Appendix B

AGING, PENSION INCOME, AND TAXES IN HAWAII

Andrew Mason
Professor, Department of Economics
Senior Fellow, East-West Center
University of Hawaii at Manoa

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Report to the State of Hawaii Tax Review Commission

by

Andrew Mason

Executive Summary

Over the foreseeable future, the number of retirees will grow much more rapidly than the number of workers. The percentage of Hawaii's population 65 and older is projected to increase from 13% in 2000 to 24.5% in 2030 and to nearly 30% by 2075. Currently there are about 22 persons 65 and older for every 100 persons of working-age (20-64). By 2030 that number will more than double to 45 seniors for every 100 persons of working age.

The aging of Hawaii's population will produce an important change in the State's income profile. Non-earned income, e.g., pensions, social security benefits, will grow much more rapidly than earnings. Between 2000 and 2020, for example, earnings will increase by less than 50%, while non-earned income will increase by almost 100%. During the entire 75-year forecast period earned income will increase at an annual average rate of 1.4 per cent, while non-earned income will increase at an annual rate of 2.1 percent.

Of non-earned income, the most rapid growth is forecast for social security benefits (2.5 percent per year), although growth in social security benefits may be curtailed by reform of the social security system. Pension income is forecast to grow by 2.3 percent per year between 2000 and 2075. Because of rapid growth of 401(k) and similar pension plans, the share of distributions from elective pension plans will increase from 6% in 2000 to 26% by 2020 and to 71% in 2050.

The shift in sources of income has important fiscal implications for the State of Hawaii because of the favorable tax treatment of pension income and social security benefits. Currently, most pension income and all social security benefits are not subject to state income tax. As a consequence, tax revenues will grow substantially slower than state income unless tax rates on other income sources are increased. If the special treatment of pension income were eliminated, the tax rates on other types of income could be significantly reduced during the next thirty years.

The study considers four tax scenarios: (1) maintaining the current treatment of pension income; (2) eliminating the exemption and including all pension income in adjusted gross income (AGI); (3) including all pension income and the federally taxable portion of social security benefits in AGI; and (4) extending the exemption to include all pension income.

Given any of the four tax scenarios considered, tax revenues are forecast to increase more slowly than total income. The largest gap in percentage terms will occur between 2010 and 2020. Under current law, tax revenues will increase by 0.89 percent for each 1 percent increase in income. If all pension income were taxed, the tax elasticity increases to 0.95 percent. If state taxes were imposed on federally taxable social security benefits, the figure would rise to 0.97 percent. If, however, the exclusion were extended to all pension income, each percentage point increase in income would generate an increase in tax revenue of only 0.81 percent between 2010 and 2020.

In 2000 taxes were 5.26 per cent of adjusted gross income. To maintain the current share of taxes in total income, the tax rate will have to rise to 5.53 per cent of adjusted gross income (AGI) by 2050 if current tax codes are maintained. If all pension income were excluded, the tax rate would have to increase to 5.96 per cent of AGI by 2050. On the other hand, if the pension exclusion were eliminated, taxes as a percent of AGI could decline to 5.00 per cent of AGI.

The rapid growth of 401(k) and other elective pension plans has two important effects under current tax provisions. First, the pension exemption does not apply to elective pension plans. Consequently, the impact of aging on tax revenues, although substantial, is less than it would otherwise be. Second, the benefits of the pension exemption will no longer accrue to nearly all who receive pensions. Rather the favorable tax treatment will increasingly favor only those retirees who have traditional, defined benefit pensions.

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Over the coming decades, Hawaii can expect its retired population to grow much more rapidly than its working population. As a consequence a rising share of income to residents will consist of pensions, social security benefits, and other non-earned income. Because some forms of pensions and all social security benefits are excluded from adjusted gross income, Hawaii's tax base will erode in the absence of tax reform.

The pension exclusion does not extend to the elective contributions to pension programs that are becoming increasingly popular. Pension distributions from defined benefit plans that cover public workers and some private-sector employees are not subject to state income tax. But elective contributions to 40 1(k) plans, 403(b) plans, IRAs, Keogh, SEP, and 457 plans and earnings on those contributions are taxed when participants retire and begin to withdraw their pensions.[1]

JRAs, 401 (k)s, and other elective plans that allowed for the deferral of income taxes first became available in the early 1980s. Since that time they have become increasingly popular with employers and in recent years eligibility requirements and contribution caps have been relaxed. These changes have led to rapid growth in the importance of elective plans relative to traditional pension plans among private sector employees.

The growth in the importance of elective plans has two important implications. First, under current tax provisions, excluded pension income will not grow as rapidly as total pension income. The aging of Hawaii's population will have a smaller negative impact on tax revenues than would be the case if all pension income were excluded. Second, the benefits of the pension exclusion will accrue to a more limited subset of Hawaii s retirees, while a growing percentage of private sector retirees will pay higher taxes on their pension incomes.

The objective of this study is to provide detailed information relevant to these issues. New population projections (2000-2075) have been prepared for Hawaii. Income by major source has been forecast to 2075. The forecasts have been used to assess the impact on adjusted gross income and tax revenues of alternative policies regarding pensions and social security. Four policies are considered: maintaining the status quo, taxing all pension income, taxing all pension income and social security benefits that are subject to federal taxation, and extending the pension exemption to all pension

[1] More detailed information is available in Tax Information Release No. 96-5 and Schedule J, which are reproduced in Appendix B.

distributions. Key results of the analysis are presented in the main body of the report. Technical details and supporting information are contained in the appendicies.

Key Findings

Hawaii's population will increase by almost 50% between 2000 and 2075. The most rapid growth will occur during the earliest years. Between 2000 and 2030 the population will increase by more than 100,000 persons each decade.

Hawaii's population will age very rapidly. The percentage 65 and older will increase from 13% in 2000 to 24.5% in 2030 and nearly 30% by 2075. Currently there are about 22 persons 65 and older for every 100 persons of working-age (20-64) in Hawaii. By 2030 that number will more than double to 45 seniors for every 100 persons of working age.

Both earned and non-earned income will increase substantially, but non-earned income will grow much more rapidly than earnings. Between 2000 and 2020, for example, earnings will increase by less than 50%, while non-earned income will increase by almost 100%. During the entire 75-year forecast period earned income will increase at an annual average rate of 1.4 per cent, while non-earned income will increase at an annual rate of 2.1 percent.

Of non-earned income, the most rapid growth is forecast for social security benefits (2.5 percent per year). Growth in social security benefits may be curtailed by reform of the social security system. Under the *status quo* the OASDI trust fund will be depleted in 2041, and the gap between revenues and benefits will increase from one-quarter to one-third by 2075.

Pension income is forecast to grow by 2.3 percent per year between 2000 and 2075. The share of distributions from elective pension plans will increase from 6% in 2000 to 26% by 2020 and to 71% in 2050.

Given any of the four tax scenarios considered, tax revenues are forecast to increase more slowly than total income. The largest gap in percentage terms will occur between 2010 and 2020. Under current law, tax revenues will increase by 0.89 percent for each 1 percent increase in income. If all pension income were taxed, the tax elasticity increases to 0.95 percent. If state taxes were imposed on federally taxable social security benefits, the figure would rise to 0.97 percent. If, however, the exclusion were extended to all pension income, each percentage point increase in income would generate an increase in tax revenue of only 0.81 percent between 2010 and 2020.

In 2000 taxes were 5.26 per cent of adjusted gross income. To maintain the current share of taxes in total income, the tax rate will have to rise to 5.53 per cent of

adjusted gross income (AGI) by 2050 if current tax codes are maintained. If all pension income were excluded, the tax rate would have to increase to 5.96 per cent of AGI by 2050. On the other hand, if the pension exclusion were eliminated taxes as a percent of AGI could decline to 5.00 per cent of AGI.

Hawaii's Population 2000-2075

Hawaii's population is experiencing two important changes that will persist into the foreseeable future - our population is growing and it is aging. We anticipate continued, but slowing, growth. According to the most recent U.S. Census Hawaii's population exceeded 1.2 million in 2000, an increase of just over 100 thousand persons during the 1 990s. During each of the first three decades of this century the projected population increase is more than 100,000. The population is projected to reach almost 1.7 million by 2050 and 1.8 million by 2075 (Table 1).

Table 1. Population Projections for Hawaii, Summary 2000-2075.

	2000	2010	2020	2030	2040	2050	2075
Population (1000s)							
Total	1,212	1,342	1,464	1,573	1,646	1,696	1,819
Under 20	327	319	322	336	335	338	350
20-64	724	821	850	851	879	903	930
65+	161	202	292	386	432	455	538
Percentage distribution							
Under 20	27.0	23.8	22.0	21.4	20.4	19.9	19.3
20-64	59.7	61.2	58.0	54.1	53.4	53.2	51.1
65+	13.3	15.0	20.0	24.5	26.2	26.8	29.6
Dependency ratios							
Total	67.4	63.5	72.3	84.9	87.3	87.8	95.6
Child	45.2	38.9	38.0	39.5	38.2	37.4	37.7
Old-Age	22.2	24.6	34.4	45.4	49.1	50.4	57.9

Note: The dependency ratio is dependent population (0-19 or 65+) per 100 members of the working-age population (20-64).

Most of the population increase will be due to increase in Hawaii s senior population — those 65 and older. Between 2000 and 2030 the senior population is projected to more than double, increasing from 161 thousand to 386 thousand. Almost one-quarter of Hawaii's population will be 65 and older by 2030 as compared with 13.3% in 2000. Population aging will continue throughout the projection period, with the percentage 65 and older projected to reach almost 30% by 2075. The most rapid changes

will occur between 2010 and 2030, when the baby-boom generation moves into the older ages.[2]

Currently the number of dependents per working-age person is declining. In 2000 there were 67 people in the dependent ages (under 20 or 65 and older) for every 100 people of working age. Two-thirds of these dependents were children and one-third were seniors. The overall dependency ratio will begin to increase after 2010 and the share of seniors in the dependent population will rise. By 2030 the number of seniors will outnumber the number of children. By 2075 we project there will be 96 dependents for every 100 of working age – 38 will be children and 58 will be seniors.

The rapid growth of the senior population, both in absolute numbers and relative to the number of children and the number in the working ages, is apparent in Figure 1.

Figure 1. Population of Hawaii, 2000-2075

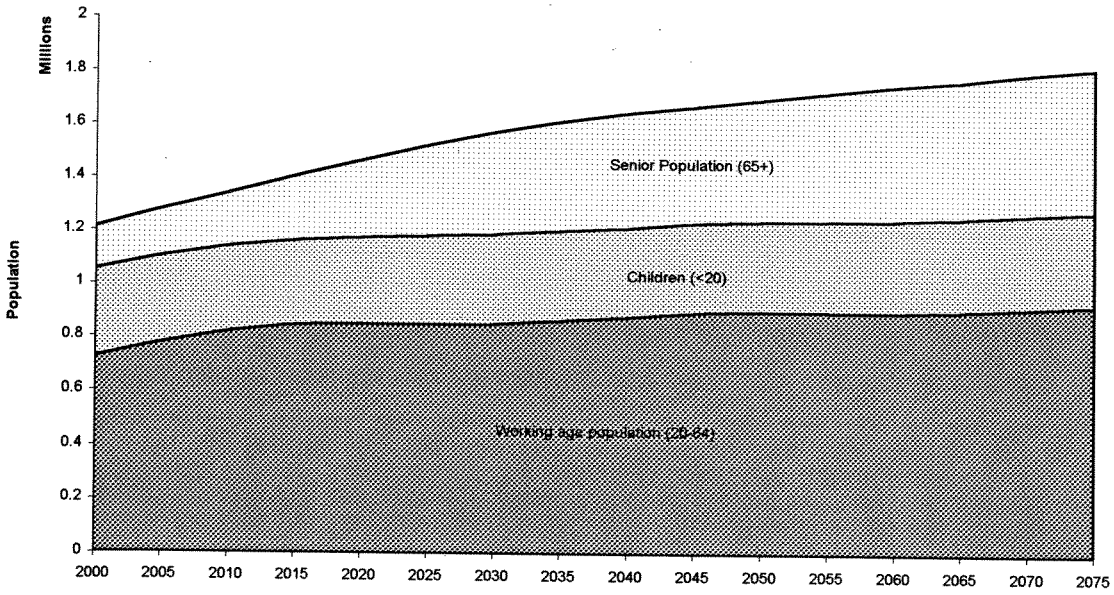
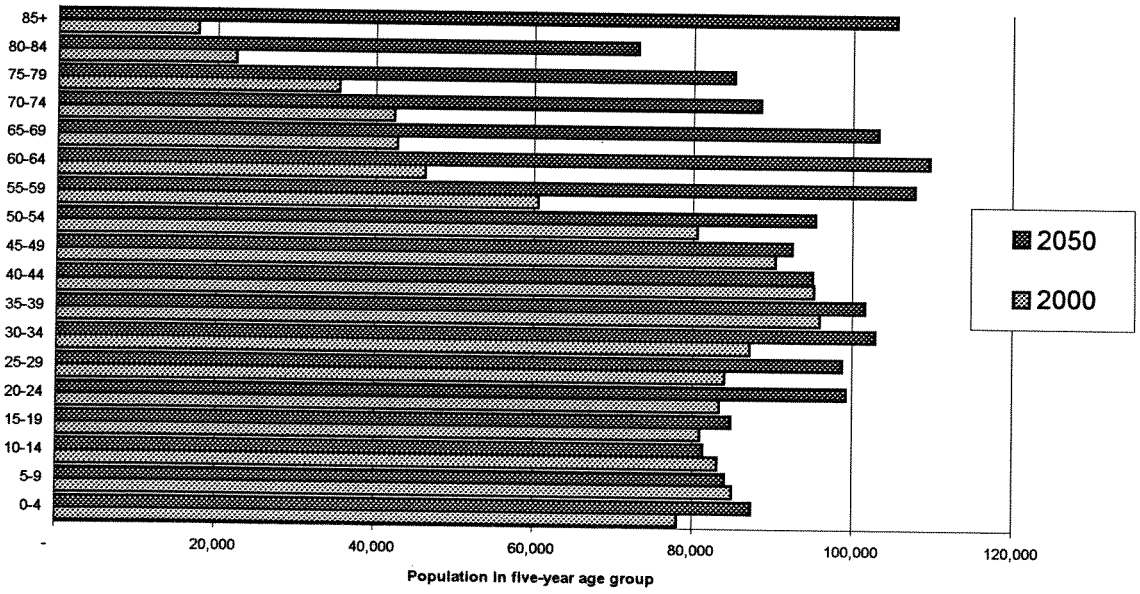


Figure 2 provides a more detailed look at the shifts in age-structure that Hawaii will be experiencing by comparing the population in five-year age groups in 2000 and 2050. The increase in the population in the working ages is confined mostly to those in their twenties and early thirties. The population in their fifties and early sixties also increases substantially, although substantial numbers of persons in these ages have already withdrawn from the labor force. The enormous increases are at the older ages, with a particularly large increase in the number in their eighties. The population 85 and older is projected to increase over five-fold, from under 20,000 in 2000 to over 100,000 in 2050.

[2] Baby-boomers were born between 1946 and 1964. Hence, the first boomer will reach age 65 in 2011; the last boomer will turn 65 in 2029.

Hawaii's demographic trends are similar to the trends for the US and other economically advanced countries. Population growth rates are slowing as birth rates have dropped to low levels. Population aging has resulted both from low birth rates and higher life expectancy. The US population is growing more rapidly and aging more slowly than many other industrialized nations because its birth rates are higher, its life expectancy is lower, and rates of in-migration are higher. (In-migrants to the US are younger than the domestic population.)

Figure 2. Population in Five-Year Age Groups, 2000 and 2050



The similarities between Hawaii and the US reflect shared social, economic, political, and institutional changes that influence fertility, mortality, and migration. For example, US immigration policy influences net migration rates to the US and to Hawaii. Policies towards health care and social welfare, many of which are established at the national level, influence mortality rates in both the US and Hawaii. Economic conditions in the US as a whole affect Hawaii's economy and its demography.

There are, however, important and persistent differences between the US and Hawaii that influence Hawaii's demographic trends. Since statehood Hawaii's population has grown more rapidly than the US population. Rapid growth during the 1950s and 1960s was an expected outcome of the economic boom that was due in part to statehood, but the difference in growth has persisted. Between 1970 and 2000, the US population increased at 0.92 percent per year, while Hawaii's population grew at 1.52 percent per year. During the 1970s, Hawaii's population grew twice as fast as the US population. Even during the 1990s, Hawaii's population grew fractionally faster than the US population despite the relatively poor performance of Hawaii's economy.

Why has Hawaii's population grown so rapidly? In part, in-migration is responsible. Economic growth has created job opportunities, deterred out-migration and attracted young workers from the mainland and overseas. But Hawaii's population has also grown more rapidly because Hawaii residents have an unusually long life expectancy. In 1990, the most recent year for which data are available, life expectancy at birth for both sexes combined was 78.8 year in Hawaii as compared with 75.4 years for the US as a whole. Hawaii enjoyed a similar advantage in 1970 and 1980 (Table 2). Hawaii's favorable life expectancy has also influenced its age structure. Its population is older because survival rates are higher at older ages.

Table 2. Life Expectancy at Birth, by Sex, US and Hawaii, 1960-90.

	United States			Hawaii		
Year	**Both sexes**	**Male**	**Female**	**Both sexes**	**Male**	**Female**
1960	69.7	66.6	73.1	72.4	70.4	74.8
1970	70.8	67.1	74.7	74.2	72.1	76.4
1980	73.7	70.0	77.4	77.8	74.5	81.5
1990	75.4	71.8	78.8	78.9	75.9	82.1

Source: **DBEDT,** The State of Hawaii Data Book 2000 (Table 2.12)
Original Sources: U.S. Department of Health and Human Services, National Center for Health Statistics, "United States Life Tables, 1998", *National Vital Statistics Reports,* Vol. 48, No. 18, Feb. 7, 2001, table 12; Hawaii State Department of Health, Office of Health Status Monitoring, "Life Tables by Ethnic Group for Hawaii, 1920-1970," *R & S Report,* No. 26 (June 1979), pp. 8-26; and "Life Expectancy in the State of Hawai'i, 1980 and 1990," *R & S Report,* No. 63 (August 1996), p. 9.

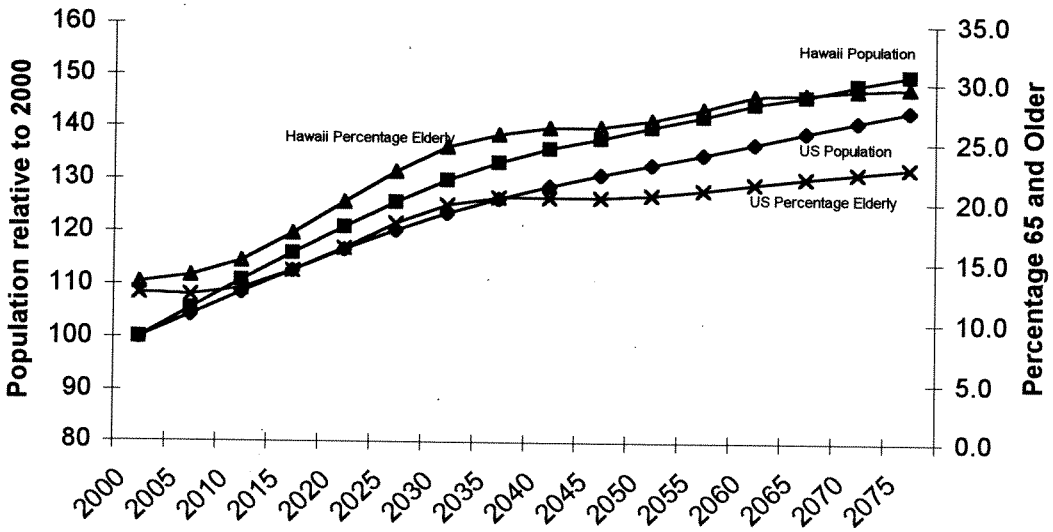
Population projections for Hawaii are based on methods that assume that differences in net migration rates and survival rates between Hawaii and the US between 1970 and 2000 will persist into the future.[3] As a result Hawaii's population will grow and age more rapidly than the US population (Figure 3). Between 2000 and 2075, Hawaii's population growth rate is projected at 0.54 percent as compared with a population growth rate of 0.48 percent for the US. Hawaii's aging is much more rapid with the percentage 65 or older reaching 29.6% in 2075 as compared with 22.9% for the US.

How does this compare with previous population projections for Hawaii? DBEDT (2000) provides population projections to 2025, which anticipate slower population growth and slower aging. For the period 2000-2025, the population growth rate in the DBEDT projections is 0.8% as compared with 0.9% in the projections

[3] See Appendix for methodological details. Population projections for the US were prepared by the Social Security Administration and refer to the "Social Security Area." US values are for January 1 of the following year, i.e., the value referred to as 2075 is essentially the value at the end of the year. The values for Hawaii are as of October 1 each year.

presented here. DBEDT projects an increase in the percentage of the population 65 and older to 2 1.2% in 2025 as compared with 22.5% here (DBEDT 2000).

Figure 3. Comparison of US and Hawaii Projections



Sources of Uncertainty

It is virtually certain that Hawaii's population will age rapidly because large cohorts of baby boomers will begin to reach age 65 in 2011. Two key issues will influence just how rapid Hawaii's aging will be.

The first issue is the extent to which survival rates continue to improve in Hawaii. The method employed here assumes that the gap in life expectancy between Hawaii and the US will remain constant in percentage terms. US life expectancy is assumed to grow at the rate in the US Social Security Administration's most recent intermediate projections (US SSA 2002). Hence, the actual trend in life expectancy will differ from the assumed trend to the extent that US life expectancy deviates from the trend assumed by the Social Security Administration and to the extent that survival rates in Hawaii diverge from or converge to US survival rates.

The future trend in US life expectancy is a controversial issue among demographers. One group contends that gains in life expectancy will come more slowly in the future than they have in the past. The life expectancy assumptions employed by the Social Security Administration are consistent with this view. A second group of demographers points out that the upward trend in life expectancy has been quite constant, showing no tendency to slow. Historically, past SSA projections have consistently underestimated improvements in life expectancy. The projections prepared in 2002, and used for this study, are based on a somewhat faster increase in life expectancy than in previous projections, but the upward revision is still short of the recommendation by the Social

Security Administration's Technical Advisory Panel. Based on experience US life expectancy may improve more rapidly than assumed in these projections.

We are aware of no scientific research on whether the Hawaii-US gap in life expectancy will continue at current levels or not. In part, the high level of life expectancy in Hawaii reflects ethnic differences. As the ethnic composition of Hawaii's population changes in the future life expectancy may converge towards the US level. The US as a whole, however, is also experiencing large changes in the ethnic composition of its population that are not necessarily favorable for a high life expectancy. Moreover, to the extent that Hawaii's healthy lifestyle, environment, and health policy influence survival rates, the US-Hawaii gap may persist. The empirical basis for investigating this issue is relatively weak. Accurate estimates of life expectancy are prepared every ten years; life tables based on the 2000 population counts have not yet been constructed. The gap in 1990 was somewhat smaller than in 1980, but the gap in 1980 was greater than in 1970. In the absence of evidence to the contrary, a prudent assumption is that survival rates in Hawaii will continue to exceed rates on the US mainland.

The second critical issue that affects the speed of population aging is immigration and ultimately the strength of Hawaii's economy. The issue is about long-term prospects for the economy, not the short-term outlook that is the focus of the existing models of Hawaii's economy. Are the long-term prospects for the tourism industry favorable? Will Japan's economy and demand for travel to Hawaii eventually recover? Will China, with its rapid economic growth and its billion-plus population, develop as an important market for Hawaii? Will efforts to diversify into other industries prove successful? If the answers to these questions are yes, Hawaii can expect more rapid economic growth, more workers relative to the number of retirees, and slower aging. This study does not address these questions but acknowledges that the extent and effect of aging depends on how successfully Hawaii exploits opportunities for economic growth.

Hawaii's Income 2000-2075

Long-term forecasts in Hawaii's income anticipate steady increases in total and per capita income and an important change in the composition of income - a significant rise relative to net earnings of non-earned income (pension income, social security, and dividends, interest and rent).

Total income is forecast to increase from just under $35 billion in 2000 to just under $55 billion in 2020, $86 billion in 2050, and $118 billion in 2075 (Table 3; Figure 4).[4] In percentage terms economic growth is most rapid between 2000 and 2020, exceeding 2 percent annual real growth. Between 2020 and 2050 we anticipate real growth varying between 1.3 and 1.8 percent per annum, and growth in total income averages approximately 1.3 percent per annum after 2050.

[4] All forecasts are real values using 2000 prices. Income is defined in a manner similar to, but not identical to, personal income as compiled by the Bureau of Economic Analysis. The major difference is the treatment of pension income. Pension income reported here includes all distributions from pension funds.

Table 3. Total and Per Capita Income by Type, 2000-2075.

	2000	2010	2020	2030	2040	2050	2075
Total Income (Millions $, 2000 Prices)							
Net Earnings	23,300	28,654	33,195	37,450	42,589	48,003	63,971
Non-Earned Income	11,180	15,739	21,472	27,383	32,620	38,062	54,262
Pension Income	3,312	5,086	7,291	9,239	10,901	12,932	18,237
Social Security	1,495	2,120	3,205	4,529	5,591	6,550	9,830
Dividends, Interest, and Rent	6,374	8,533	10,975	13,615	16,127	18,581	26,196
Total Income	34,480	44,394	54,666	64,833	75,209	86,065	118,233
Per Capita Income ($, 2000 Prices)							
Net Earnings	19,232	21,359	22,668	23,804	25,876	28,299	35,174
Non-Earned Income	9,228	11,732	14,663	17,405	19,819	22,438	29,836
Pension Income	2,733	3,791	4,979	5,872	6,623	7,623	10,028
Social Security	1,234	1,580	2,189	2,879	3,397	3,861	5,405
Dividends, Interest, and Rent	5,261	6,361	7,495	8,654	9,799	10,954	14,404
Total Income	28,460	33,091	37,330	41,209	45,695	50,737	65,010

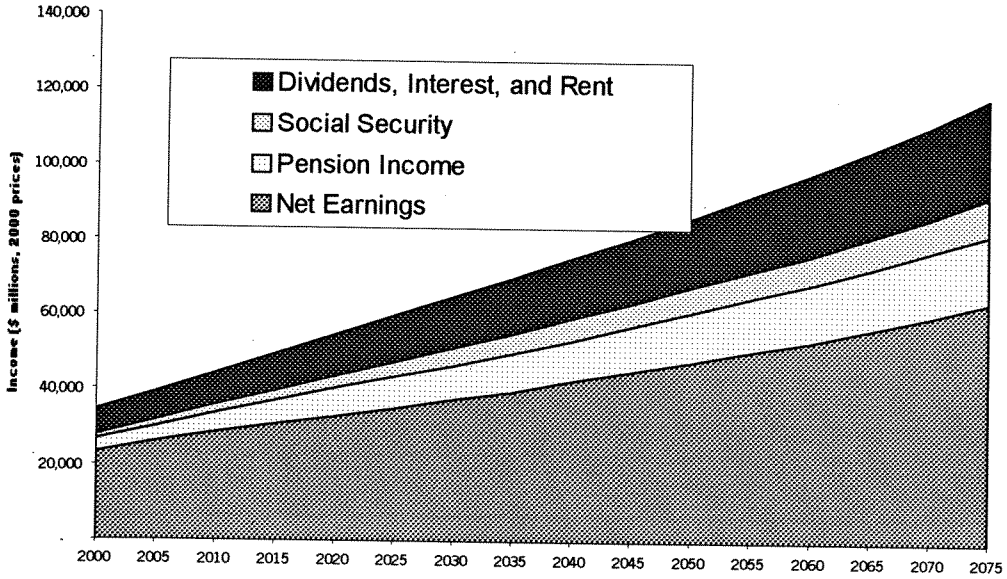
Both earned and non-earned income increase substantially between 2000 and 2075, but non-earned income grows much more rapidly than earnings. Between 2000 and 2020, for example, earnings increase from $23 billion to $33 billion, a rise of less than 50%. During the same period, non-earned income increases from $11 billion to $21 billion, an increase of almost 100%. During the entire 75-year forecast period, earned income increases at an annual average rate of 1.4 per cent, while non-earned income increases at an annual rate of 2.1 percent.

Of non-earned income, the most rapid growth is forecast for social security benefits (2.5 percent per year), followed by pension income (2.3 percent per year) and dividends, interest, and rent (1.9 percent per year). The forecast for social security benefits assumes that benefit levels will continue as prescribed by current law. If, as is likely, benefit levels are reduced in response to fiscal constraints, social security benefits will grow more slowly. This issue is discussed in more detail below.

Substantial growth in real per capita income is also forecast for Hawaii, with total per capita income rising from $28,460 in 2000 to $65,010 in 2075. Real per capita earned income is forecast to grow at 0.8% per year and real per capita non-earned income by 1.6% per year between 2000 and 2075.

The forecast trends in Hawaii's income reflect changes in the productivity of the labor force and changes in the size and age structure of Hawaii's population as previously

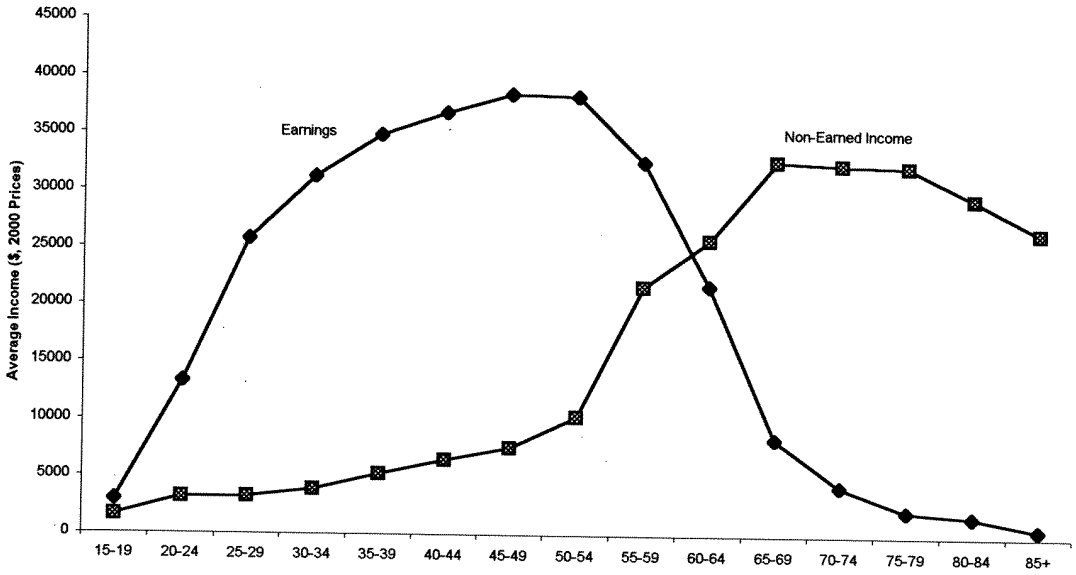
Figure 4. Total Income by Type, 2000-2075



described. The baseline forecasts presented here are based on the assumption that earnings of workers at each age will grow at 1% per cent per year between 2000 and 2075. The US Social Security Administration in its long-range forecasts for the US economy assumes annual productivity growth of 1.1% (US SSA 2002). DBEDT (2000) long-term forecasts for the Hawaiian economy are for real growth in output per worker of 1.05% per annum. Thus, the assumption employed here is similar to other long-term forecasts. This assumption is optimistic, however, compared to the recent performance of Hawaii's economy. For the 1970-2000 period taken in its entirety, real wages adjusted for changes in the age-structure of the labor force were stagnant. The results presented here assume greater economic success in Hawaii than has occurred for some time.

Demographic changes underlie part of the growth in Hawaii's economy and all of the changes in sources of income described above. Earnings increase more rapidly because the number of workers in Hawaii is projected to increase; pensions and social security benefits increase with growth in the number of pensioners. The substantial shift in the sources of income arise because of the rapid growth in the number of elderly, whose income is disproportionately non-earned income. The striking differences in the age-profiles of earnings per person and non-earned income per person estimated for Hawaii in 2000 are shown in Figure 5. As the population shifts towards older ages the source of income inevitably shifts from earnings to non-earned income.

Figure 5. Earnings and Non-earned Income by Age, 2000



Pension Income and Social Security

The rise in pension income and social security benefits has important fiscal implications for Hawaii because of differences in their tax treatment. By federal statute social security benefits are not subject to state income tax. The tax treatment of pension income varies by type of pension. Traditional defined benefit pension plans, in which public workers and some private workers participate, are not subject to state income tax. Individual retirement accounts (IRAs) and Keogh Plans, on which many self-employed residents rely, are subject to state income tax. Employer contributions to defined contribution pension plans are exempt from state income tax, but the contributions by employees are fully taxable. These plans, of which 401(k) plans are the most important, are relied on primarily by private sector workers, although similar programs are available to public workers.[5] Because of the difference in tax treatment the anticipated rise in the relative importance of pension income and social security will lead to an erosion of the share of total income subject to state income tax.

Pension Income

Given current treatment of pension income, the fiscal impact of the rapid growth in pension income will depend on the relative growth of IRAs, 401(k)s, and traditional pension programs. Detailed forecasts of pension income by type of plan are presented in Table 4. The most important feature of these forecasts is the extent to which distributions from 401(k) programs come to dominate private pension plans at the expense of defined benefit plans. In 2000, we estimate that about 6% of private pension distributions were from 401(k) and Keogh plans. The share of 401(k) and Keogh plans is forecast to rise to

[5] See the appendix for an overview of pension programs.

26% by 2020, 71% in 2050, and 81% by 2075. The share of "other private" plans is projected to decline from 83% in 2000 to 63% in 2020, 19% in 2050, and 9% in 2075. In contrast to these dramatic changes, we anticipate relatively little change in the importance of public pensions and IRAs. Public pensions as a percent of total pensions is forecast to increase from 37% in 2000 to 38% in 2075. Retirement distributions from IRAs as a percentage of total pensions is forecast to drop from 6% to 5% between 2000 and 2075.

Table 4. Annual Total and Per Capita Pension Income by Type, 2000-2075

	2000	2010	2020	2030	2040	2050	2075
Total Pension Income (Millions $, 2000 Prices)							
Public	1,239	1,849	2,656	3,440	4,112	4,849	6,954
Private	2,073	3,237	4,635	5,799	6,789	8,083	11,283
IRAs	229	305	481	619	684	784	1,088
401(k) and Keogh	123	394	1,225	2,482	4,004	5,742	9,159
Other Private	1,720	2,539	2,929	2,699	2,101	1,557	1,036
Total Pension Income	3,312	5,086	7,291	9,239	10,901	12,932	18,237
Total Pension Income by Tax Status (Million $, 2000 Prices)							
Taxable	312	568	1,301	2,281	3,367	4,631	7,225
Exempt	3,000	4,518	5,990	6,958	7,534	8,300	11,012
Proportion of Total Exempt	0.906	0.888	0.822	0.753	0.691	0.642	0.604
Proportion of Private Exempt	0.850	0.824	0.719	0.607	0.504	0.427	0.360
Per Capita Pension Income (Dollars, 2000 Prices)							
Public	1,022	1,378	1,814	2,186	2,498	2,858	3,824
Private	1,711	2,413	3,165	3,686	4,125	4,765	6,204
IRAs	189	227	328	393	415	462	598
401(k) and Keogh	102	293	836	1,577	2,433	3,385	5,036
Other Private	1,420	1,893	2,000	1,715	1,277	918	569
Total Pension Income	2,733	3,791	4,979	5,872	6,623	7,623	10,028

The shift towards 401(k)s, given current tax code, will result in a substantial increase in the share of pension income subject to state income tax. It will also result in substantial differences in the treatment of pension income received by public and private sector retirees.[6] The proportion of total pension income exempt from state income tax will decline from 90% in 2000 to 75% in 2030 to 64% in 2050 and 60% in 2075. The

[6] Some workers have both public and private pension plans, because they may have worked for both the public and the private sector and because public sector workers can accumulate pensions in 401(k)-type programs.

percentage of private sector pension income exempt from state income tax will decline from 85% in 2000 to 72% in 2020 to 36% in 2075 (Table 4). The implications of alternative tax treatments of pension income are discussed in more detail below.

Social Security Benefits

Social security benefits are a critical source of income for Hawaii's elderly and projected to be a growing share of total income in Hawaii. In the baseline projections presented above, social security benefits increase from $1.5 billion dollars in 2000, about 4% of total income in Hawaii, to $9.8 billion dollars in 2075 or 8.3% of Hawaii's total income. For the elderly social security benefits are much more important. In 2000, we estimate that social security benefits were about 16% of total income for those 65-69 and over 30% of total income for those 85 and older.

The baseline forecast of social security benefits assumes that benefits levels are not reduced as the aging of the US population undermines the sustainability of the current system. In its most recent assessment, the Board of Trustees of OASDI estimated that the trust fund would be depleted by 2041, in the absence of reform, and that the gap between revenues and benefit payments would increase from about 25% in that year to about one-third in 2075 (US SSA 2002). The benefits levels contained in the base-line forecast are possible only with a substantial increase in tax rates. Alternatively, benefit levels may be reduced below the baseline forecasts.

The nature and timing of reform to the social security system are impossible to foretell. We can explore some simple alternatives, however. The baseline forecast is one possibility: benefit levels may be retained by increases in taxes sufficient to maintain balance in revenues and benefit payments, once the trust fund is exhausted. A second possibility is that only benefit levels are adjusted to maintain balance in the system and tax rates are left unchanged. A third possibility is that the costs of reform are equally divided between beneficiaries and taxpayers, i.e., total benefits are reduced and total taxes are raised by equal amounts.

The implications of these three scenarios for social security benefits and tax payments are quantified in Table 5. No change occurs prior to 2041, the year in which the OASDI trust fund is depleted. By 2050 benefit payments would be reduced by about one-quarter if the short-fall is met entirely by benefit reductions. By 2075 benefit payments would be reduced by one-third. Similar percentage adjustments in tax payments would be required given the nature of reform to the social security system.

Hawaii experiences an interesting shift in its relationship to the Social Security program. Hawaii currently subsidizes the social security system. For 2000 we estimate that Hawaii paid social security taxes of approximately $1.7 billion and received benefits of $1.5 billion, for a net "loss" of $200 million.[7] By 2010, benefits received and taxes

[7] In 2000, $1.82 billion was paid to OASDI. The OASI component is not reported separately. The value reported in the text is estimated assuming that the OASI proportion of OASDI taxes is equal to the OASI proportion of OASDI benefits paid to residents in the state (SSA 2000).

Table 5. Social Security Projections for Hawaii with alternative adjustments to shortfall, 2000-2075. Millions of dollars, 2000 prices.

	2000	2010	2020	2030	2040	2050	2075
Benefits Received							
Shortfall met by raising taxes	1,495	2,120	3,205	4,529	5,591	6,55	9,830
Shortfall met by reducing benefits	1,495	2,120	3,205	4,529	5,591	4,84	6,657
Taxes and benefits adjusted equally	1,495	2,120	3,205	4,529	5,591	5,69	8,243
Taxes Paid							
Shortfall met by raising taxes	1,717	2,111	2,446	2,759	3,138	4,77	6,960
Shortfall met by reducing benefits	1,717	2,111	2,446	2,759	3,138	3,537	4,713
Taxes and benefits adjusted equally	1,717	2,111	2,446	2,759	3,138	4,158	5,836

Note: Assumes current system is maintained until trust fund is depleted. Thereafter, benefits and taxes are adjusted to maintain balance in the system.

paid by Hawaiian residents are roughly in balance. Thereafter benefits increase relative to taxes with Hawaii's surplus reaching between $1.9 and $2.9 billion in 2075, depending on the nature of Social Security reform. Why does this occur? One reason is that the number of elderly — social security beneficiaries — is growing more rapidly in Hawaii than in the US as a whole. Another is that forecast earnings in Hawaii grow more slowly than in the US. Between 2010 and 2075 total earnings in Hawaii increases by 223% as compared with 278% for the US as a whole. This difference is due in part to a difference in the rate of growth of the total work force and in part to a difference in the annual rate of productivity growth assumed (1.0% for Hawaii versus 1.1% for the US).

Adjusted Gross Income, Taxes, and Alternative Policies

The implications for tax revenue of the forecast changes in income are reviewed in this section. Three broad changes were identified in the previous section that have a potentially important fiscal impact on the state. First, real per capita state income is forecast to increase significantly. Rising real incomes, when combined with rising prices, will push individuals into higher marginal tax brackets — bracket creep. In the absence of any revisions to the tax code tax revenues will increase more rapidly than state income. In. its long-term economic projections DBEDT (2000) estimates that tax revenues will increase by about 1.1% for every 1% increase in state income. Our study is not concerned with this issue and we assume that income tax brackets will be revised periodically so that tax revenues will not be influenced by an increase in either real or nominal per capita income. Second, total state income is forecast to increase substantially because of the combined forces of growth in the population receiving income and the increases in per capita income. Growth in the absolute size of the state economy and the public sector might yield scale economies in the production of public goods and services. If so, the public sector may not grow as rapidly as the overall economy, allowing for some reduction in the share of state income taxed. The historical

evidence for Hawaii shows no indication that the public sector grows more slowly than the overall economy. Moreover, the aging of Hawaii's population may produce a significant increase in the demand for state and local public goods and services. The extent to which increased demand for public services to the elderly will outweigh reduced demand for public services for the young is not known, nor is it the subject of this study. Consequently, except as discussed below, our baseline approach assumes that tax revenues will grow at the same rate as state income. The third important change identified is that the sources of state income will change dramatically, with earnings declining; pension income, social security benefits, and dividends, interest, and rental income will rise as a proportion of state income. Because of differences in tax treatment, changes in the composition of state income will have important implications for state finances — tax revenues will grow substantially slower than state income.

This conclusion is supported by the results presented in two tables. Table 6 reports adjusted gross income given current law and three alternative scenarios. The first scenario considers the effect on AGI of taxing all pension income. The second scenario considers the effect of taxing all pension income and federally taxable Social Security benefits, an option that is currently precluded by federal law. The third option extends the current partial exemption of pension income to include all pension income, including distributions from 401(k)s, IRAs, and similar plans.

Adjusted Gross Income (AGI) in Hawaii in 2000 was approximately $20 billion. Had pension income been fully taxable, AGI would have been almost 10% higher, almost $2.2 billion. Had the federally taxable portion of Social Security benefits also been subject to state income tax, AGI would have been higher by another $450 million. Had the exemption for pension income been extended to all forms of pensions in 2000, AGI would have been reduced by about $400 million compared with the actual value for 2000.

The impact of the current pension exemption on AGI increases substantially over time as pension benefits become a more important source of income in Hawaii. If we compare the trend in AGI under the current law with the trend in AGI under the "tax all pension income" scenario, AGI under the current law grows more slowly especially during the first two or three decades of the forecast period. During the later years of the forecast period, AGI growth under the current law and the "tax all pension income" scenario are similar. The reason is that the portion of pension income exempt from taxation erodes with growth in 40 1(k) plans. The pension income exemption has a smaller impact on AGI, in percentage terms.

If all pension distributions were exempt from taxation, the growth in AGI would be substantially curtailed, even in the later years of the forecast. By 2075, the full pension income exemption reduces AGI by over $12 billion, more than 15%, as compared with the "tax all pension income" scenario.

Table 6. Projection of Adjusted Gross Income, Alternative Scenarios, 2000-2075

	2000	2010	2020	2030	2040	2050	2075
Adjusted Gross Income (millions of $, 2000 prices)							
Current Law	20,129	25,344	30,524	35,810	41,675	47,805	65,376
Tax all pension income	21,913	28,083	34,186	40,061	46,247	52,823	72,013
Tax all pension income and federally taxable Social Security benefits	22,361	28,696	35,052	41,222	47,657	54,463	74,421
Exempt all pension income including IRAs	19,739	24,737	29,382	33,969	39,058	44,291	59,978
Adjusted Gross Income as a Percent of Total Income							
Current Law	58.4	57.1	55.8	55.2	55.4	55.5	55.3
Tax all pension income	63.6	63.3	62.5	61.8	61.5	61.4	60.9
Tax all pension income and federally taxable Social Security benefits	64.9	64.6	64.1	63.6	63.4	63.3	62.9
Exempt all pension income including IRAs	57.2	55.7	53.7	52.4	51.9	51.5	50.7

The effect of alternative tax provisions on tax collections depends both on the changes in AGI and tax rates at which excluded or included income are taxed. Forecasts of taxes, presented in Table 7, incorporate both of these effects.[8] The results are summarized in a number of ways. The third panel provides estimates of the income elasticity of tax collections under alternative scenarios. Under current law the income elasticity is about 0.9 for 2000-2020, meaning that for every 1 percent increase in income, tax revenues will increase by only 0.9 percent. After 2030 the income elasticity is close to 1.0. The scenarios that are least immune to the influences of aging are those that include pension income and social security benefits in AGI. None of the scenarios considered include all social security benefits in AGI, one reason that income elasticities are less than one for all scenarios. The lowest income elasticity will result if the pension

[8] Calculation details are provided in the appendix.

income exemption is extended to all pension income. Aging will lead to the greatest erosion of tax revenues under this scenario.

The tax shortfall presented in Table 7 is an estimate of the difference between tax revenues given the scenario under consideration and the tax revenues that would be yielded if the current ratio of taxes to income were maintained. In the absence of any revisions to current law the shortfall reaches $30 million in 2010, $107 million in 2030, and $128 million in 2050. Eliminating the exemption for pension income or pension income and federally taxable social security benefits produces a substantial surplus in all years of the simulation. Exempting all pension income from taxation would produce a shortfall of $58 million in 2010, $206 million in 2030, and $317 million in 2050.

The tax shortfall as a percentage of AGI provides an estimate of the percentage point change in income tax rates that would be necessary to balance the growth in tax revenues and income in Hawaii. In 2000, taxes were 5.26% of AGI. Given current law the rate would have to be increased to 5.66% by 2030. If pension income were taxed, the income tax rate could be lowered to 4.97% by 2030, and if federally taxable social security benefits were also taxed, rates could be lowered to 4.83% by 2030. If all pension income were exempted, rates would have to be increased to 5.7 1% by 2020 and to 5.96% by 2050. The bottom line: full exemption of pension income, compared with no exemption of pension income, requires state income taxes paid by residents without pension income to increase by 16% in 2020 and by 18% in 2050.

Conclusions

The number of retirees will grow much more rapidly than the number of workers in Hawaii for the foreseeable future. Retirees have a very different income profile than workers. Consequently, the share in state income of pension income, social security payments, and other non-earned income will increase while the share of earned income will decline.

The shift in sources of income has important fiscal implications for the State of Hawaii because of differences in the tax treatment of pension income and social security benefits. Currently, most pension income and all social security benefits are not subject to state income tax. As a consequence, tax revenues will grow substantially slower than state income unless tax rates on other income sources are increased. If the special treatment of pension income were eliminated, the tax rates on other types of income could be significantly reduced during the next thirty years.

The rapid growth of 401(k) and other elective pension plans has two important effects under current tax provisions. First, the pension exemption does not apply to elective pension plans. Consequently, the impact of aging on tax revenues, although substantial, is less than it would otherwise be. Second, the benefits of the pension exemption will no longer accrue to nearly all who receive pensions. Rather the favorable tax treatment will increasingly favor only those retirees who have traditional, defined benefit pensions.

Table 7. Projected Taxes, Alternative Scenarios, 2000-2075

	2000	2010	2020	2030	2040	2050	2075
Taxes (millions of $, 2000 prices)							
Current Law	1,058	1,332	1,605	1,883	2,191	2,513	3,437
Tax all pension income	1,169	1,502	1,832	2,146	2,474	2,824	3,848
Tax all pension income and federally taxable							
Social Security benefits	1,202	1,548	1,896	2,231	2,576	2,942	4,020
Exempt all pension income	1,041	1,304	1,545	1,784	2,051	2,324	3,145
Taxes as a Percent of Total Income							
Current Law	3.1	3.1	2.9	2.9	2.9	2.9	2.9
Tax all pension income	3.4	3.4	3.4	3.3	3.3	3.3	3.3
Tax all pension income and federally taxable							
Social Security benefits	3.5	3.5	3.5	3.4	3.4	3.4	3.4
Exempt all pension income including IRAs	3.0	2.9	2.8	2.8	2.7	2.7	2.7
Income Elasticity of Tax Revenues							
Current Law	0.91	0.89	0.94	1.02	1.02	0.99	-
Tax all pension income	0.99	0.95	0.93	0.96	0.98	0.97	-
Tax all pension income and federally taxable							
Social Security benefits	1.00	0.97	0.95	0.97	0.98	0.98	-
Exempt all pension income	0.89	0.81	0.84	0.94	0.93	0.95	-
Tax Shortfall (millions of $, 2000 prices)							
Current Law	-	(30)	(73)	(107)	(117)	(128)	(192)
Tax all pension income	110	139	154	156	166	183	219
Tax all pension income and federally taxable							
Social Security benefits	144	186	219	242	268	301	391
Exempt all pension income	(17)	(58)	(132)	(206)	(258)	(317)	(484)
Taxes as a Percent of AGI Required for Balanced Growth							
Current Law	5.26	5.38	5.50	5.56	5.54	5.53	5.55
Tax all pension income	4.83	4.85	4.91	4.97	4.99	5.00	5.04
Tax all pension income and federally taxable							
Social Security benefits	4.73	4.75	4.79	4.83	4.84	4.85	4.88
Exempt all pension income	5.36	5.51	5.71	5.86	5.91	5.96	6.05

Notes: Shortfall is calculated taxes under each scenario less 3.1 percent of total income, the tax share of total income in 2000. The income elasticities are the percentage change in tax revenues divided by the percentage change in income for the ten year interval beginning in the indicated year. The values for 2050 are the income elasticities for the period 2050-2075. Taxes as a percent of AGI required for balanced growth are the tax rates required to maintain the tax share of total income constant at the 2000 level.

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Appendix A. An Overview of US Pension Programs

Private pension programs have been an important part of the employee benefit package for many decades. In 1999, 44% of all private US workers were covered by pension plans. Forty-seven percent of men and 40% of women were covered. Coverage is highly correlated with educational level and income. Only 18% of workers with less than a high school degree are covered as compared with 62% of college graduates. Only 6% of workers earning less than $200 per week participated in a plan. Of workers earnings $1000 or more per week, 76% participated in a pension plan. Seventy percent of unionized workers participated in pension plans as compared with 41% of non-union members.[9]

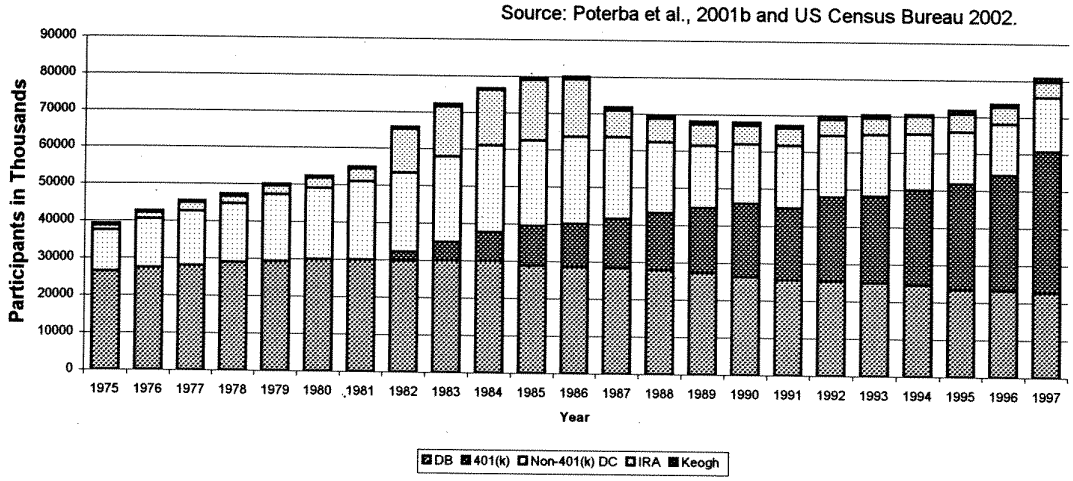
Between 1980 and 1997, the level of participation in private pension programs varied between 5 and 6 active pension accounts for every 10 civilian employees with little evidence of any trend in participation.[10] Participation rates reached a peak in the mid-1980s and again in 1997, but a linear trend fit to the 1980-97 data shows no evidence of a persistent trend in participation.

Pension contributions as a percentage of wages and salaries also have been remarkably stable in the US for the last quarter-century. During the early 1980s, when IRA contributions were available to all individuals, private pension contributions were about 8 percent of private wage and salary earnings. In other years, the contribution rate was close to 6 percent of wage and salary earnings. Total pension contributions, i.e., both private and public sector contributions, were close to 10% of total wage and salary earnings between 1982 and 1986. Otherwise, contributions were about 8% of total wage and salary earnings. The higher contribution rate for total as compared with private reflects the more generous pension programs available to public workers.

Despite this seeming stability, private pension programs in the US have been transformed in the past two decades. In 1975, traditional defined benefit (DB) plans were dominant, although about 30 percent of plan participants were members of defined contribution (DC) plans. In the early 1980s, the pension landscape changed dramatically. For a five-year period beginning in 1982, Individual Retirement Accounts (IRAs) were very popular until legislation greatly restricted eligibility. Participation in 401(k) plans also began to grow at the same time, although more slowly than participation in IRAs. By 1987, however, participation in 401(k) plans was greater than participation in IRAs and 401(k) plans have continued to rise in importance. As that has occurred the participation in DB plans and non-401(k) plans has declined steadily. By 1997, about one-quarter of plan participants were in DB plans, under 20% were in non-401(k) DC plans, about 6-7% were in IRA or Keogh plans, and nearly half were participants in 401(k) plans. More than half of all participants are enrolled in 401(k), IRAs, or Keogh plans (Figure A.1).

[9] Estimates based on 1999 Contingent Work Supplement to the February 1999 Current Population Survey.
[10] The number of active accounts per worker exceeds the proportion of workers with accounts, because many workers have more than one account.

Figure A.1. Active Participants in Private Pension Plans (with double counting)



Public pension programs have also changed in important ways, but not to the extent of private pension programs. Public workers are much more likely to be enrolled in defined benefits programs and a much higher percentage of their pension benefits are from defined benefit programs. Individually managed tax-deferred pension programs are available for public workers (403(b) plans for non-profit organizations, 457 plans for state and local employees, and the Thrift Savings Plan for federal employees). Public worker pensions are generally much more generous than private sector pensions. Retired military receive especially generous pension benefits. More detailed information is provided below.

Private Sector Plans

Individual Retirement Accounts (IRAs). Created as part of private pension reform legislation (ERISA) in September 1974. Anyone can make *after-tax* contributions of up to $3,000 per year ($3,500 if age 50+) from earned income. To contribute the full $3,000 per year ($3,500 if age *50+)* on a *tax-deductible* basis, an individual's 2002 adjusted gross income has to be $34,000 or less ($54,000 or less for couples filing jointly). If an individual's 2002 adjusted gross income is between $34,000 and $44,000 ($54,000 to $64,000 for joint filers), the amount that can be contributed on a tax-deferred basis gradually decreases. Above $44,000 ($64,000 for joint filers) all contributions must be in after-tax dollars. In 1997, IRA assets amounted to $2 trillion.

Roth IRAs were introduced in 1998. Roth IRAs are available to single people with adjusted gross incomes of under $110,000 and joint filers whose combined incomes are under $160,000. A single person with adjusted gross income under $95,000 ($150,000 for couples filing jointly) can contribute up to $3,000 per year ($3,500, if age

50+). Contribution maximums are reduced between $95,000 and $110,000 for single filers and between $150,000 and $160,000 for joint filers. You can convert assets from a Classic IRA to a Roth IRA if your household's adjusted gross income is under $100,000. Taxes on the contribution to Roth IRAs are not deferred, however interest earned from Roth IRAs is tax-free.

The Economic Growth and Tax Relief Act of 2001 raises the contribution limits for IRAs to $3,000 for 2002-2004, $4,000 for 2005-2007, $5,000 for 2008. Thereafter, the contribution limit is indexed for inflation in $500 increments. People age 50 and older can contribute an additional $500. The amount increases to $1,000 per year starting in 2006.

401(k) Plans. In 2000, more than 42 million workers participated in 401(k) plans and total assets exceeded $1.8 trillion. The average account balance, net of plan loans, was $49,000 and the median account balance was $14,493 in 2000 (EBRI 2002). The proportion of workers who are eligible for 401(k) plans and who are participating in 401(k) plans has increased dramatically since 1984. By 1993, 401(k) plans were made available to at least one employee in 50 percent of all families with an employed member. Thirty-three percent of those families participated in 401(k) plans (Table A.1).[11]

Table A.1. Eligibility and Participation in 401(k) plans.

Year	Eligibility (%)		Participation given Eligibility (%)		Participation (%)	
1984	12.6		57.0		7.2	
1987	18.5		61.3		11.3	
1988		40.4		62.4		23.2
1991	31.7		70.0		22.2	
1993	42.3	50.1	63.8	70.8	27.0	32.8

Note: First column of estimates based on the Survey of Income and Program Participation; second column of estimates based on the Current Population Survey.
Source: Poterba et al. (1998).

The Revenue Act of 1978 authorized 401(k) plans that allow employers to sponsor plans to which employees can make tax-deferred contributions. Some plans are profit sharing plans and some allow employee contributions with no matching contribution by the employer. The most common arrangement is for employers to provide some matching funds. The annual contribution by employees was limited to $30,000 in the original legislation, reduced to $7,000 in the Tax Reform Act of 1986 but indexed to the rate of inflation (Schulz, 2001). Section 401(k) plans must comply with the Section 415 limit on total contributions to retirement plans. This limit, the lesser of 100 percent of taxable compensation or $40,000, governs the maximum amount that may be contributed for an employee during a plan year beginning after December 31, 2001.

[11] Estimates of participation based on the Survey of Income and Program Participation are lower than these values, based on the Current Population Survey. See Porterba et al. (1998) for a more detailed explanation.

The Tax Reform Act of 1986 placed an annual cap of $7,000 on elective contributions. This cap increased to $10,500 by 2001, the same limit that applies to elective deferrals under 403(b) plans. The Economic Growth and Tax Relief Reconciliation Act of 2001 increased the 402(g) limit on elective deferrals to either 401(k) or 403(b) plans to $11,000 in 2002, $12,000 in 2003, $13,000 in 2004, $14,000 in 2005, and $15,000 in 2006 and later years. In addition, the 2001 Act allows participants age 50 and over to make additional contributions -- $1,000 in 2002, $2,000 in 2003, $3,000 in 2004, $4,000 in 2005, and $5,000 in 2006 -- that aren't subject to either the Section 415 or 402(g) limits (TIAA-CREF 2002).

In 1993, the contribution rate for employees was 6.0% and the matching rate from employers was 2.7%. The contribution rates have been relatively stable over time and employers typically contribute about one dollar for every two dollars contributed by an employee. Contribution rates tend to rise modestly with age (Table A.2.)

Table A.2. Contribution Rates by Age, 1993

Age	Employee Contribution	Employer Contribution	Total Contribution Rate
25-29	5.6	2.9	8.6
30-34	5.6	2.8	8.4
35-39	5.4	2.5	8.0
40-44	5.9	2.4	8.3
45-49	6.3	2.7	9.0
50-54	6.4	2.5	8.9
55-59	6.9	3.0	9.9
60-64	7.4	3.1	10.6
All	6.0	2.7	8.7

Note: Based on Employee Benefits Supplement to the Current Population Survey.
Source: Poterba et al., 1998.

Keogh Plans. Keogh plans are the largest tax-deferred pension plan for the self-employed. ERISA liberalized the contribution limits in 1974. In 1997, there were roughly 1 million active Keogh plans with a combined value of roughly $10 billion in the US. The annual contribution per active participant for Keogh plans varied between $8,000 and $9,000 during the 1990s. Although 401(k) contributions have increased at about the same rate as salary and wage earnings, Keogh contributions have not increased during the 1990s (Poterba et al. 2001b).

Several additional pension plans have been authorized by recent legislation including Simplified Employee Pensions (SEPs) and employee stock option plans (OSEPs), but these plans have not been widely adopted as of yet (Schulz 2001).

Public Sector Pension Programs

Federal Civil Service. The federal system was reformed effective December 31, 1986. All workers hired after that date and virtually all workers hired after December 31, 1981 are subject to the new provisions.

Old system: Full retirement to workers with at least 5 years of service and 62 years old; 20 years of service and age 60; or 30 years of services and age 55. Benefit formula is 0.015 * years * avg salary for the first five years + 0.0175 * years * avg salary for the 2d five years + 0.02 * years * avg salary for all years over 10. For thirty years of services, the benefit is 56.25% of average annual earnings. In addition, a "thrift saving plan" allowed workers to save up to 5% of pay in a tax-deferred plan with no matching contribution.

New system: (1) Federal workers now participate in social security and receive social security benefits. (2) Employees contribute 0.8% of their salary and participate in a DB plan which provides 1.0 percent * years * three highest consecutive years. If retiree is 62 or older multiple is 1.1 percent. (3) A thrift savings plan — government contributes 1% of pay, matches 1 for 1 up to 3% contribution by employee, 1 for 2 for the next 2% contributed by employee. The employee can contribute up to 5% additional (for a max of 10%) with no match from the Feds. Maximum in thrift plan would be 15% with 5% contributed by Feds and 10% contributed by individual.

Cost of living adjustments are the rate of inflation less 1 percent if inflation is greater than 3 percent; adjustment is 2 percent if rate of inflation is 2-3 percent; actual rate if rate of inflation is less than 2 percent (Source: Schulz 2001).

Military Pensions. No minimum retirement age. With 20 years of service, pension is 50% of base pay; 30 years of service pension is 75% of base pay. Current median age of retirement is 42 for enlisted personnel and 46 for officers. Personnel hired after 1986 receive a cost of living adjustment of the rate of inflation — 1%. At age 62 the benefit is adjusted to recoup the lost COLA but thereafter the inflation rate-1 rule applies. New employees also receive 40% if retire after 20 years with 1% additional for each year (Source: Schultz 2001). The right to participate in thrift saving plans was extended to military personnel in 2001. Members of the armed forces may contribute up to 7% of basic pay and up to 100% of incentive or special pay (including bonus pay) subject to IRS limitations.

Employee Retirement Service. State and local workers in Hawaii can retire at age 62 with at least 10 years of credited service or at age 55 with at least 30 years of credited service. Early retirement is possible at age 55 with 20 years of credited services but with a 6% age reduction penalty for each year between age 55 and 62. Special provisions apply to disabled workers. For non-contributory members, the public pension program is a defined benefit program. The maximum benefit, a lifetime pension with no survivor benefits, is calculated as the number of years of service x 0.0125 x average salary for the highest three years of service. Benefits are reduced for retirees electing to provide

benefits to a surviving beneficiary. Participants in ERS can also elect to participate in non-traditional pension plans including 403(b) plans and 457 plans.

Appendix B. Tax Policy and Forecasts

The analysis presented here considers four cases, which vary in their treatment of pension distributions and social security benefits. To assess the impact of changes in tax policy, we estimate the effect of tax policy on adjusted gross income (AGI) and the effect on tax rates assuming that the current real tax brackets remain in place. The four policies are as follows:

Case A. Current tax policy is unchanged. The definition of AGI does not change. Income tax brackets are assumed to adjust so that individuals who experience no increase in real AGI will experience no change in the ratio of taxes to AGI.

Case B. Current tax policy is changed to *include* all pension income in AGI.

Case C. Current tax policy is change to *include* all pension income and the federally taxable portion of social security benefits in AGI.

Case D. Current tax policy is changed to *exclude* all pension income, including IRAs, 401(k) plans, Keogh plans, and similar retirement plans that currently included in AGI, in whole or in part.

Adjusted Gross Income (AGI)

In the base year, 2000, AGI is directly observable (DOT 2002). For the other cases, AGI is defined as follows:

Case B: AGI equals observed AGI plus the excluded portion of pensions and annuities reported for 2000.

Case C: AGI equals Case B AGI plus reported taxable IRA distributions.

Case D: AGI equals observed AGI minus the included portion of pensions and annuities reported for 2000 minus taxable IRA distributions to households with a member 65 or older.

AGI for each case is forecast by assuming that AGI will grow at the same rate as the appropriately measured value of household income. The appropriate measure of household income is earned income plus dividends, interest, and rental income plus the included portion of pension find[12], IRAs, and social security benefits. We assume that the federally taxable portion of social security benefits is a constant fraction of total social security benefits and equal to the value for the base year.

[12] Pension fund distributions is an estimated component of total income, not the pension and annuity component of AGI.

Table B.1. Taxable Income and Tax Liability in Millions under Alternative Definitions of AGI, by AGI Class, 2000.

Hawaii Adjusted Gross Income Class (under alternative scenarios)		Actual			Scenario I		Scenario II		Scenario III	
		Hawaii Taxable Income	Hawaii Tax Liability	Average Tax Rate	Hawaii Taxable Income	Hawaii Tax Liability	Hawaii Taxable Income	Hawaii Tax Liability	Hawaii Taxable Income	Hawaii Tax Liability
Taxable Resident Returns										
Under $	5,000	44	1	0.0220	44	1	43	1	4	1
5,000	10,000	197	7	0.0353	196	7	198	7	19	7
10,000	20,000	839	42	0.0502	825	41	876	44	87	44
20,000	30,000	1,304	78	0.0596	1,288	77	1,377	82	1,34	80
30,000	40,000	1,283	82	0.0641	1,274	82	1,444	93	1,39	89
40,000	50,000	1,177	77	0.0658	1,160	76	1,346	89	1,33	88
50,000	75,000	2,631	181	0.0686	2,603	179	2,932	201	3,09	213
75,000	100,000	1,893	136	0.0718	1,832	132	2,118	152	2,23	160
100,000	150,000	1,773	134	0.0758	1,716	130	2,120	161	2,24	170
150,000	200,000	709	56	0.0795	689	55	825	66	86	69
200,000 and over		2,432	202	0.0831	2,396	199	2,611	217	2,68	223
Total - Taxable Returns		14,281	997	0.0698	14,022	978	15,889	1,112	16,30	1,144

Notes: Scenario I: AGI and taxable income are redefined as actual values less taxable IRA distributions.
Scenario II: AGI and taxable income are redefined as actual values plus pensions and annuities.
Scenario III: AGI and taxable income are redefined as actual values plus pensions and annuities and federally taxable social security.

Source: Department of Taxation tabulations.

Tax Rates

Changes in the definition will change the average tax rate because of changes in the average and distribution of AGI. The effect on tax rates is assessed by redefining AGI in a sample of individual tax returns and re-calculating individual tax payments. The individual records are then accumulated to determine the total change in tax liability under alternative definitions.[13] Three alternative scenarios are considered, which do not conform exactly to the cases described above because no data are availability on the portion of pension and annuities income that is excluded from taxes. Thus, the three scenarios considered are to subtract all IRA distributions from AGI (scenario I), to add all pension and annuity income to AGI (scenario II), and to add all pension and annuity income and federally taxable social security to AGI (scenario III). Table B. 1 reports the effect on taxable income and the tax liability under the alternative scenarios.

[13] Special tabulations for this analysis were prepared by the Department of Taxation. For more information about the sample see Department of Taxation 2002.

Using the information from this analysis, we estimate the marginal effect on taxes of an additional dollar of IRA income, of non-IIRA pension income, and non-IRA pension and taxable social security income combined. These values, reported in Table B.2, are then used to calculate the effect on taxes of changes in IRAs, pension income, and taxable social security reported in the body of the report.

Table B.2. Calculation of Marginal Tax Rates of IRAs, pensions and annuities, and federally taxable social security. Values in millions.

	Hawaii AGI	Hawaii Taxable Income	Hawaii Tax Liability	Average Tax Rates
Actual	19,04	14,28	99	0.052
Scenario I	18,72	14,02	97	0.052
Scenario II	20,91	15,88	1,11	0.053
Scenario III	21,33	16,30	1,14	0.054
	Marginal Effects			Marginal Rates
Scenario I	(325)	(259)	(19)	0.057
Scenario II	1,864	1,608	115	0.062
Scenario III	2,288	2,022	147	0.064

Notes: All values for taxable resident returns only.
Scenario I: AGI and taxable income are redefined as actual values less taxable IRA distributions
Scenario II: AGI and taxable income are redefined as actual values plus pensions and annuities.
Scenario III: AGI and taxable income are redefined as actual values plus pensions and annuities and federally taxable social security.

Marginal tax rate is the increase in taxes per additional dollar of Hawaii AGI.

Source: Department of Taxation tabulations; calculations by author.

Appendix C: Model Specification and Estimation

These sections describe the specification of the forecasting model for projecting population, income, pensions, and taxes. Values are estimated at five-year intervals for five-year age groups. The base year is 2000 and the final year is 2075.

Population Projections

The population is projected separately for males and females in 5-year age groups at five-year intervals. The model is a variation on the standard cohort-component model. In the cohort-component model, the size of each cohort declines from one period to the next because of deaths to members of the cohort and either declines or increases because of net migration. Thus, the population of a cohort in a period is the population of the same cohort five years earlier multiplied by the proportion surviving and the net migration rate. The population of the youngest cohort is equal to the number born during the previous five year period less deaths plus net migrants into that cohort. Applying the cohort-component method requires the base year population and forecast values of age-specific fertility rates, the sex ratio at birth, sex- and age-specific survival rates, and sex- and age-specific net migration rates.

The population projection for the State of Hawaii is conditioned by the population projection for the United States. Following the cohort-component method, the population in any age group is represented by:

$$N^h(a+5,t+5) = s^h(a,t)m^h(a,t)N^h(a,t) \tag{1.1}$$

where $s^h(a,t)$ is the proportion of the age group surviving five years, $m^h(a,t)$ is the net migration rate (a value exceeding 1 indicates net in-migration; a value less than 1 net out-migration), and $N^h(a,t)$ is the population aged a in year t. For simplicity sake, we do not distinguish males from females in the formula, but the model is applied separately to males and females. The superscript h represents Hawaii; the absence of a superscript denotes values for the US.

If we divide by $N^h(a,t)$, take the natural logarithm and divide by 5, we obtain the annual growth rate of the cohort

$$n^h(a,t) = 0.2\ln(s^h(a,t)m^h(a,t)) \tag{1.2}$$

The relationship between growth in a Hawaii cohort and a US cohort is given by:

$$n^h(a,t) = n(a,t) + \frac{\ln(s^h(a,t)m^h(a,t))}{\ln(s(a,t)m(a,t))} \tag{1.3}$$

The rate of growth of a cohort in Hawaii exceeds the rate of growth of the same cohort in the US to the extent that survival rate or the net migration rate for that cohort exceeds the survival rate and net migration rate for the same cohort for the US population as a whole. The relative survival rate and relative net migration rates in equation (1.3) can be separated into two linear components, but for the present purpose this is unnecessary. Analysis of historical data for Hawaii shows that the population growth differential is relatively stable and not characterized by any particular trend. Hence, the cohort growth rate and cohort population are projected by:

$$\begin{aligned} n^h(a,t) &= n(a,t) + \delta(a), \text{ where} \\ \delta(a) &= \ln(s^h(a)m^h(a))/\ln(s(a)m(a)), \text{ and} \\ N^h(a+5,t+5) &= e^{n^h(a,t)}N^h(a,t). \end{aligned} \tag{1.4}$$

The population in the 0-4-year-old cohort is projected using the standard cohort-component methodology. The number of births is calculated by:

$$B(t) = \sum_a f(a,t)N^f(a,t) \tag{1.5}$$

where $f(a,t)$ is births per woman aged a in year t during the subsequent five-year period and $N^f(a,t)$ is the female population aged a in year t. The sex ratio at birth is used to calculate the number of male and female births. The female and male populations aged 0-4 depends on the survival and net migration rates to which births are exposed during the first five years of their lives. These rates are assumed to be constant over the projection period. This is a reasonable assumption for Hawaii given the low infant mortality rates that characterize the state.

Income Forecasts

The model distinguishes four major sources of income: earnings, pension income, social security, and other non-earned income (dividends, rent, and interest income). Pension income is further sub-divided into public pensions (federal, state and local, and military) and private pensions.[14] Private retirement income is krther divided into three categories: (1) distributions from defined benefit and non-401(k) defined contribution programs; (2) IRAs; and, (3) 401(k), Keogh plans, 403(b), 457, and similar programs. Henceforth these programs will be referred to as 401(k) plans.

The method for forecasting income is similar for all income types, except as noted below. The cross-sectional age-income profile is held constant, in relative terms, throughout the projection. The profile shifts upward depending on the rate of productivity increase. Thus, average income profile for income type i is calculated as:

[14] Public pensions include only the traditional pension benefits and not IRA, 403(b), or other non-traditional pension distributions received by retired public sector workers. These are combined with private pension programs.

$$\bar{Y}^i(a,t) = e^{\rho(t-2000)}\bar{Y}^i(a,2000) \quad (1.6)$$

where $\bar{Y}^i(a,t)$ is the mean income of type *i* of Hawaii residents aged a in year t and ρ is the annual rate of productivity growth.

Total income of type *i* in year *t* is given by:

$$Y_t^i = \sum_a N(a,t)\bar{Y}^i(a,t) \quad (1.7)$$

Pension Income: 401(k) Simulations

Total private pension income, distributions from IRAs, and total public pension income are forecast using the method just described. The 401(k) portion of private pension income, however, is forecast by simulating the accumulation of 401(k) assests and the distribution of 401(k) benefits based on the trend in employee participation in 401(k) plans, historical and projected earnings data, information on the share of earnings invested in 401(k) plans, data on the rates of return to 401(k) plans, etc.

The trend in the value of 401(k) assets for any cohort is governed by a simple identity:

$$A(a,t) = A(a-5,t-5) + C(a-5,t-5) + I(a-5,t-5) + W(a-5,t-5) + B(a-5,t-5). \quad (1.8)$$

where *A(a,t)* is the value of 401(k) assets at the beginning of the year, *C(a-5,t-5)* is the total value of contributions out of earnings made by either employees or the employer during the five-year period *t-5* to *t*. *I* is the total investment income or the returns on assets earned by pension companies net of all administrative costs. W is the total withdrawals by retirees. *B* is the net decline in pension assets due to the net decline in the number of members belonging to the cohort, irrespective of the source. This component captures changes in pension assets due to the death of pension holders or because holders of 401(k) pensions enter or leave the state.

Initial Assets. The model is applied beginning in 1970 when 401(k) plans had not yet been established and initial **assets** were zero. Using historical information, assets in year 2000 are obtained via simulation, i.e., the application of equation (1.8), and used in all forecasts.

Contributions. Contributions are determined by three factors – earned income (Y^l)), the share of 401(k) plans in total pension plans (s), and the contribution rate (π), i.e.,

$$C(a,t) = \pi s(a,t)Y^l(a, \quad (1.9)$$

Earned income is forecast as explained above and the contribution rate is assumed to be constant. The share of 401(k) plans is governed by a logistic relationship fit to historical data. The form of the equation estimated is:

$$\ln(s/(U - s)) = a + \beta t, \tag{1.10}$$

where s is the proportion of non-traditional plans, U is the upper limit which s exceed, and t is year. The proportion of employees participating in 401(k) type plans is forecast by:

$$s = L\exp(\alpha + \beta t)/(1 + \exp(\alpha + \beta t)) \tag{1.11}$$

Investment Income. Investment income is calculated as the return on pension fund assets net of all administrative costs, i.e.,

$$I(a,t) = r'(t)A(a,t). \tag{1.12}$$

The net rate of return, $r'(t)$, is assumed to be constant beginning in 2005. The rate of return from 2000-2005 reflects the recent performance of the investment funds.

Withdrawals. In the analysis we assume that accumulated pension wealth is withdrawn by retired individuals over the remaining years of their expected life. Based on current life expectancy *(L)* and expected interest rates ***(r),*** individuals draw down their pension wealth at a constant rate that would just deplete their funds if they lived the expected number of years. At the beginning of each five-year period, the values are recalculated based on the life expectancy the cohort now faces. Thus, withdrawals in subsequent five-year period will decline because those who survive will, on average, live longer than anticipated and because of the secular increase in the period life table.

The annual payout, P, is given by:

$$\begin{aligned} P &= A_t / \sum_{x=0}^{L-1} (1+r)^{-x} \\ &= A_t / \frac{1+r}{r}\left[1 - \frac{1}{(1+r)^{-L}}\right] \end{aligned} \tag{1.13}$$

The proportion of assets at the beginning of the period paid out during the subsequent five-year interval, p, is given by:

$$p = 5/\frac{1+r}{r}\left[1-\frac{1}{(1+r)^{-L}}\right] \text{ for } L > 5$$
$$= L/\frac{1+r}{r}\left[1-\frac{1}{(1+r)^{-L}}\right] \text{ for } L \le 5. \qquad \textbf{(1.14)}$$

The payout rate will exceed one in the final payout period because the payout will include all of the initial assets plus interest accumulated during the period. Note that the payout is made at the beginning of the year and interest is credited at the end of the year.

The decline in pension assets over any five-year interval for each cohort is given by:

$$A_{t+5}/A_t = \frac{(1+r)^{L-5}-1}{(1+r)^{L-5}-(1+r)^{-5}} \text{ for } L \ge 5$$
$$= 0 \text{ for } L<5. \qquad \textbf{(1.15)}$$

The withdrawal rates are for retired individuals. Hence, for any cohort the withdrawal rate will be equal to the proportion of cohort members retired times the withdrawal rate for retired individuals.

Bequests and Net Migration. We assume that mortality and net migration are both independent of pension wealth. Thus, any decline or rise in the size of a cohort results in a proportionate decline or rise in pension assets and a corresponding decline or rise in contributions, investment income, and withdrawals.

Adjusted Gross Income and Taxes

The methods for calculated AGI and taxes under alternative policies are explained in the main report.

Data and Estimation

Population Projections: Base Year Population

The population for 2000 is from the 2000 Census of Population. These data have not been adjusted for under-enumeration. The population is:

Table C.1. Population of Hawaii, 2000.

Age	Male	Female
0-4	40110	38053
5-9	43739	41241
10-14	42740	40366
15-19	42200	38802
20-24	45709	37700
25-29	44016	39984
30-34	44391	42758
35-39	48760	47175
40-44	47817	47425
45-49	45130	45274
50-54	40523	40052
55-59	29905	30656
60-64	22293	24107
65-69	19503	23344
70-74	18919	23496
75-79	16020	19366
80-84	9626	12763
85+	7270	10294

Population Projections: Fertility Assumptions

Age-specific fertility rates (ASFRs) for Hawaii 1995-2000 were estimated based on registered births from the Department of Health and population estimates from the US Census Bureau. The ASFRs and the total fertility rate (TFR) are assumed to remain constant throughout the projection period.

Table C.2. ASFRs and TFR Hawaii, 1995-2000

Age	Births per woman
15-19	0.047
20-24	0.144
25-29	0.100
30-34	0.095
35-39	0.050
40-44	0.012
TFR	2.140

A sex ratio at birth of 1.06 male birth per female birth is used.

Population Projections: Survival and Net Migration Rates

The differential rate of cohort growth is estimated using population estimates for Hawaii and the US at five-year intervals for 1970 to 2000. The differential is calculated as the mean differential for each age and sex group during the period in question. The values obtained are:

Table C.3. Differential cohort growth rates

Age	Males	Females
0-4	-0.006	-0.007
5-9	-0.005	-0.006
10-14	0.009	0.002
15-19	0.037	0.008
20-24	-0.024	0.009
25-29	0.003	0.008
30-34	0.003	0.000
35-39	-0.006	-0.006
40-44	-0.002	0.001
45-49	0.004	0.006
50-54	0.009	0.007
55-59	0.012	0.011
60-64	0.012	0.012
65-69	0.013	0.003
70-74	0.022	0.011
75-79	0.024	0.011
80-84	0.027	0.031

Population Projections: United States

Population projections are projections for the United States prepared by the Social Security Administration. The assumptions underlying the projections are described in detail in US SSA 2002.

Table C.4. Assumptions Underlying Projections of US Population

		Sex- Age- Adjusted Death Rates Per 100,000			Net Immigration	
	TFR	Total	Under 65	Over 65	Legal	Other
2000	2.1	812.4	238.1	4834.1	637,358	300,000
2010	2.1	759.8	215.1	4574.3	600,000	300,000
2020	2.0	698.1	195.6	4217.3	600,000	300,000
2030	2.0	642.2	178.4	3890.1	600,000	300,000
2040	2.0	593.2	163.4	3603.0	600,000	300,000
2050	2.0	550.0	150.0	3351.1	600,000	300,000
2075	2.0	462.6	122.9	2741.6	600,000	300,000

Detailed projections have not been published, but were provided for this study by the Social Security Administration.

Age-Income Profiles

Table C.5. Estimates of Average Income by Age, Hawaii, 2000

Age	Income	Earnings	Non-earned Income			
			Total	Interest, dividends, and rental income	Social Security	Pension Income
15-19	4,526	2,939	1,587	1,430	157	-
20-24	16,472	13,315	3,157	3,125	32	-
25-29	28,971	25,771	3,199	3,126	62	11
30-34	35,076	31,205	3,872	3,744	109	19
35-39	40,113	34,867	5,246	5,012	161	73
40-44	43,281	36,805	6,476	6,041	239	196
45-49	46,053	38,466	7,587	6,977	316	293
50-54	48,593	38,278	10,315	8,790	351	1,173
55-59	54,213	32,554	21,659	10,304	639	10,716
60-64	47,475	21,745	25,730	10,242	2,390	13,097
65-69	41,113	8,462	32,652	12,568	6,701	13,383
70-74	36,734	4,329	32,405	11,765	7,693	12,947
75-79	34,419	2,183	32,237	12,407	7,896	11,934
80-84	31,236	1,761	29,475	11,090	8,176	10,208
85+	27,139	640	26,499	10,780	8,186	7,533

The age-income profiles for earnings, interest, dividends, and rental income, social security, public pensions, and IRAs are estimated using the 2000 Current Population Survey (CPS) for the US. The age-profiles are adjusted proportionately using data from a variety of sources. Earnings were adjusted to produce values consistent with average values reported for Hawaii residents in the 1995 and the 2000 CPS. The age-profile for the US and for Hawaii respondents was constructed using the 1995 and 2000 CPS. The ratio of average Hawaii income to US income at each age was computed. An average ratio was constructed using the average income at each age in Hawaii as weights.

The social security age profiles were adjusted using information on the total social security benefits paid to residents of Hawaii in 2000. Likewise, public pension income was adjusted using data on total pension payments to state and local retirees, federal civilian retirees, and military retirees. IRA profiles were adjusted to produce results consistent with TRA distributions reported by households containing a member 65 or older in 2000 State of Hawaii tax returns. Interest, dividends, and rental income were adjusted using Bureau of Economic Analysis estimates of personal income in Hawaii.

The estimated adjustment ratios for each income type are:

Table C.6. Adjustment factor - final income profiles relative to US CPS profiles for 2000.

Income Type	Ratio
Earnings	1.07
Social Security	0.94
Public Pension Income	2.76
IRAs	9.60
Dividends, Interest and Rental Income	2.46

Values close to 1 indicate that the age-earnings profiles based on US data in 2000 are consistent with alternative sources of information used to construct final profiles for Hawaii. Values significantly different than one may reflect real differences between Hawaii and the US or errors in the underlying data. The earnings and social security estimates indicate that average nominal earnings in Hawaii are about 7% greater in Hawaii than in the US as a whole, while average social security benefits are about 6% lower. The differences between CPS-based estimates for pension income and alternative estimates for Hawaii are very large. Other studies have concluded that the CPS substantially underestimates pension income. Nonetheless, the extent to which IRAs are under-estimated by the CPS is troubling.

401(k) Type Plans

Historical Simulation and Base Year Estimates. No reliable estimates of 401(k) pension wealth or income are available for Hawaii. Thus, estimates are obtained using simulation methods. Beginning in 1970, the accumulation of 401(k) pension assets is simulated annually yielding estimates of assets, earnings, and withdrawals by the age of individual through 2000. For 2000, 401(k) assets held by Hawaii residents are estimated at $4.8 billion and withdrawals for that year are estimated at $53 million. Withdrawals are a very small percentage of assets in 2000, because a very high percentage of 401(k) assets are held by individuals who have not yet reached retirement age. Withdrawals will rise as a percentage of assets as the 401(k) program matures.

The detailed procedures for the historical simulation are as follows:

Annual Earnings. Annual earnings by age were estimated assuming that the shape of the age-earnings profile remained constant between 1970 and 2000, but shifted with the trend in real wages. The age-profile is based on the 2000 Current Population Survey for the US, as described above. The trend in real wages is measured by the average annual wage for employees covered by the Hawaii employment security law and unemployment compensation for federal employees deflated by the Honolulu urban CPI. (Table 12.25 State Data Book of Hawaii, DBEDT web site). The trend in wages is partly influenced by age structure, but we adjust for these changes by measuring the annual change in wages due to changes in age structure. Then we construct an index of the shift in

"productivity" purged of age structure effects. This index is used in conjunction with the 2000 age-earnings profile to calculate average earnings by age.

Participation in 401(k) Plans and Contribution Rates. The proportion of persons of each age participating in 40 1(k) plans is calculated in the following manner. First, SIPP and CPS data from Poterba et al (1998) are used to estimate the proportion of employees participating in 1984, 1988, 1991, and 1993. The SIPP data were proportionately adjusted so as to match the 1993 data that are available from both sources. Prior to 1981, the year in which 401(k) plans were introduced, the participation rate is set to 0; values from 1981 and 1984, 1984 and 1988, 1988 and 1991, and 1991 and 1993 are linearly interpolated; after 1993 rates are assumed to be constant. (Constant values after 1993 produce a national participation consistent with the most recently available numbers on the aggregate number of participants.)

The percentage of persons employed in each year is based on 2000 CPS data for the number of earners by age. The participation rates by Poterba et al. 1998 count persons as participating if either member of a couple (or a single individual) has earnings. We constructed a similar measure to obtain the proportion of persons who were earners. Details are available from the author. The proportion of the age group participating is the product of the proportion with earnings and the proportion participating conditional on being earners.

The proportion of earnings contributed to 401(k) plans by participants was set to 8% in line with estimates from Poterba et al. 1998.

Earnings on pension assets. Earnings on pension assets were estimated using the rate of return on the Standard and Poor's 500 Index of stocks with reinvested dividends. The index is available from the Federal Reserve Board of St Louis and it closely mirrors estimates of the rates of return to 401(k) plans available for the 1990s. We assumed that the cost of investing was 1% of pension assets – a value similar to estimates of 401(k) pension costs from Economic Systems, Inc. 1998.

Withdrawals. Withdrawals from 401(k) plans were estimated using the methods described above. For the historical calculations, life expectancy is held constant based on estimates of survival rates for 1990 and the expected rate of return is assumed to equal 6%.

Bequests. Pension assets also decline due to the death of participants. We assumed that pension assets were bequeathed to a spouse if surviving. Otherwise the 401(k) account was dissolved. We assumed that the proportion of accounts dissolved in any year, then, was given by $d(1-m)+d^2m$ where d is the proportion of an age group dying and m is the proportion of the age group married. The first term is the proportion dying who are unmarried. The second term is the proportion who were married, died, and their spouse died in the same period. The death rates were estimated for 1990 for Hawaii; the proportion married were for 1990 for the US. (Values for Hawaii are not readily available.) The values were held constant at the 1990 levels for these calculations. (The

period in question is sufficiently small that variations in mortality rates had a negligible effect on the 2000 distribution of assets).

Forecast of 401(k) Pensions

Assets in the base year, 2000, by age are obtained by methods described above. Hence, assets for 2005-2075 are forecast by forecasting each of the four components identified in equation (1.8): contributions, pension earnings, withdrawals, and "bequests".

Contributions. We assume that a number of important variables that influence contributions do not change during the simulation period. These include the percentage of earnings contributed to 401(k) plans by participants, the percentage of private employees covered by pension programs of any type, and the percentage of persons of each age who are private employees. To varying extents these assumptions are consistent with observed patterns for the US and perhaps Hawaii, as well. The percentage of earnings contributed to pensions plans and the percentage of private employees covered by pension plans has been relatively stable for some time in the US. There has been a long-term downward trend in the age at retirement in the US and other industrial countries, although during the 1 990s the age at retirement stabilized and showed some upward movement in the US. Possibly, changes in age at retirement legislated in US social security reform may push the age at retirement higher, but this remains to be seen. The most important change in retirement programs for this study is the rapid shift in the composition of US pension plans - from defined benefit to defined contribution plans. The importance of the changing composition underlies the particular methodological approach employed for forecasting changes in contributions to 401(k) plans.

The change in the composition of pension plans is forecast using a logistic model of the form:

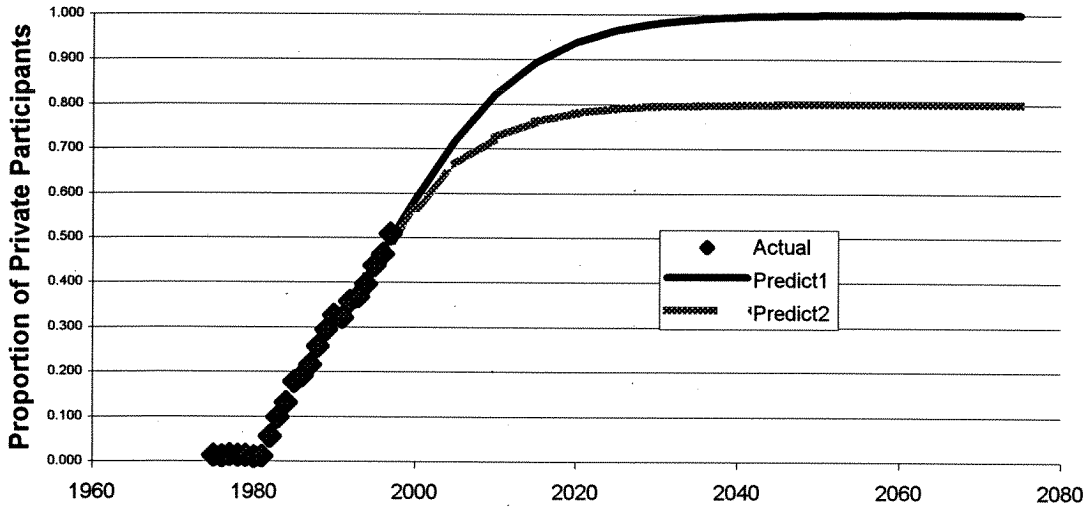
$$1n(s/(U—s)) = a + b\ t, \qquad (1.16)$$

where s is the proportion of non-traditional plans (Keogh and 401(k) plans), U is an upper limit on the proportion of non-traditional plans, and t is year.

The model is estimated using relatively recent data (1988-1997) for the US. Earlier data is not included because of the important legislative changes that established IRAs and 401(k) plans and then restricted IRA eligibility and established contribution caps. The trend since 1988 is consistent with a continuing and rapid transition to a pension system dominated by non-traditional programs, however the data provide no real indication as to whether non-traditional pensions will entirely replace traditional plans or whether the traditional programs will continue albeit at a reduced level. To illustrate this point, two forecasts are shown in Figure C.l.. In one forecast, the non-traditional programs replace the traditional programs in their entirety. In the second forecast, the

Non-traditional programs stabilize at 80% of the total participation. Either forecast is entirely consistent with the historical data.[15]

Figure C.1. Forecast Participation in 401(k) and Keogh Plans



Anecdotal evidence suggests that complete replacement is the less likely of these two outcomes. The initial growth of 401(k) plans has been among companies and employees who are most amenable. Unions, for example, are relatively resistant to non-traditional pension programs so that the complete replacement of traditional plans may not be imminent (Schieber 1998). 'In the forecasts presented below, we assume that the non-traditional plans will reach 80% of total private participation.

Setting the upper limit to 0.8 in the logistic, ordinary least squares estimates of the coefficient of t is 0.111 and the intercept term is —221.1. The coefficient of determination is 0.97.

The logistic model provides a forecast of the overall level of participation in 401(k) plans by earners. To obtain an estimate of participation by age of earner, we use the age-profile of participation from Poterba et al. 1998. The profile is based on the proportion of private employees participating in 40 1(k) plans based on the 1993 Current Population Survey. We adjusted the profile based on the most recently available estimate of the total number of active participants in 40 1(k) plans.

The contribution of each cohort during a five-year period is the total earnings of that cohort during that period times the proportion of earners participating in 401(k) plans times the contribution rate. The earnings during any five-year period is based on population and average earnings of cohort members at the beginning and the end of the five-year period. We assume that the earnings change in linear fashion. Thus,

[15] The R^2 is 0.97 for both regressions.

contributions reflect changes in the population due to net migration and mortality during the five-year interval.

Pension Earnings. Pension earnings are determined by the net rate of return on pension assets. The net rate of return will depend on the choice made by retires about the extent to which they concentrate their portfolios in equities, which have a relatively high but variable rate of return, trends in the rates of return and the equity premium, and administrative costs.

Poterba, Venti, and Wise 1998 use nominal rates of return since 1926 on Corporate Bonds (6%) and the S&P 500(12.7%). According to Ibbotson 2002 the nominal rate of return for common stocks was 10.7% between 1926 and 2001. Campbell forecasts a real rate of return of 5-5.5 percent from stock market with an equity premium of only 1.5 to 2.0 percent. Ibbotson forecasts an equity premium of 4% in excess of long-term bond yields. Campbell 2002 says that historical real rate of return to stocks is 7 percent. Campbell 1999 (Table 2:1241) reports a real rate of return to US stocks of 7.569 for 1947.2 - 1996.4 and of 6.697 for 1891-1995. Current yield on inflation-indexed treasury bonds according to Campbell 2002 is 3.5% a safe investment.

Asset allocation varies modestly by age with young 401(k) holders investing a larger share of their funds in equities. Holden and VanDerhei (2001: Table 3: page 8) report the following assets allocation:

Table C.7. Allocation of 401(k) Funds by Age.

Age	Equities	Other
20s	76.8	23.2
30s	78.6	24.4
40s	74.5	25.5
50s	68.3	31.7
60s	56.1	43.9
All	69.9	31.1

In the baseline model, we assume a real net rate of return of 6 percent after 2005. For the 2000-2005 period, the rate of return is the an average of 6% for future periods and the estimated rate of return for 2000, 2001, and the first half of 2002. The estimate for this period is based on the performance of TIAA-CREF, the largest US pension find.

Withdrawals. The methodology employed for estimate withdrawals requires data on the expected rate of return and life expectancy. We assume that the expected rate of return is equal to 6% for all periods.

Life expectancy in Hawaii is estimated by linking it to the projected trends in life expectancy for the US in the following manner. The US SSA projections provide life expectancy at age 65 for males and females at five-year intervals. US *female* life expectancy at age 65 was 19.0 years in 2000, equal to Hawaii's *combined* life expectancy of 19.0 years in 1990. Thus, we assume that Hawaii life expectancy at age 65 would

equal female life expectancy for the US with a 10 year lead. For the final ten years of the projection we assumed that the increase would be constant and equal to the increase between 2070 and 2075 for the US. Life expectancy increases about 0.5 years of age per decade in the US SSA projections.

To obtain life expectancy at other ages we relied on a simple model life table constructed in the following way. Beginning with the Hawaii 1989-91 life table as a base, we assumed that 5 minus the years lived in any five-year interval will decline proportionately for all ages 55 and greater. This provides a family of tables from which we select the table in each year corresponding to the life expectancy at age 65 for each year.

Aggregate Variables

Aggregate variables for 2000 are used to calibrate the model to the base year. The aggregate variables and their sources are:

Table C8. Aggregate Data for the State of Hawaii, 2000

Variable	Amount	Source
Dividends, Interest, and Rent (millions)	6,374	Bureau of Economic Analysis, 2002
Social Security (OASI, millions)	1,495	US Bureau of Economic Analysis, 2002; US Social Security Administration, 2002
Military Pensions (millions)	267	US Census Bureau 2002**a.**
State and Local Pensions (millions)	492	Hawaii ERS 2002.
Federal Pensions (millions)	480	US Census Bureau 2002**a.**
IRAs reported by households claiming an elderly exemption (millions)	229	Hawaii Department of Taxation 2002.
Adjusted Gross Income (millions)	20,129	Hawaii Department of Taxation 2002.
Tax Liability (millions)	1,058	Hawaii Department of Taxation 2002