,953 Navy civilian employees and contains approximately 1.4 million records. The second file covering 1980-1984, has an initial population of 296,372 employees and contains approximately 0.8 million records. The results from the 1975-83 file were used to test and validate the NAVDYN model. The 1980-

1984 file was used to develop the results for actual policy analysis.

The public data files used in NAVDYN were extracted from the March Current Population Surveys (CPS) for 1976-1984. This period is consistent with periods covered on the Navy files. In aggregate, over one million records of household data containing special survey occupation and wage variables are included. In addition, published Gross National Product (GNP) and Consumer Price Index (CPI) data were used. GNP and CPI projections were made after reviewing a number of published national forecasts.

V. VALIDATION AND TESTING

The RETCALC/NAVDYN models were developed under a short time frame with frequent changes in response to Congressional deliberations on both the CSRS and new retirement systems. Consequently, there was limited development and testing time. The development effort yielded models which could sufficiently differentiate between retirement program alternatives to assist in the analysis of legislative options. It was possible to replicate previous loss patterns using the base case. Technical improvements are desirable if the RETCALC/NAVDYN models are used for situations requiring accuracy normally needed for operational decision making.

Numerous validation runs were made to analyze retention behavior. The NAVDYN model was tested by comparing actual losses from the 1975-1983 Navy cohort file with model results for the same period. The results are encouraging for persons between twenty and sixty years of age. The initial modeling approach for the youngest and oldest age groups is being reexamined. Future

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analysis will use separate models for these age groups.

Another type of preliminary study was a sensitivity check of the principal modeling variables grouped into benefit related and wage related subsets. All of these variables are intended to measure the willingness of an individual to leave the employment system. The benefit related variables include: cumulative contributions to the current retirement program, benefit loss due to exiting the current retirement program, and available second pensions in alternative job opportunities. The wage related variables include the change in government wages relative to other wage opportunities in the private sector. The most sensitive factor is the lost benefit from exiting the current retirement program. To our knowledge, this fact is significant new information not explictly known before. In the future compensation analysts should pay more attention to the current pension increase foregone (after becoming eligible for full vesting) when an employee decides to leave his present job.

A separate analysis was done to calculate the effect of a large relative private sector wage increase over the life span of employment. Figure 2 shows the impact of a ten percent relative private sector wage advantage for different age groups. Increased employee losses resulting from this relative wage difference are most significant at the early and late career stages.

Vl. RESULTS

A number of retirement scenarios were examined using the RETCALC/NAVDYN models to determine the impact on Navy's civilian work force. Federal employees hired prior to January 1984 are

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IMPACT OF 10% PRIVATE WAGE INCREASE
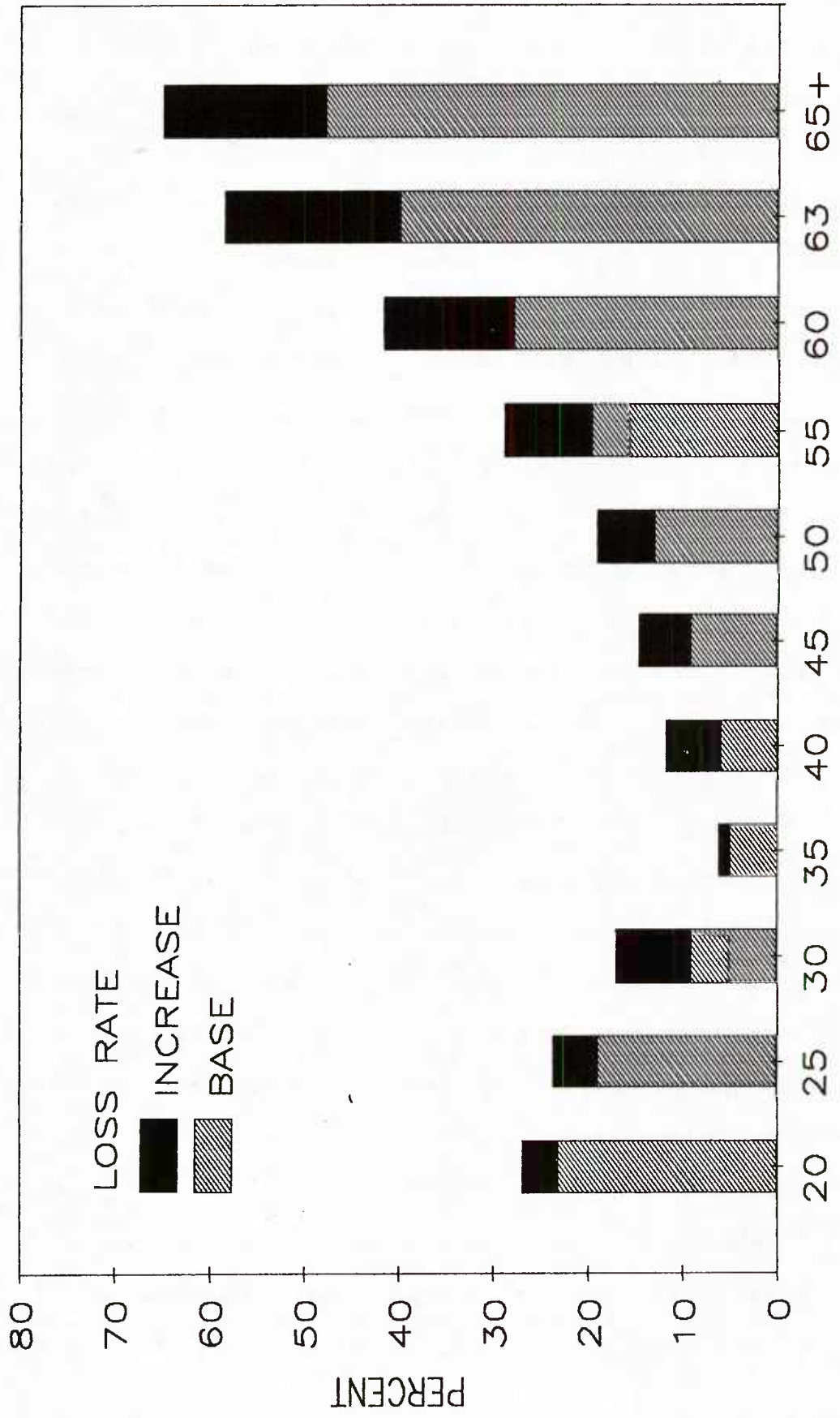EXTERNAL LOSS INCREASE OVER BASE CASE

FIGURE 2

covered by the Civil Service Retirement System (CSRS). Federal employees hired since January 1984 are covered by an interim retirement program which includes Social Security. Congress is designing a permanent retirement system for these post 1983 employees which will include Social Security, a defined benefit plan, and a thrift plan. This paper presents the analysis of the design options for this new retirement system as proposed by the Senate Government Affairs Committee and the House Post Office and Civil Service Committee. These design options for the new retirement system are significantly different than current CSRS provisions.

The Navy data base for the final analyses was the 1980-1984 civilian personnel cohort file. After calibration with data from the 1980-1984 file, the model was used to project behavior of a base population of personnel on board as of December 31, 1983. Although this base population includes employees under the current CSRS, these employees were projected under the proposed new retirement programs because they reflect the full composition of the Navy civilian work force. Use of this full work force population is one of the few approaches that can compare alternative retirement programs covering employees hired after January 1984 in all phases of their careers.

The current CSRS and Congressional proposals for a new retirement system are summarized in Figure 3. The current system and proposed alternatives are labeled as follows:

```
CSRS    - Civil Service Retirement System (current system)
SENATE A - Senate Option A (proposed new system)
SENATE B - Senate Option B              "
HOUSE   - House Proposal                "
```

COMPARISON OF SENATE AND HOUSE RETIREMENT PROPOSALS

	CURRENT CSRS	SENATE PROPOSAL		HOUSE PROPOSAL
		OPTION A	OPTION B	
Social Security	Medicare Coverage Only	Add-on Plan	Add-on Plan	Add-on Plan
Basic Pension Plan	Defined Benefit Plan	Defined Benefit Plan	Defined Benefit Plan	Defined Benefit Plan
	5 Year Vesting	5 Year Vesting	5 Year Vesting	5 Year Vesting
	Accrual Base	Accrual Base	Accrual Base	Accrual Base
	● High 3 Year Average Salary	● High 5 Year Average Salary	● High 5 Year Average Salary	● High 3 Year Average Salary
	Accrual Rate	Accrual Rate	Accrual Rate	Accrual Rate
	● 1-5 Yrs, 1.5% ● 5-10 Yrs, 1.75% ● 10+ Yrs, 2.0%	● 1-15 Yrs, .9% ● 15+ Yrs, 1.1%	● 1-15 Yrs, .9% ● 15+ Yrs, 1.1%	● 1.0% All Years
	7% Employee Contribution	No Employee Contribution	Employee Contribution Formula of 7.0% - OASDI Contribution	Employee Contribution Formula of 7.0% - OASDI Contribution
			● 1.3% to Social Security Wage Base ● 7.0% Our Wage Base	● Flat 1.3% Contribution Regardless of Wage Base

FIGURE 3

SENATE PROPOSAL

	CURRENT CSRS	OPTION A	OPTION B	HOUSE PROPOSAL
	Normal Retirement	Normal Retirement	Normal Retirement	Normal Retirement
	• 55 with 30 yrs • 60 with 20 yrs • 62 with 5 yrs	• 62 with 5 yrs	• 55 with 30 yrs • 62 with 5 yrs	• 55 with 30 yrs • 60 with 20 yrs • 62 with 5 yrs
	No Voluntary Early Retirement	Voluntary Early Retirement	Voluntary Early Retirement	No Voluntary Early Retirement
		• 55 with 30 yrs, 2% penalty up to 62 • 55 with 10 yrs, 5% penalty up to 62	• 55 with 10 yrs, 5% penalty up to age 62	
	COLA, Full CPI	COLA	COLA	COLA, Full CPI
		• 55-61, No CPI • 62-66, CPI - 2% • 67+, Full CPI	• 55-61, CPI - 2% • 62+, Full CPI	
Capital Accumulation Plan	None	Tax Deferred Savings Plan	Tax Deferred Savings Plan	Savings Plan
		Employee Contribution Up to 10%	Employee Contribution to 10%	Employee Contribution up to 10%
		Employer Matches Employee Contribution up to 5%	Employer Matches Employee Contribution up to 6%	Employer Matches Employee Contribution up to 6%
		• 1-5% matched 100% • 6-10% not matched	• 1% matched 100% • 2-3% matched 50% • 4-6% matched 25% • 7-10% not matched	• 1-6% matched 100% • 7-10% not matched
Voluntary Transitional Provisions	None	Employees credit in current CSRS is frozen and employee begins credit in new system.	Same	Employees in current CSRS may not join new system. Employees may join savings plan without employer matching.

FIGURE 3 (continued)

The NAVDYN model produced a number of loss reports for each of the four alternatives. These reports included projected losses by year across an eight year period from 1985-1992 for: (a) total population (b) length of service groups, (c) major occupation groups, and (d) selected geographic regions.

Figure 4 shows the aggregate loss by year under the alternative retirement programs. These results show that the two Senate alternatives produce larger projected losses in the initial years with subsequently smaller losses in the later years of the eight year period which is projected. The age and length of service penalities increase early period losses because retirement eligible employees leave rather than accept new age eligibility standards. Another reason for these loss rates is that the employer matching of employee thrift plan contributions are vested on a graduated basis. The employee becomes entitled to the employer's matching contributions at a rate of 20% per year during the first five years reaching 100% after 5 years. The impact of the Senate retirement proposals rapidly drains the retirement eligible pool as external opportunities for alternative private sector employment and leisure become relatively more attractive.

The House proposal appears to offer considerably higher benefits accruals to covered employees than the Senate options. This proposal excludes age and length of service penalities. The tastes and preferences of individuals for the program increase as it is fully installed. The net projected effect of the House proposal as shown on Figure 4 is a slightlty increased retention rate over the CSRS base case.

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PROJECTED EXTERNAL LOSS RATES 1985 – 1992

LEGEND
CSRS
SENATE A
SENATE B
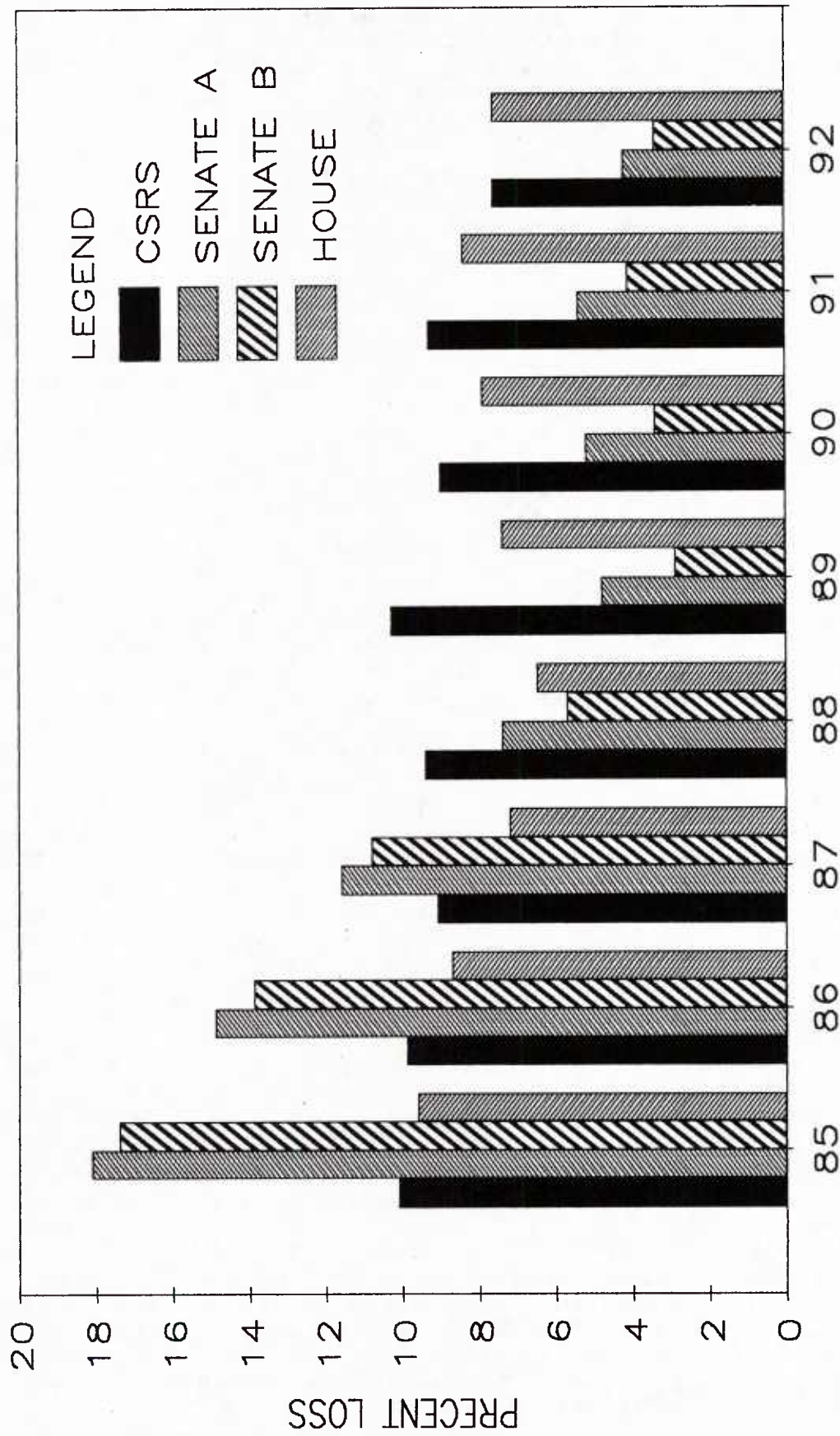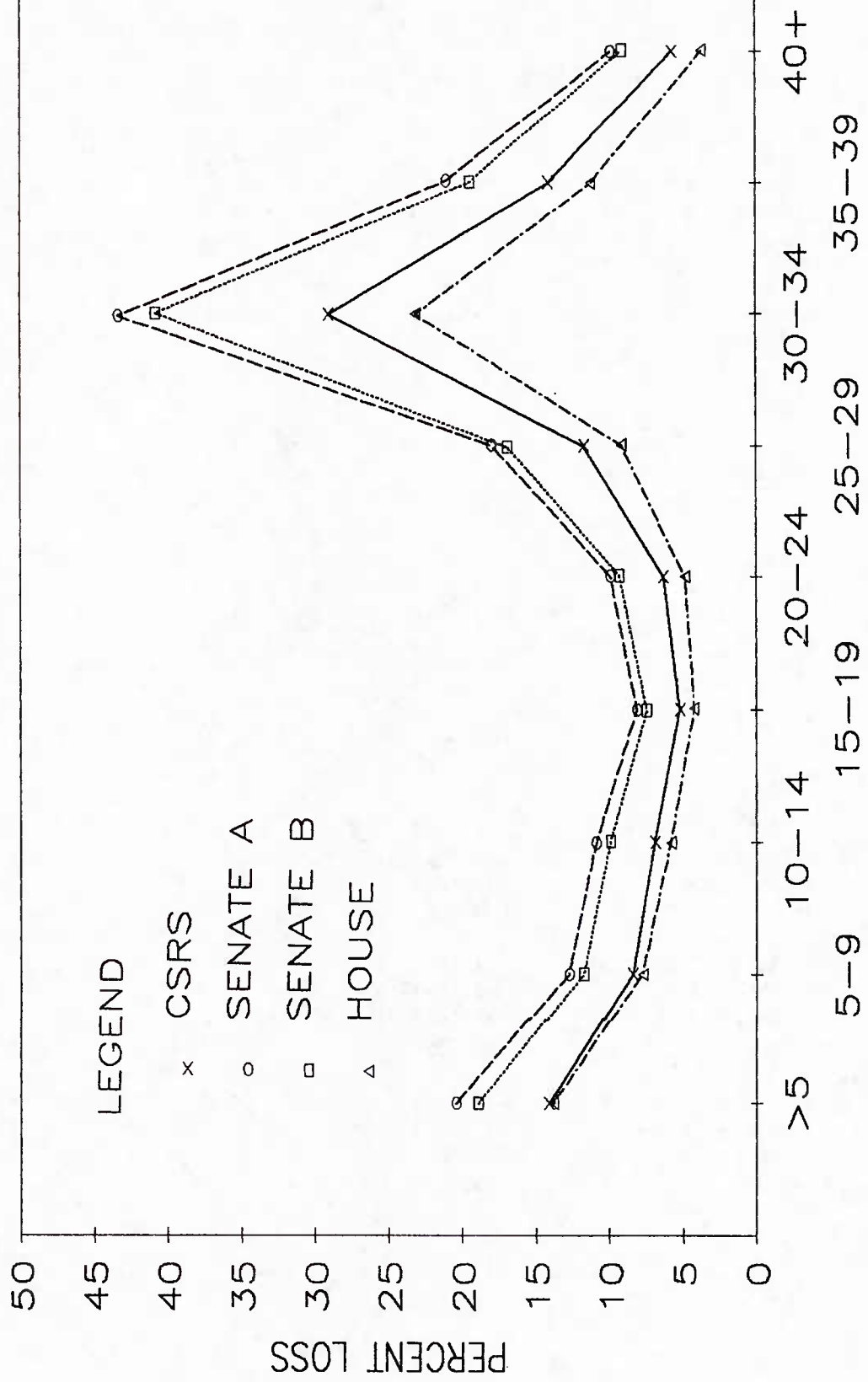HOUSE

PRECENT LOSS

YEAR
FIGURE 4

A single year (1986) was selected for exposition of the length of service projections shown in Figure 5. In this case the early year of the projection was used so that a relatively large number of the retirement eligibles would still be in place. The pattern is as expected on Figure 5 with the greatest number of losses indicated at the early career and retirement eligible stages. The Senate proposals, less generous than the House proposal, produce higher losses over the entire career life cycle. A long term cost benefit to the Government of less generous plans is that fewer people who start employment will stay long enough to collect a pension other than Social Security and the vesting in the thrift plans.

Projections by major occupation group can also be produced. While not shown, the projected pattern of losses over time follows the same trends shown on Figure 4 with higher losses for some alternatives in the earlier years than in subsequent years. There are fewer losses projected for the professional and skilled occupations than for occupations with fewer entry requirements. The less generous retirement plans again produce higher losses throughout. In these cases the overall losses for less skilled personnel are higher. However, the projected additional losses for the highly skilled personnel is particularly troublesome to the Navy since these people where more much more difficult to recruit.

Table 2 compares loss data for three different regions: Region 1 (Southern California - Arizona); Region 9 (Greater Washington D.C.); and Region 10 (Tidewater Virginia). The

PROJECTED EXTERNAL LOSS RATES
BY LENGTH OF SERVICE — 1986

LENGTH OF SERVICE GROUPS
FIGURE 5

LEGEND

×	CSRS
○	SENATE A
□	SENATE B
△	HOUSE

PERCENT LOSS

TABLE 2

EXTERNAL LOSS RATES BY REGION

YEAR/SCENARIO	SO. CA/ARIZONA	WASHINGTON DC	NORFOLK VA
1985			
CSRS	0.101	0.094	0.162
SENATE A	0.182	0.165	0.292
SENATE B	0.175	0.159	0.280
HOUSE	0.096	0.091	0.153
1986			
CSRS	0.099	0.091	0.158
SENATE A	0.149	0.136	0.240
SENATE B	0.139	0.127	0.222
HOUSE	0.086	0.081	0.138
1987			
CSRS	0.091	0.083	0.146
SENATE A	0.116	0.107	0.185
SENATE B	0.108	0.099	0.173
HOUSE	0.072	0.067	0.114
1988			
CSRS	0.094	0.085	0.152
SENATE A	0.073	0.067	0.117
SENATE B	0.056	0.051	0.090
HOUSE	0.065	0.060	0.104
1989			
CSRS	0.103	0.094	0.164
SENATE A	0.048	0.042	0.077
SENATE B	0.028	0.024	0.046
HOUSE	0.074	0.067	0.119
1990			
CSRS	0.089	0.083	0.142
SENATE A	0.051	0.045	0.083
SENATE B	0.033	0.029	0.054
HOUSE	0.079	0.071	0.127
1991			
CSRS	0.092	0.086	0.076
SENATE A	0.054	0.048	0.006
SENATE B	0.041	0.035	0.066
HOUSE	0.084	0.077	0.134
1992			
CSRS	0.075	0.071	0.000
SENATE A	0.041	0.038	0.000
SENATE B	0.033	0.029	0.054
HOUSE	0.076	0.068	0.111

differences in the external loss rates reflect the characteristics of the age and length of service of the Navy civilian work force in the region. The same pattern of losses associated with each of the retirement program alternatives persists across the regions.

The projected loss results under these alternatives retirement programs appear to be consistent since larger losses are projected for the less generous plans. The study shows that Navy civilians react as one might expect when one changes economic benefits. Higher losses to other job and leisure opportunities are projected when pay and retirement benefits are reduced as suggested by the Senate options. Better retention is projected for the House proposal where the benefits are somewhat comparable to the current CSRS. The results show that it may be possible to develop a new alternative retirement system that would produce similar losses to the current CSRS at a lower cost to the Government.

It is emphasized again that the base population for this study provides a representative rather than an actual situation relating to the Navy work force. Of the 308,400 Navy U.S. citizen full time employees on-board on December 31, 1984, approximately 273,100 or 89 percent were still covered by the old CSRS. This means that the full impact on the Navy of any of the new retirement system proposals will not occur for some time to come. The level of retirement benefits appears to have a direct effect on the stay/leave decision across a career, even in the early stages. Thus, such effects should not be ignored in human resource supply/demand planning.

VII. COPES METHODOLOGY

a. Computer Systems Support Requirements

In addition to retirement analysis, the RETCALC/NAVDYN models yielded considerable information for designing the support capabilities. These design issues include better user assess and fundamental improvements in modeling technology. The COPES development program has been modified to incorporate the added knowledge obtained in the course of this study.

The strategy for computer hardware/software support for COPES appears essentially correct. The plan is to accomplish incremental development using fully configured micro computers linked to a large mainframe computer. In our case we are using IBM PC/AT workstations linked to an IBM 3081 computer. On both the microcomputers and mainframe, standard commercially available packages are used for all processing. We are currently developing COPES microcomputer applications using dBase III, LOTUS 1-2-3, STATA, and CHARTMASTER as data base, spreadsheet, statistical, and graphics packages. On the mainframe, we are using SAS to manipulate the internal work force data files obtained from the Navy's CAMAS and external work force data files obtained from public sources such as the Department of Labor and the U.S. Census Bureau.

b. Copes Extension

The retirement program is just one component of the compensation analysis capability of COPES. Technical improvements, beyond stand alone features, are desirable for more comprehensive supply/demand studies related to operational

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decision making. Specifically, planned development efforts will combine the regression models of the type used in NAVDYN with goal programming based flow models similar to those currently available in CAMAS. The non-linear nature of the flows which are found when work load requirements are built into the problem requires a system of models combining the strengths of the NAVDYN with the strengths of personnel flow models using Markov-like structures. It should be possible to construct such a new integrated supply/demand model with the knowledge gained in through the NAVDYN studies.

The regression models currently used in NAVDYN can be improved. Desirable new features include: (a) variable horizon retention (loss) capabilities; (b) explicit determination of the Federal labor markets external to the Navy; (c) explicit evaluation of special skill/ regional wage capabilties, and (d) longer term projections.

The variable horizon retention (loss) modeling capabilities would be designed to reflect future expectations of employees at different points in their careers. Models of the type currently used in NAVDYN have a limited horizon of 7-9 years. Models of the type used in the annual cost of leaving (ACOL II) studies (See Arnold, Black and Warner (1985)) generally have a horizon covering an entire 30-40 year career. It is felt that civilian personnel retention studies should employ models with a horizon which dynamically changes, extending further into the future as one moves into his/her career. In this case one could use a NAVDYN type model for the earlier career stages and a combination

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NAVDYN/ACOL type model for the mid and later stage analysis.

The planned development of special skill/ regional wage capabilities involves moving from the broad categories of occupational skills to more specialized skills which also reflect regional wage characteristics. This effort must address the issues of (a) small number problems, (b) limited historical information, (c) specification biases, and (d) market dynamics which are discontinuous.

The planned COPES studies of the influence of Federal labor markets require consideration of the effects of qualification requirements for Federal jobs into the analysis. For many jobs above the initial levels, the qualification requirements or the need to have gained Federal status effectively restrict eligibles to those already in the Federal work force. Because of the initial work involving the relationship of different work force populations to the Navy work force, this task is seen as a modification of existing capabilities rather than a separate new effort.

Finally it is planned to use the improved COPES capabilities to make longer term projections of the work force. This involves extending the projections to ten to twelve years in the future rather than the five to seven years as is done currently. Such longer term projections have more statistical uncertainty but provide guidance as to the general direction of trends that take a longer time to develop.

VIII. SUMMARY AND CONCLUSIONS

This paper presents new external labor force models that assess the impact of retirement changes on Navy's civilian work

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force. The RETCALC/NAVDYN models indicate the new retirement system for employees hired since January 1984 will effect civilian retention rates. Civilian employees will become more responsive to other job opportunities due to changes in the relative wage advantage and the portability of retirement benefits. This impact will become more pronounced as a larger percentage of the work force becomes covered under the new retirement system. The RETCALC/NAVDYN models are part of the management tools being developed to analyze and plan more effectively for future work force changes.

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