2000

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Citation

Rettenmaier, Andrew J., and Thomas R. Saving. 2000. The Economics of Medicare Reform. Kalamazoo, MI: W.E. Upjohn Institute for Employment Research. https://doi.org/10.17848/9780880994156

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W.E. Upjohn Institute for Employment Research
Kalamazoo, Michigan

Library of Congress Cataloging-in-Publication Data

Rettenmaier, Andrew J.
The economics of medicare reform / Andrew J. Rettenmaier and Thomas R. Saving.
p. cm.
Includes bibliographical references and index.
ISBN 0–88099–211–5 (pbk. : alk. paper) —
ISBN 0–88099–212–3 (cloth : alk. paper)
1. Medicare. 2. Medicare—Finance. 3. Health care reform. 4. Medicare—Economic aspects. I. Saving, Thomas Robert, 1933– II. Title.

RA412.3.R48 2000
338.4'33684'2600973—dc21 00–043722

W.E. Upjohn Institute for Employment Research
300 S. Westnedge Avenue
Kalamazoo, Michigan 49007–4686

Cover design by J.R. Underhill.
Index prepared by D.E. Nadziejka.
Printed in the United States of America.

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Acknowledgments

We thank the Upjohn Institute for Employment Research for its financial support, and the Lynde and Harry Bradley Foundation for generous support of their Medicare Reform project. We also thank Liqun Liu, Hugh Richardson, and Martin Gritsch for valuable comments and suggestions, Laurel Van Allen and Caton Walker for research assistance, and Barbara Fisher, Susanne Williams, and Maria Wojciechowski for their help in preparing each manuscript.

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The Rise and Fall of Medicare

We are coming to the end of Medicare as we know it. This end will come about not because Medicare is not popular and not because the reason for Medicare's existence is past, but because Medicare's financing cannot sustain its expenditures. Spiraling per-capita benefit costs and the prospect of an avalanche of new members in the program will force Congress to find new revenues or to drastically cut benefits. The natural questions are: How did we get here? And, why didn't we see the crisis coming? Yet the answers to these questions only give us the source of our problems and not the solution, if there is one. In this book, we follow Medicare through its relatively short life, pointing out the reasons for the briefness of its healthy period and proposing a permanent solution to the crisis. We deal with all three aspects of the Medicare program that have worked together to get us to the current situation: a payment scheme that ensures the users of the system will not care what it costs; a financing system that involves generation transfers as its principal source of revenue; and the penchant of Congress to fund "worthy" causes with any funds that appear available. The remainder of this chapter presents an overview of the factors that have resulted in the potential insolvency of Medicare and our solution to the Medicare crisis.

WHO PAYS AND THE ESCALATING PER-CAPITA COST OF MEDICARE

As a point of departure, consider the difference between the full-page grocery store advertisements that appear in every daily newspaper and those touting your local hospital or health care provider. The grocery store ads, no matter in what city they appear, are dominated by one thing: the price of the advertised goods. Health care firms also advertise, and their ads inform us about why we should use their

respective facilities, but price is never mentioned. Only the nonprice components of care are the subject of hospital and medical clinic ads.

Why is price prominent in grocery advertising but never mentioned in ads for hospitals or medical clinics? The reason is simple, and it is a major reason for the escalating per-capita cost of Medicare: the majority of consumers of medical care are not concerned about its cost because they aren't paying for it (at least not directly). Because buyers are not concerned about medical care costs, the sellers of medical care aren't either. Consumers are happy to demand state-of-the-art care, and providers are happy to supply it.

Consider hospitals, for example. Well over 90% of all payments to hospitals in the year 1990 were not paid by the recipients of hospital services. For physicians services, over 80% of all payments were not paid by patients. Even for dental services and prescription drugs, relative newcomers to the prepaid insurance market, more than 50% of payments in 1990 were not made by the patients. If the patients aren't paying, who is? The payers are the federal government, through Medicare, and the patients, indirectly through various medical prepayment plans (commonly known as medical insurance, although the insurance companies simply administer group plans and are not at risk as they would be if insurance was really involved).

Private insurance, or prepaid medical care, works this way. Suppose you are fully aware that your next year's group premiums depend solely on your group's expenditures this year. Suppose further that you are a member of a group of 1,000 and contemplate an additional $1,000 worth of medical services. This extra $1,000 in expenditures will raise your next year's premium only one dollar, because the other 999 members will pay the rest ($1 each). Thus, you have every incentive to treat medical care as essentially free. Furthermore, you can't expect the providers of medical care to be concerned about the cost if you are not. In this type of environment, no hospital will advertise price, but rather what state-of-the-art services they can provide. After all, you can and will pay anything, because you are not actually paying; your fellow workers are.

Imagine if the air-travel market operated the same way as the market for health care. You are in Florida and want to travel to California. Your choices are 1) fly from, say, Orlando to Los Angeles on any major carrier in coach for perhaps $500; 2) fly the same route and carrier first

class for $2,000; 3) fly the space shuttle at a full cost of $50 million (assuming convenience of schedule and flight safety were equal to those of the airlines). Looking at actual travel statistics, most Americans choose the $500 coach ticket. Why? Because they are paying for the ticket. The airlines know this and spend a lot of money telling prospective travelers what it will cost to fly on their airline. Now imagine you had Travelcare insurance that was operated in the same manner as most U.S. health insurance. Voila! Now all three modes of travel cost you the same. You can opt for first class or the space shuttle for the same price as coach. How many coach seats do you think travelers would demand? How many coach seats would airlines supply? You would be right if you said, "none." What would airline advertisements look like? Well, you can be sure they would not mention the price of the ticket. You can also be sure that the NASA budget would be much higher as more and more shuttle trips were flown.

To see the impact on the industry of who pays, consider the following facts. The real cost of a hospital room adjusted for the change in consumer prices has risen over 450% during the last 30 years. In contrast, the adjusted costs of physician services and dentist services have risen 170% and 130%, respectively, while that of pharmaceuticals has fallen 20%. What is different about these latter three categories of medical care? Why is there such a difference in real costs relative to the hospital sector? Perhaps the answers are in who is paying. For example, on average over the last 30 years, hospital patients paid less than 13% of all hospital bills and real costs have risen at 5% per year. Patients have paid on average less than 40% of physicians' bills and real costs have risen just under 2% per year. On the other hand, patients have on average paid more than 75% of their dental bills and the real cost of dental services has risen less than 1% per year; likewise, they have paid more than 80% of all their prescription bills, and real costs have fallen at an annual rate of just less than 1% per year. These are powerful facts that relate real increases in costs of medical care to whether or not buyers care what it costs.[1]

THE TRAGEDY OF MEDICARE FINANCING

When the Social Security Act was passed in 1935, the financing was envisioned as being fully funded by those working, so that when they retired there would be enough in the "Old-Age Reserve Account" to pay for their retirement.[2] Through a combination of failure to enact the programmed tax increases, premature initiation of payments to retirees, and expansion of benefits, the trustees of the Social Security Trust Fund estimate that the fund will be bankrupt by the year 2029. When Medicare was passed and the Medicare Trust Fund was established in 1965, there was never any pretense that the "trust funds" in that fund would be adequate to pay for the health care expenditures of the covered population. Not surprisingly, then, bankruptcy of the Medicare Trust Fund is expected by the year 2007.

As bad as all this sounds, the real issue may be even worse. The Social Security and Medicare trust funds—indeed, all government trust funds—are not trust funds at all. A trust fund, as you and I use this term, means resources put away to meet some future contingency. However, that is not what the Social Security and Medicare trust funds are. The assets of government trust funds are promises of the government to use future tax revenues to pay for the future expenditures that are guaranteed by the trust funds. These promises are not the source of any future revenues, and that is the problem.

As originally conceived, the Social Security Trust Fund (the name was changed from the Old-Age Reserve Account in 1939) was to buy in the market outstanding U.S. government bonds. The purchase of these bonds would have indeed represented a real investment, because these purchases would have reduced the future commitment of the government to pay interest on the purchased bonds, making these resources available for the retired. What in fact has occurred is that the tax revenues flowing into the trust funds have been treated as normal tax revenues to be spent on general expenditures; new, special U.S. government bonds have been issued and placed into the trust funds, which increases the net indebtedness of the government but is never entered in any official accounting of the outstanding federal debt.

To better see the relation between what a trust fund contains and that fund's ability to finance future expenditures, let us consider an

education trust fund established for a newborn child. Consider two types of assets in a college education trust fund for this child: bonds issued by entities other than yourself and bonds issued by you. In the former case, the trust fund has as its assets the ownership of income that others are legally obligated to pay to the trust. As a result, if the college education of your children depends only on the ability or the financial status of the issuers of the bonds to repay when your child enrolls in college, you have prepaid for your children's education. On the other hand, if the trust fund has as its assets only your promise to pay for your children's college education when they enroll in college, there is no prepayment. Imagine that you place in the trust fund each year 15.3% of your earnings (15.3% is equal to the sum of the 12.4% Social Security tax and the 2.9% Medicare tax). Instead of investing this money in stocks or bonds each year, you take the money back out, spend it on a trip to Europe, and replace it with a promise to pay the trust fund when your children enroll in college. Now the costs of your children's college education depend solely on your willingness to reduce your living standard by an amount equal to the costs of college education for your children. The education of your children depends on your promise to mend your spendthrift ways by the time they reach college age.[3]

The Social Security and Medicare trust funds both have earmarked revenues from payroll taxes placed in them, and thus they have all the appearances of the first form of a college education trust fund, one in which real assets are put away to pay future expenditures. It is the next step that is crucial to what has happened to these two trust funds. The government takes the income going into the trust funds and replaces it with its own promises to pay in the future. This is not a problem if the government invests the trust fund revenues in real social overhead capital that enhances the real productive capacity of the nation, because when the time comes to use the trust funds, the ability of the government to pay the cost has been enhanced because of the real investments made. Unfortunately, even a casual look at the federal budget over the past 20 years indicates that the revenues have all been spent on current consumption rather than on investment.

In every sense, the Social Security and Medicare trust funds are fiction. There are no resources put aside to meet the future expenditures that these trust funds were designed to insure. As a result, if the

Medicare Trust Fund's "value" were sufficient to pay for Medicare for the entire millennium, the taxpayers of this nation would be no better off: every dollar of Medicare expenditures for the millennium would still have to come from taxpayers at the time of these expenditures. There simply is nothing real in the Medicare Trust Fund.

In another sense, this fact does not matter. Only if the nation is willing to tighten its belt will it have the real resources necessary to provide for the retirement and health care of a growing elderly population. If we are not willing to do this, then we must begin to put something real away. If the government will not invest for the future, then we must restructure the system so that private individuals can do so.

THE WORTHY-CAUSE EFFECT

In addition to the lack of real assets in the Medicare Trust Fund, Medicare's funding problems have been exacerbated by expansion of its original scope. By 1972, Congress was already finding worthy causes on which to spend the excess of Medicare tax revenues over actual Medicare expenditures, making the all-but-fictitious trust fund balance even smaller than it would have been. These causes were in three areas: an expansion of those eligible to receive Medicare benefits, an expansion of the benefits themselves, and other non-Medicare but health care–related expenditures.

Legislation approved in 1972 extended Medicare coverage to disabled persons under age 65 who were eligible for benefits under Social Security or Railroad Retirement and to certain other individuals under age 65 suffering end-stage renal disease. Coverage was also extended to any individual not eligible for Medicare as a result of not being eligible for Social Security or Railroad Retirement who was aged 65 or older and enrolled in the voluntary Supplemental Medical Insurance (SMI) program. In 1985, Medicare benefits were extended to state and local government employees not covered by Social Security, and coverage was also extended to include spouses of workers who were not currently covered but would be eligible. Finally, in 1986, Medicare was made the secondary payer for individuals and their spouses when their work-supplied health care insurance was exhausted.

By 1967, Congress was already adding to the benefits of Medicare: 60 additional days of in-patient hospital care were added to the lifetime limit. In 1972, payment for the services of interns and residents in podiatry training was added to the benefit package. In 1980, unlimited home health visits were allowed, as was the use of alcohol detoxification facilities. In 1985, Medicare added payment for liver transplant services.[4] The only break in this steady expansion of benefits occurred with the Balanced Budget Act (BBA) of 1998. The BBA, in an effort to reduce the deficit in the flow of funds into the Medicare Trust Fund, moved home-health-care coverage from the Hospital Insurance portion of Medicare—the part of Medicare directly funded by the Medicare tax and for which the Medicare Trust Fund applies—to the SMI portion of Medicare. This move did nothing real except to take expenditures out of one category and place them in another; total expenditures remained the same. It saved the trust fund, but there is nothing in the trust fund, so the future tax implications of the program remain unchanged.

Quite possibly the most controversial use of Medicare tax receipts has been subsidies to teaching hospitals to aid in the training of physicians. This program represented a significant subsidy to those few hospitals that were in the program. These funds subsidized both the training of physicians and the use of the hospitals by indigent patients. Both of these uses might have been worthy of support, but if they were so worthy, it seems that general revenue funds should have been made available.

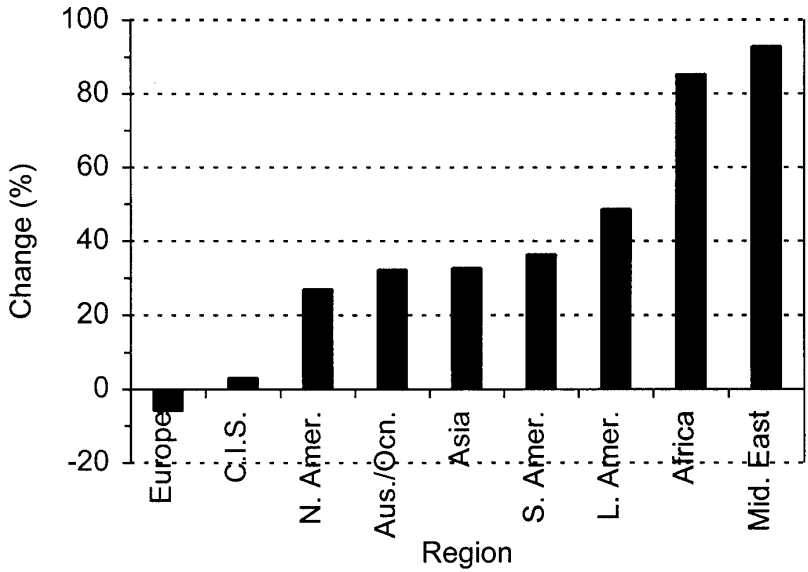
THE DEMOGRAPHICS FACTOR

In addition to financing and program expansion, demographics plays an important role in the Medicare problem. Over the next 30 years in the United States, and in the rest of the developed world as well, increased longevity combined with lower fertility will result in an increased proportion of population that is above a constant retirement age. In most of the developed world, the fertility rate is below the population-sustaining rate, a fact in startling contrast to the predictions of the Club of Rome that population growth would be the bane of the 21st century. It appears that the economics of procreation have moved us

from a world of exploding population to one of perhaps declining population. The trend toward slower population growth, while not carried as far as in the developed countries, has even hit the emerging countries: the developing countries of the Pacific Rim are also seeing declining fertility. Figure 1.1 shows the expected change in regional population between 1999 and 2030. Europe's population will decline 5%; at the other extreme, the Middle East's and Africa's populations are expected to grow by over 80%. In the United States, the population is expected to grow by 27%. Given that the U.S. fertility rate is 2.07, most of the growth will be due to immigration.

In 1965, 40% (77 million) of the U.S. population was 19 or younger; 20 years earlier, 33% of the population had been 19 or younger. This dramatic change in the age distribution of the U.S. population provided the potential for change in the nation. As this generation (referred to as the "baby boom") has grown up, it has had a profound impact on America's culture and its economy. Products have

Figure 1.1 Change in Population 1999–2000 (%)



been designed for the baby boomers and marketing campaigns have been pitched toward them. More importantly, the biggest impact of these same baby boomers is yet to be experienced, and not just here at home, but worldwide.

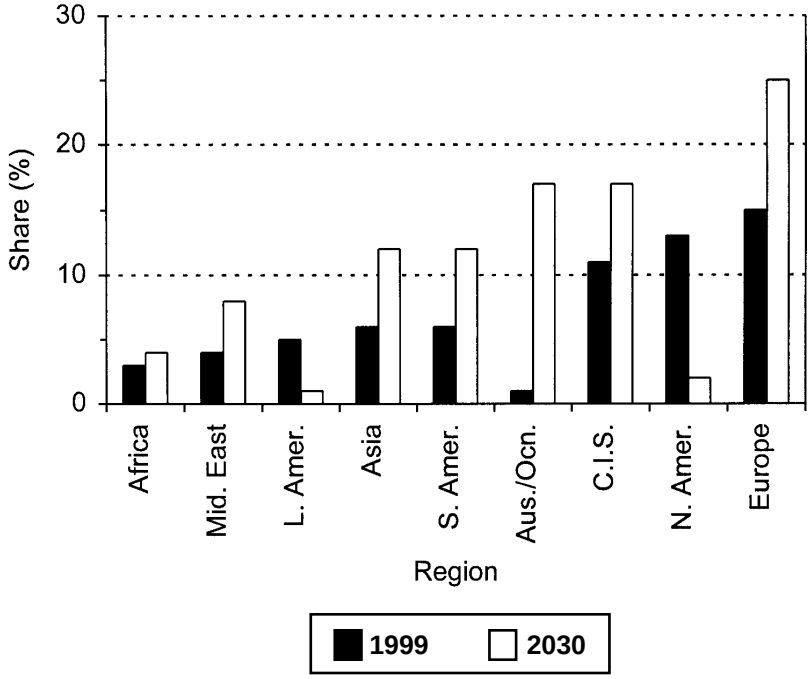
Currently, members of the baby boom generation are experiencing their peak earnings years, they dominate politics, and their voting behavior shapes public policy. In a few years they will retire, and again they will be part of a dramatic change in the age distribution of the U.S. population. Once again, this generation will provide the potential for change in the nation, but this time the change will occur as a result of the agedness, rather than the youthfulness, of the population. What changes can we anticipate and how widespread will these changes be? The answer requires some background concerning where the United States fits among the rest of the world's population distributions.

North America and Europe together account for only 13.7% of the world's population, but they produce almost 60% of the world's output. Over the next 30 years, the combined population in North America and Europe will drop to 10.6% of the total. Because of significant expected immigration, the North American population share is expected to decline only 7.8% while Europe's population share is expected to fall 31%.

The combination of the post-war baby boom in the developed world and declining fertility portend great changes in the age composition of the world's population. For the developed world, the elderly (defined as individuals 65 years of age or older) currently comprise between 12% and 16% of the population (Figure 1.2). In Europe as a whole, the elderly account for 15.4%; in France, 16%; in Germany, 16.1%; in England, 15.7%; and in Italy, 17.9%. In Japan, 16.5% of the population is over 65, and in the United States, 12.6%.

Over the next 30 years, dramatic increases in the proportion of the population that is elderly will force significant adjustments to government-sponsored pension programs and health care programs that redistribute from workers to retirees. By 2030, the elderly in Europe will account for more than 25% of the total population: 29.6% in Germany, 25.8% in France, 23.5% in Britain, and a startling 29.3% in Italy. In the United States, 20% of the population will be 65, and in Japan, 27.4%.

Figure 1.2 Share of Region's Population 65 and Above (%)



The proportion of elderly matters because the world's output is basically produced by the young. Most countries have social insurance contracts that encourage the elderly to leave the labor force as a result of labor policies that are still dominated by the Great Depression notion that jobs are limited; by discouraging work by the elderly, we save jobs for the young. These policies fail to view labor as a resource (in fact, as the main engine of output). As the age composition of the population changes, the share of the world's workers that reside in Europe and the United States will fall. Equally as important as who produces the world's output is who consumes the output. Currently, the elderly in the developed world consume between 12 and 17% of total production. By the year 2030, their consumption will rise to between 25 and 32%! In Europe, the elderly will be consuming well

over 30% of all production; in the United States and Canada, the elderly will consume 25%.

Virtually every country in the world has engaged in a system of taxing workers to ensure the retirement benefits of the elderly. When these systems were instituted, the population share of the elderly was very small and the population was growing at fertility rates well above population sustaining rates. Thus, the proportion of the population that reached retirement age was very small relative to the number of workers, and, as a consequence, the burden on the young of providing for the consumption of the elderly was small. A further consequence was a small effect on any nation's capital stock. Now, everything has changed, and the whole system is about to topple, which will place every country in a funding dilemma.

How the funding dilemma is solved has deep meaning for the future, especially for the next 30 years. When we do long-term planning, we consider how governments will deal with this pending crisis. Privatization of elderly entitlements, including Medicare, is a way to capture the productive capacity of the current population bulge that exists in all of the developed countries. Many of the countries of South America have already privatized their social security systems; England has partially privatized. The alternative to privatization will be a rapid and significant increase in taxation that elected representatives will find unpalatable. The required tax increase will bring the tax rate for funding current U.S. Social Security and Medicare entitlements to 22.12%. If we wait until the problem arrives in earnest, the required tax rate will be almost 29%.

What does the fact of declining fertility mean for the promises we have made to provide for the health care of the elderly? The generation-transfer system of finance works so long as the number of young is growing rapidly. A system that is based on population growth cannot continue to provide expanding benefits when that necessary growth stops. The pending retirement of the baby boom generation magnifies the inefficiencies inherent in the generation-transfer system of finance. The current population of elderly stands at about 34 million and will grow to approximately 39 million at the beginning of the baby boom retirement. In the next 28 years, the elderly population will almost double. When the last of the baby boomers retire in 2029, the elderly population will stand at approximately 67 million. At that time there

will be 2.2 workers per retiree, down from a current level of 3.9 workers per retiree.

In the United States, there are myriad reform proposals being offered in the current Congress that promise to overcome the funding crisis facing Social Security. A handful of these proposals include the provision of establishing private retirement accounts. Medicare's funding crisis is equally severe, but prefunding the program has received little attention. The provision of health care for the elderly population can be made less sensitive to demographic changes if steps are taken to move current Medicare to prefunded, no-first-dollar-coverage retirement health care and to reduce the incentives to retire early. These demographics are hard to escape. We must either raise taxes significantly or reform the system, but only reform has any chance of reducing the pain by providing the means of producing the output that will be required for the consumption of both the working and the retired populations.

A COHORT-BASED SOLUTION

Any complete solution to the problems of Medicare must address both the flow cost of the system and its ability to provide for future recipients. On a flow-cost basis, the Medicare system is already in deficit because the current benefits paid are in excess of current revenues. Thus, we are now drawing down the trust fund, meaning that current tax revenues (which could have been tax cuts) are funding current Medicare expenditures because the trust fund contains only promises to use tax revenues for Medicare. In the following chapters, we will present an approach that is based on each generation prepaying its own Medicare. While prepaying can ensure that the resources necessary to provide benefits in the future are in place, it does not solve the flow cost problem. For this, we design an alternative benefit package and price this package. Our package, on a total out-of-pocket-cost-to-recipient basis, is only marginally different from current Medicare; however, the incentive structure is very different. The difference in incentives has the potential of bringing the market to bear on Medicare

expenditures, resulting in both the buyers and sellers of health care services caring what it costs.

In order to concentrate on the primary issue of providing health care for the aged population, the original purpose of Medicare, we peel away all the non-aged benefits of the current Medicare program. This is not to say that these programs are without merit, but simply that their inclusion confounds the analysis of dealing with the problem of the cost and financing of health care for the aged. In effect, there are many reasons for engaging in transfers from one group of society to another, but we are restricting ourselves to the study of transfers that are related to age and nothing else. In particular, transfers to the poor are not considered, because being poor is not age-related. In a sense, all poor should be treated by the system in a similar manner, independent of age.

Because we are discussing the provision of health care for the aged, the question arises as to how this differs from other programs designed to provide for the consumption expenditures of the aged, such as Social Security or other retirement plans. Our answer is that on one hand, there is no difference, and on the other hand, the difference is overwhelming. The similarity lies in the fundamental fact that both provide for the consumption expenditures of the elderly population. The difference, however, is twofold. First, as a society we have decided that we will not tolerate great differences in the level of health care provided for the aged, regardless of ability to pay. As a result, there is little incentive for the young to provide for their own retirement health care. Second, because of rapid changes in technology, we have converted many aspects of what was once considered part of the normal aging process to a medical condition, thus expanding expenditures on health care. As a result, the level of uncertainty in future health care expenditures is far greater than for general living expenses.

The current structure of Medicare combines the worst of incentives on the market side with a financing system that discourages saving for the future. The result is a lower capital stock for the nation which, when coupled with the upcoming bulge in the population of the aged as a result of the retirement of the baby boomers, is going to bring Medicare to its knees.

We propose changing Medicare in two important ways. First and foremost, the generational transfer method of financing must be aban-

doned; it results in a reduced capital stock and reduces work incentives, both of which reduce national income. Second, we propose introducing health insurance with no first-dollar coverage. Even though in our solution the total out-of-pocket costs of serious illnesses are the same as under current Medicare, the requirement that the first dollars spent are the responsibility of the consumers will create incentives to care what health care costs. If consumers care, then competition will result in producers caring what health care costs.

We propose that each age cohort, defined as all individuals born between January 1 and December 31 in any given year, insure itself against retirement medical expenses. Each worker within an age cohort will make contributions that are direct offsets to their current Medicare tax. These contributions are placed into a Private Retirement Insurance for Medical Expenditures (PRIME) account that, by the time of the cohort's retirement, will contain enough to pay for a lifetime of retirement health care expenditures. Because of the considerable uncertainty concerning retirement health care expenditures at the time a cohort begins contributing, the level of contributions must be adjusted as a cohort ages and more information concerning future medical needs is revealed. An additional benefit of cohort-based financing is that it eliminates cohort size risk of the type we are now facing with the pending retirement of the baby boom generation. If the population age distribution experiences a bulge because of greater-than-normal fertility or immigration, the contribution to retirement medical insurance of these cohorts will rise, maintaining the same per-capita value as that for smaller cohorts.

All individuals would be required to participate in the program we are proposing. The primary reason for mandatory participation is a result of individuals' incentives to underinsure themselves against medical expenses that arise during retirement. As a society, we have made the decision that individual access to health care will not depend on ability to pay. Thus, individuals have incentives to save too little during their working years to fund retirement health care; they expect "society" to take care of them should they fall ill.

In the past, family units, through implicit intergenerational contracts, provided this insurance function. With today's increased mobility and the changing dynamics of family units, a new means of insurance is required. Cohort-based insurance in which, at the mini-

mum, all working individuals in a cohort pay into the system, ensures that a sufficient level of assets will be set aside as the cohort ages. By forming cohort risk pools, mandatory participation also solves the problem (i.e., adverse selection) that arises when individuals choose to join the system only when they expect large medical expenses.

Insurance that comes into play only if an individual reaches the age of 65 and has medical expenditures that exceed the policy's annual deductible requires smaller contributions than would a medical IRA. Tying a mandatory life insurance program to the purchase of retirement medical insurance simply increases the cost. In addition, we already have a mandatory life insurance program contained in Social Security. Thus, our proposed new Medicare, just as the current Medicare program, has no life insurance component and pays no death benefits to survivors. In its simplest form, catastrophic retirement health insurance coverage is purchased during a worker's years in the labor force, the benefits of which are received only if the worker survives to retirement. The specific insurance we are proposing is comparable to today's $2,500 deductible policies, which pay all expenses above the deductible.

Since our proposed insurance is universal, it must address the issue of redistribution. With cohort-based insurance, redistribution occurs within each age cohort rather than between cohorts. Within each age cohort, workers subsidize nonworkers and high-wage earners subsidize lower-wage earners. As an age cohort enters the labor force, they do not know who will survive to retirement, who will be sickly, or who will be high-income earners. At this time, they make a compact with one another to pay the same percentage of their wages into a fund that will purchase their retirement medical insurance, should they survive.

The level of retirement medical care that will be demanded by today's young workers is unknown, as is the composition and form of that medical care. Both of these sources of uncertainty affect the timing of the purchase of retirement health insurance. Our approach does not specify when retirement medical insurance will be purchased, but the timing of the insurance purchase determines who bears the risks associated with the medical care purchases that will be made by today's young workers when they are old. The real question is, will future retirees pay for their own retirement medical purchases or will

they rely on their children and grandchildren to pay for their medical care?

CONCLUSION

When one considers the large difference in the potential unfunded liability of the current system and our cohort-based alternative, one wonders, where is the free lunch? After a thorough look at our proposal, however, it will be clear that there is no free lunch—but, there is a considerably cheaper lunch that is of better quality than the one we are currently committed to buying. The current generation-transfer system of financing Medicare reduces the nation's capital stock and thereby reduces national income. By moving to prepaid financing, we remove the disincentives to invest, and the nation will experience an increase in its capital stock and income. It is this increase in the capital stock and national income that provides the additional resources available to pay off most, but not all, of the current system's unfunded liability. Moving to prepaid retirement health insurance is just good business.

Even if it is good business to switch to cohort-based financing, why is it so important to do it now? The answer lies in the income-generating power of the baby boom generation. While the pending retirement of the baby boomers looms like a dark cloud over the present Medicare system, these same baby boomers can become our saviors if we can harness their earning power. To do this, we must act quickly. The baby boomers begin to reach 65 in 2011 and, given past history, they will begin their exit from the labor force even sooner (as soon as age 50, which was in the year 1996). If we are to succeed in making the transition to a fully funded Medicare system, we must move all the baby boomers into the new system. Each year we delay acting costs us $100 billion. We must face the fact that the promises we have made to the elderly must be declared null and void unless the system is drastically changed.

In our analysis, we show that using reasonable assumptions about male and female earnings distributions and average rates of return on investments in our nation's capital stock, young cohorts can guarantee

their retirement medical expenditures for a fraction of their current Medicare taxes. Moreover, by acting now, we can transition from the current system to a cohort-based system for far less than the unfunded liability implicit in our existing Medicare system. In fact, the difference is staggering. Using current Health Care Financing Administration estimates, the existing Medicare system has an unfunded liability of over $9 trillion (or 2.5 times our current national debt). Our system, if adopted in the next two years, has a total unfunded liability of only $700 billion (less than one-tenth the unfunded liability of the current system).

OVERVIEW

In Chapter 2, we present a history of Medicare that details the political issues and population demographics that led to its adoption. Our cohort-based solution to the Medicare crisis has as its cornerstone the potential increase in the nation's income that will result by moving from a Medicare financed through intergenerational transfers to a Medicare prepaid by each generation. In Chapter 3, we present the theory that underlies the source of this increase in national income.[5] Any proposal that uses savings to finance retirement health care expenditures must be based on estimates of both future earnings and health care costs. In Chapter 4, we present a detailed discussion of our earnings forecasts. These forecasts deal with several issues, such as labor force participation rates and life cycle earnings profiles, to name just two. Chapter 5 provides the same level of detail for our estimates of future retirement health care expenditures. Chapter 6 presents our proposal for a transition to a fully funded Medicare system. Finally, Chapter 7 offers concluding comments.

Notes

1. The trend is for all areas of medical care to have increased third-party participation, so that buyers are being taken out of the "who-cares-what-it-costs" loop. Patients currently pay less than 20% of doctor bills and less than 50% of dental and prescription bills. As expected, the real inflation rates of these aspects of medical care have shown a significant increase in the last decade.

2. See A.W. Willcox (1937) for a complete discussion of the act and the public finance aspects of the Old-Age Reserve Account, now referred to as the Social Security Trust Fund.
3. We should note here that if the trust fund buys back some of your outstanding debt rather than using it to support your current consumption, then the result is exactly the same as buying bonds from others. The proceeds in the trust fund represent a net addition to your asset position and are therefore available for use later. If, on the other hand, you simply issue bonds to the trust fund and spend the proceeds on current consumption, there is a deterioration in your net asset position and there are no funds available for use later.
4. An excellent review of the history of Medicare provisions is contained in the annual statistical supplement to the 1996 *Social Security Bulletin* (Social Security Administration 1996).
5. Of necessity, Chapter 3 is abstract, although the heavy mathematics is relegated to an appendix. If the reader is willing to accept the theoretical propositions that intergenerational transfers reduce national income and that we can restore this lost income by moving to a prepaid system, then nothing is lost by skipping Chapter 3 and moving immediately to Chapter 4.

2
A Brief History of Social Insurance for the Aged in the United States

Insurance against the loss of income due to old age, unemployment, or illness has existed for thousands of years. In the past, old-age insurance was implicitly centered on the family: assets were transferred between parents and children in exchange for care during old age. Voluntary forms of insurance against the loss of income were also historically prevalent in trade unions and fraternal organizations. However, government-administered compulsory insurance is a relatively new institution. The first nationwide, compulsory old-age insurance program was established in Germany by Chancellor Bismark in 1889. By the time the U.S. Social Security Act was enacted in 1935, nineteen European nations, following Germany's lead, had instituted compulsory, universal old-age insurance (Committee on Economic Security 1935). Thirty years after Social Security was adopted, Title XVIII of the Social Security Act was signed into law, establishing the Medicare program. Though separated by three decades, the programs share a common heritage that is explored below.

This chapter endeavors to accomplish three things. First, it presents the historical development of social insurance in the United States as embodied in Social Security and Medicare. It is intentionally terse but attempts to convey the pertinent facts.[1] Second, particular attention will be paid to the economic arguments used to justify government-administered transfers to the aged, as well as to the eventual reliance on pay-as-you-go financing. As the historical record suggests, the rationales for Social Security and Medicare were and continue to be couched in the language of market failure. Though not part of the original Social Security Act, pay-as-you-go financing was quickly adopted due to the unwillingness in Congress to maintain the tax increases required to make the program actuarially sound, including the increases that were scheduled in the original act. Third, the chapter places today's debate in its historical context by highlighting instances where the historical debates foreshadowed the contemporary debates.

The deliberations that preceded and followed the passage of Social Security in the 1930s and the issues which marked the Medicare debates of the 1960s are being repeated today, whether the debate is over private versus public provision, prefunding versus pay-as-you-go financing, means testing versus universal coverage, or redistribution versus individual outcomes.

THE SOCIAL SECURITY ACT OF 1935

The push for Social Security began in earnest during Franklin D. Roosevelt's first term in office, but prior to his election there were isolated calls for social insurance that targeted the needs of the elderly in the United States. The early proponents of old-age insurance reasoned that the transition from an agrarian to an industrial economy left the elderly without their historical role in the family and the marketplace. A 1919 report of the Pennsylvania Commission on Old Age Pensions stated,

> The question of providing for the aged hardly existed before the era of the factory system. The modern problem of old age is a result of the tremendous industrialization of production since the industrial revolution . . . The usefulness of an old man or woman also rarely ceased in an agricultural society before actual senility had taken place. (In Johnsen [1922], p. 243)

An early statement of the concepts of social insurance can be found in Seager (1910). In the chapter on the provision for old age, he stated,

> The proper method of safeguarding old age is clearly through some plan of insurance. Old age is a risk to which all are liable, but which many never live to experience. Thus according to American life tables, nearly two thirds of those who survive the age of ten die before the age of seventy. Under these circumstances, for every wage earner to attempt to save enough by himself to provide for his old age is needlessly costly. The intelligent course is for him to combine with other wage earners to accumulate a common fund out of which old-age annuities may be paid to those who live long enough to need them. (Pp. 118–119)

Seager goes on to suggest that the private annuities market was not well developed at the time, citing limited evidence in the form of union- and fraternal-order-based insurance, but he saw significant promise in employer-based pensions. He concluded that adoption of nationwide old-age insurance in the United States was contingent on whether employer-based pensions became generally available and transferable between jobs.

At about the same time, it was already being argued that market provision of old age pensions had failed. For example, in 1913, Spencer Baldwin, the Secretary of the Massachusetts' Commission on Old Age Pensions, wrote, "It is evident that some comprehensive plan of old age insurance or pensions must be adopted in this country, at some time in the near future. The inadequacy of private enterprise, cooperative insurance, and corporation plans is generally admitted." Though more an advocate of state-sponsored programs, he suggested that compulsory insurance was justifiable on the grounds that it protects society against old-age pauperism, and that it is the only plan "that offers an adequate, comprehensive, workable, final solution of the problem" (Baldwin 1913).

With the onset of the Great Depression of the 1930s came increased pressure for government action on the issues of social insurance in general and old-age pensions in particular. One group at that time which gained nationwide attention for its old-age pension plan was the Townsend Movement. The movement began in 1932 and was based on a plan promoted by a 66-year-old unemployed physician, Francis E. Townsend. The basic plan called for a universal $200 monthly pension for individuals 60 years of age and above. Funding for the pensions would come from a 2% national sales tax. Within a few years there were 7,000 Townsend clubs advocating the plan with a reported membership of over 2.2 million (Kingson and Berkowitz 1993, pp. 32–33; Social Security Administration 1998).

Though the Social Security Act in its final form differed significantly from the Townsend plan, the proponents of national social insurance were gaining momentum in the early 1930s. In a June 8, 1934, message to Congress, President Roosevelt invoked sentiments similar to those of the early social insurance proponents.

> So, also, security was attained in the earlier days through the interdependence of members of families upon each other and of the families within a small community upon each other. The complexities of great communities and of organized industry make less real these simple means of security. Therefore, we are compelled to employ the active interest of the Nation as a whole through government in order to encourage a greater security for each individual who composes it. (Roosevelt 1934a)

By the end of the same month, Roosevelt had commissioned the Committee on Economic Security (CES) to "study problems relating to the economic security of individuals and shall report to the President no later than December 1, 1934, its recommendations concerning proposals which in its judgment will promote greater economic security" (Roosevelt 1934b). Besides old-age insurance, the Committee also studied unemployment and health insurance.

By the beginning of 1935, the Committee's recommendations were introduced to Congress for debate, and within four months the House had passed its version of the Social Security bill by a vote of 372 to 33. The Senate version passed on June 19, 1935, with a vote of 77 to 6, and on August 14, 1935, the Social Security Act was signed into law. The act was

> to provide for the general welfare by establishing a system of Federal old-age benefits, and by enabling the several states to make more adequate provision for aged persons, blind persons, dependent and crippled children, maternal and child welfare, public health, and the administration of their unemployment compensation laws; to establish a Social Security Board; to raise revenue; and for other purposes. (U.S. Public Law 271, 1935)

Though only eight months passed between the introduction and passage of the Social Security Act, it is important to note a Senate amendment that did not make it into the final bill. The amendment, sponsored by Senator Bennet Clark of Missouri, would have exempted employers with government-approved pension plans from the payroll tax. The House and Senate committees handling the bill voted against the provision, but Clark succeeded in reintroducing it into the Senate version that went to the conference committee. Opponents of the provision argued that private insurers would be in competition with the government and might lure the younger workers away from the federal

system, leaving it with the older workers who had not made any contributions. If this adverse selection occurred, the system would never take in enough revenues to cover the expense. Thus, the opponents argued that support for the system would dwindle as people opted into private pension plans (Kingson and Berkowitz 1993, p. 37). The amendment never made it out of the conference committee, however. If workers had been given the opportunity to opt out of the system, the opponents' expectations may have been realized and a system of compulsory private pensions would now be in place.

THE PAYROLL TAX AND THE EVOLUTION TO PAY-AS-YOU-GO FINANCING

From the outset, Roosevelt intended that Social Security would eventually be self-supporting. During the start-up phase, a period projected to be 30 years, pensions for those who were close to retirement age would be paid out of general revenues. But for younger workers, he envisioned a "self-supporting system for those now young and for future generations," with self-supporting or self-sustaining having the connotation "that funds for the payment of insurance benefits should not come from the proceeds of general taxation" (Roosevelt 1935). Title II of the Social Security Act set the retirement age at 65 and 1942 as the year of the first benefit payment. It also established a redistributive benefit structure, the death benefit, and the property rights assigned to worker's expected benefits.

The use of a payroll tax was attractive to Social Security's early proponents for a number of reasons. First, in the words of Franklin Roosevelt,

> They [taxes] are politics all the way through. We put these payroll contributions there so as to give the contributors a legal, moral, and political right to collect their pensions and unemployment benefits. With those taxes in there, no damn politician can ever scrap my social security program. (Schlesinger 1958, pp. 308–309)

Or, as stated by Wilbur Cohen, who started his career as a research assistant on the Social Security Act and would eventually ascend to the

position of Secretary of Health, Education, and Welfare in the Johnson administration, in his defense of using a payroll tax to finance an expansion of Medicare: "This gives beneficiaries the psychological feeling that they have helped to pay for their protection. It is the reason why social security has been so popular and well accepted. People do not want something that is called a hand-out or welfare" (Berkowitz 1995, p. 265). The use of the payroll tax also enhanced the expected payments from the system. The American Federation of Labor argued that if the program were to be financed with general revenues, they would "irresistibly be pulled down to relief standards" (Derthick 1979, p. 230). The payroll tax tied all wage earners to the system, and in doing so, established the compulsory and universal nature of the program. Interestingly, in the current Social Security and Medicare debate, the defenders of the status quo echo the early proponent's sentiments that the popular support of the programs would erode if benefits were to be means-tested.

Title VIII of the Social Security Act of 1935 spelled out the provisions of the taxing arrangement. Tax revenues were to begin in 1937 at a rate of 1% of covered wages, collected from both employers and employees. The rate was to gradually increase to 3% collected from the employer and employee (6% combined) by the end of 1948. With the rate increases specified in the original act, a financial reserve was expected to build up so that interest from the fund would help finance benefit payments. As pointed out by Derthick (1979), however, beginning with the 1939 Social Security Act Amendments and continuing until 1950, Congress postponed even the first incremental change in the tax rate, to 1.5%, which was slated to begin in 1940. In an action that compounded the effect of failing to enact the scheduled tax increases, Congress opted to pay the first benefits in 1940 rather than waiting until 1942, as was called for in the original act. Together, these actions essentially transformed the system's finances from one that would have a reserve (which, if appropriately invested, would increase the capital stock and provide for each generation's retirement income) to a pay-as-you-go system.

Several causes of the rapid transformation described in the historical accounts are important because of their relevance in today's policy discussions. Opponents of a large reserve fund—one estimated to eventually provide for 40% of the system's benefit payments through

interest income—could be found across the political spectrum of the day. In terms of immediate policy relevance, postponing benefit payments into the future while the reserve was building did not seem reasonable. The sooner contributions to the program could be tied to relieving some of the pains of the Depression, the more relevant the program would be. A large reserve account was also criticized by some economists on the grounds that it would hinder the government's ability to respond to a recession (Berkowitz 1996, p. 157).

Others like Albert Linton, who had been one of four actuarial consultants to Roosevelt's Committee on Economic Security, were concerned that Congress would be tempted to increase benefits as the reserve account accumulated a growing balance. Linton also warned that the costs would increase over time and that binding future generations to the program's implied commitments would have to be reexamined. Specifically, he wrote,

> We of this generation do not propose to pay out any such proportion of our earnings to provide current benefits under the Social Security Act but we blithely assume that our children and grandchildren will be able to do so without serious disturbance to the economic life of the country. This whole philosophy needs to be reconsidered. (Derthick 1979, p. 235)

So while not in favor of a reserve account, which was expected to provide partial funding of future liabilities, Linton was aware that moving in the direction of a pay-as-you-go system would necessitate high future tax payments and thus require reconsideration of the whole system.

Linton's opposition to the accumulation of a large reserve account was repeated in Congress. The early actuarial projections put the size of the reserve at $47 billion by 1980. Arthur Vandenberg, a Republican member of the Senate Finance Committee, was on record as saying that a large reserve account was "the most fantastic and the most indefensible objective imaginable. It is scarcely conceivable that rational men should propose such an unmanageable accumulation of funds in one place in a democracy" (Derthick 1979, p. 232).

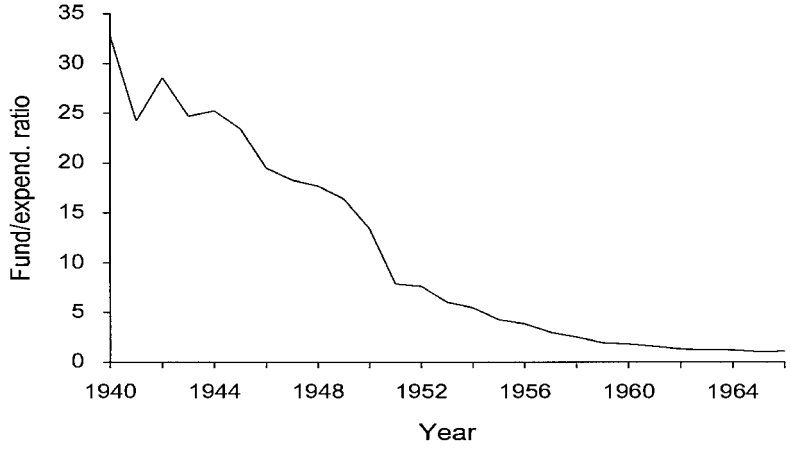
On the other hand, Arthur Altmeyer, a member of both the technical board on the CES and the original Social Security Board, argued that the reserve account was a necessary device to show the magnitude

of future commitments (Derthick 1979, pp. 237–238). A.W. Willcox, writing in the *Quarterly Journal of Economics* in 1937,[2] favored the accumulation of a large reserve account as well, on the grounds that the future tax rates under purely pay-as-you-go financing would be unbearable.

> For while it would be very easy to levy payroll taxes which for a generation would be just adequate to pay currently the benefits fixed by Title II, the percentage would ultimately rise to a figure considered to be out of the question. In other words, to ask the covered working population of 1980 to pay taxes which would equal the cost of supporting the seventy-odd million pensioners of 1980 on even the scale contemplated by Title II would be to ask at least the politically impossible. (Willcox 1937, p. 447)

From the inception of the Social Security system, Congress showed its unwillingness to maintain the higher tax rates that would be necessary to build up the reserve account specified in the original act. Seven times between 1939 and 1947, Congress delayed raising the tax rate and taxable base. Ultimately, the first tax increase (to 1.5%, levied on the employee and employer) occurred in 1950 rather than 1942, as originally called for in the act. The effects of the congressional actions are depicted in Figure 2.1. In 1940, the year of the first official benefit payments, the Social Security Trust Fund balance was almost 33 times

Figure 2.1 Ratio of Old Age and Survivors Insurance Trust Fund to Yearly Expenditures



the system's expenditures in that year; by 1950 the ratio had dropped to 13.4; and by 1965 the trust fund was approximately equal to one year's expenditures. In a matter of a few years, the concept of a large reserve fund was abandoned, and pay-as-you-go financing became a hallmark of the Social Security system.

As would be argued by Wilbur J. Cohen in 1961, who by then had become the Under Secretary of the Department of Health, Education, and Welfare,

> The philosophy which the Congress has embodied in the present law is that because compulsory social insurance is assured of continuing income (since new workers must come into the program), it does not have to build up the kind of reserves that are necessary in an institution that might have no new customers and might be forced out of business. Private insurance is required to maintain the type of reserves that will meet the threat of dissolution. Social insurance is financially sound, on the other hand, as long as the legislation on which it is based provides for a plan of financing which yields income sufficient to meet all benefit costs as they fall due. And the social security law does so provide. (Fiengold 1966, p. 241)

Though Social Security's origins can be linked to the acceptance of social insurance in other industrialized nations, the specific economic conditions in the United States during the 1930s helped provide the necessary environment for large-scale government intervention. In the words of Franklin Roosevelt,

> Among an increasing host of fellow citizens, among the often intangible forces of giant industry, man had discovered that his individual strength and wits were no longer enough. This was true not only of the worker at shop bench or ledger; it was true also of the merchant or manufacturer who employed him. Where heretofore man had turned to neighbors for help and advice, they now turn to Government. (Roosevelt 1938)

The proponents justified the program on the basis of a changing economy that left the elderly without their traditional roles. They argued that without savings, the absence of a developed private annuities market, and the lack of productive employment, the elderly required intervention on their behalf.

Many of the Social Security program's central features, from a dedicated financing source to compulsory participation to a redistributive benefit structure, were specified in the original act. At first, only workers in commerce and industry were required to participate, but by 1955 virtually all workers in the United States were covered. Reserve fund financing was quickly abandoned in favor of pay-as-you-go financing, even though the future implications of pay-as-you-go financing on tax rates were well understood from the outset. By the time Medicare was being considered, Social Security was a well-established institution, providing the initial beneficiaries real rates of return in excess of the market's performance. The acceptance of Social Security, its adaptations between 1935 and 1965, and its popularity helped set the stage for the eventual adoption and structure of the Medicare program.

THE ORIGINS OF MEDICARE

Between President Roosevelt's 1935 signing of the Social Security Act and President Johnson's signing of the bill establishing Medicare on July 30, 1965, as Title XVIII of the Social Security Act, many proposals for some form of compulsory health insurance program received congressional consideration. Over these three decades, the push for a comprehensive, government-administered health insurance program for all ages was replaced by a campaign for a health insurance program which targeted the aged. We will pick up the story in the 1930s and follow the public debates which led to the specific Medicare bill signed by President Johnson in 1965. Our focus will be on the economic justification used by Medicare's proponents. We point out that the financing problems that the Medicare program currently faces were foreseen before it was enacted, and that many of the contemporary Medicare reform proposals have historical predecessors.

The 1930s to the 1950s

In its final report, published in 1932 after five years of work, the Committee on the Costs of Medical Care (CCMC) recommended that

the costs of medical care should be paid for on a group basis through insurance, taxation, or both. The Committee went on to recommend compulsory health insurance for low-income groups, citing the practices in place in many European countries. The CCMCs work was sponsored by eight leading private foundations, and its recommendations[3] were influential in framing the health insurance debates for years to come. Two years after the publication of the CCMC's final report, the Committee for Economic Security analyzed health insurance as part of its mandate. However, this Committee did not present a specific health insurance proposal, offering instead a set of broad guidelines. The Committee's recommendations formed the basis for the Social Security Act as initially introduced for congressional debate. The language in Title VII of the Social Security Act gave the Social Security Board authorization to study and make recommendations on a broad array of social insurance issues; however, the original language that specifically included health insurance was omitted. In his speech marking the third anniversary of the act, President Roosevelt expressed his continued hope that the act would be improved and extended, mentioning in particular protection against the losses associated with illness (Roosevelt 1938).

Most of the early legislative activities that followed focused on compulsory national health insurance. From 1939 to 1947, Senator Robert Wagner (D-N.Y.) sponsored or cosponsored a series of bills calling for national health insurance financed through a compulsory payroll tax. The bills, known as the Murray-Wagner-Dingell bills in honor of sponsors, Wagner, Senator James Murray (D-Mont.), and Representative John Dingell (D-Mich.), became the framework for a proposal advanced by President Truman in 1949 (Marmor 1973, p. 11). Though national health insurance was debated during the 1948 presidential campaign, the proposals never gained popular appeal. The main opponent to these proposals was the American Medical Association (AMA). The AMA's efforts in the defeat of several members of Congress in 1950 who had been proponents of national health insurance was cited as evidence of the rejection by the public of national health insurance initiatives (Derthick 1979, p. 318; Fiengold 1966, p. 97).

At the same time that national health insurance was being debated in Congress, employer-based health insurance was expanding rapidly. Between 1939 and 1945, the percentage of the population covered by

employer-based health insurance plans grew from 8% to 25% (Falk 1973, p. 13). Prior to the war, employer-provided health insurance was rare, as was health insurance in general. However, the combination of wage controls and wartime increases in the demand for labor resulted in employers searching for other ways to raise workers' compensation. Paying workers in the form of health insurance was one way to raise workers' compensation without raising their wages. A special ruling in 1943 by the IRS declared that insurance purchases on behalf of employees did not represent taxable income (Standard Federal Tax Service 1943, Special Ruling 6587). Because of their special tax status, employer-based health insurance plans became a fixture in the employment relationship. By 1965, 80% of the population was covered by some form of private health insurance (Council of Economic Advisers 1966, p. 106). This expansion of private health insurance, as much as the political opposition, was crucial to the demise of national health insurance proposals.

The 1950s to 1965

In the early 1950s, proponents of national health care shifted their focus to the uninsured, and in particular the aged. A forerunner of the Medicare bill was first introduced in 1957 by Representative Aime J. Forand (D-R.I.) during the Eisenhower administration.[4] Forand was a member of the Committee on Ways and Means, which had jurisdiction of bills related to Social Security matters. The Forand bill would have provided Social Security beneficiaries with coverage similar to today's Hospitalization Insurance (HI), with the addition of nursing-home and surgeon-fee coverage, and would have been financed by an additional payroll tax of 0.25%. The bill was never reported out of committee in 1958 and was reintroduced in 1959, but, after hearings, further action was postponed until 1960 (Fiengold 1966, pp. 102–104).

By 1960, several competing bills addressing health care for the aged were debated. Eventually, a bill sponsored by Robert Kerr (D-Okla.), a member of the Senate Finance Committee, and Wilbur Mills (D-Ark.), the Chairman of the Committee on Ways and Means, was passed in September 1960. The act was quite similar to an earlier proposal favored by the Eisenhower administration, providing states with federal grants to defray part of the medical costs of the needy elderly.

Mills was quite reticent to tie a medical care program to Social Security, and thus this bill was an attempt to address the health care needs of the elderly without tapping into the Social Security system. His bill did not go far enough in the eyes of those who wanted one like Forand's, with its general coverage and, more importantly, its "Social Security financing." With the 1960 election of John F. Kennedy, who favored including health care in the Social Security program, the progress toward Medicare's passage began.

This progress, however, was slowed by Mills's continued opposition in the House and Kerr's in the Senate. Between 1961 and 1963, three successors to the Forand bill were introduced. Because of Mills's opposition and his position as the Chairman of the House Committee on Ways and Means, the bill's proponents first introduced the bills in the Senate. These bills would provide hospitalization, some nursing home care, and laboratory and x-ray services. All would have relied on financing through Social Security. Notable among the three was the 1962 Anderson-Javits bill (Senators Clinton Anderson [D-N.M.] and Jacob Javits [R-N.Y.]). This bill had the special feature of offering beneficiaries the choice between federal or private insurance.[5] The Anderson-Javits bill was expected to receive Senate backing, but because of its proposed financing it was not expected to even make it out of a conference committee which would include members of the House Ways and Means and the Senate Finance committees (Fiengold 1966, pp. 121–122). The latest of the three was the 1963 King-Anderson bill (Representative Cecil King [D-Calif.]) and Senator Clinton Anderson [D-N.M.]), which dropped the private insurance option that had been included in Anderson-Javits.

In 1963, Robert Kerr died, and a Medicare bill passed the next year in the Senate. With Kerr's death, Wilbur Mills became the primary leading Democrat who stood in the way of passing a hospitalization insurance bill that would rely on Social Security financing. The following excerpts from a speech he gave during an Arkansas-Missouri Kiwanis luncheon meeting on September 28, 1964, detail his concerns and his reasons for opposing the bills that had come his way. His comments came after a conference committee was unable to agree on the health insurance provisions like those in the King-Anderson bill being part of the Senate version of a Social Security bill. In his speech, Mills

defended his stance on several key issues. The essence of Mills's position is summarized here:

> The central fact which must be faced on a proposal to provide a form of service benefit—as contrasted to a cash benefit—is that it is very difficult to accurately estimate the cost. These difficult-to-predict future costs, when such a program is part of the social security program, could well have highly dangerous ramifications on the cash benefits portion of the social security system.

He went on to outline some of the future tax rate implications that would result if the King-Anderson bill was passed. The ramifications were brought out during questioning of the Chief Actuary of the Social Security Administration, Robert Myers, in hearings before the House Ways and Means Committee.

> In practical terms, this meant that if the hospital insurance system which would be created by the bill was to remain sound, the taxable wage base would have to be increased at least $150 each year. Clearly, this would be a case of the tail wagging the dog. The Congress would be left completely hamstrung, with only two alternatives: (1) A total program which we know was actuarially unsound, or (2) a commitment into the indefinite future to a steady but wholly uncontrolled increase, due to the hospital part of the program, in the amount of wages taxed for social security purposes. Clearly, we could not conscientiously be a party to such an abrogation of congressional responsibility.

To add detail to his concerns, he indicated that average earnings in covered employment grew at a 4% annual rate between 1955 and 1963, while average daily hospitalization costs grew at a 6.7% annual rate over the same period, and that he had no reason to assume that the growth in hospitalization cost would slow in the future. Besides believing that such a system would be actuarially unsound, Mills was also wary of the unfunded liability that would result from providing hospitalization benefits immediately to individuals who had not paid into the system. In the following excerpt, Mills articulates this concern and introduces the notion of prepayment.

> However, on the question of financing, a further very serious problem is the effect which the assumption of the liability for the hospital costs for all of the currently retired persons will have on the social security program as a whole. I do not believe that it is gen-

> erally understood that this unfunded liability would amount to at least $33 billion. It must be realized that the currently retired individuals under the social security program have not paid any taxes as such for hospital insurance benefits. This is where the prepayment argument when applied to the King-Anderson proposal completely breaks down.

Finally, Mills restates his hesitation to tying the hospitalization insurance provisions to Social Security and reiterates his interest in pursuing a prepayment option.

> I for one will continue to view this problem with an open mind and will continue my efforts to work for the best interests of our elderly citizens and to help them enjoy the latter years of their lives without the nagging fears which so many of them now face due to the possibility of disastrous medical bills. I would be hopeful that the basic prepayment concept might lead us in the direction of sound approaches to this matter. There are other principles which we can embody to insure a sound medical program while at the same time preserving our basic social security system.

As the preceding statements indicate, from the outset it was common knowledge within the Social Security Administration and among members of Congress that Medicare was expected to face financing difficulties. Mills' grasp of the issues and assumptions involved in the Social Security Administration's actuarial projections was apparently unsurpassed among representatives. According to Wilbur Cohen, Mills "is probably the only man out of four hundred and thirty-five people in Congress who completely understands the actuarial basis of Social Security. He is completely conversant with the basis for making the actuarial estimates and all of the factors that enter into it" (Zelizer 1996, p. 343). This thorough understanding likely led to his interest in funding alternatives including prepayment. Nonetheless, by July of the following year, a much broader program than the one serving as a point of reference for these comments would become law. Mills eventually relented and supported the more sweeping bill.

Before discussing the final legislative developments in the months leading up to Medicare's passage, it will prove useful to review the rhetoric used to justify the need for universal health insurance for the aged. A good source of that rhetoric is found in the Joint Economic Committee's March 17, 1965, comments on the *1965 Economic Report*

of the President. The committee suggests that the market had failed to provide adequate insurance, that universal coverage was preferred to means-tested coverage, and that the program should be financed through the Social Security system. The comments only pertain to hospitalization insurance, as the supplemental medical insurance was added towards the end of the legislative process. In this first statement, the committee suggested that the market had failed to provide affordable insurance.

> This year the Congress faces another stage in one of the great unfinished tasks of our society—assuring an adequate hospital insurance program for the aged. Private insurance plans have failed to provide adequate protection at premiums that most of the aged can afford. The Committee concludes that Federal help is essential to an effective program. (P. 24)

In the next set of statements, the committee argues for universal rather than means-tested coverage and suggests that the aged were captive to the costs of medical care due to insufficient financial resources.

> The question before our Nation is not whether our aged should have adequate medical care—all are agreed that they should—but in what manner that care should be financed. The facts on the income and savings levels of the aged population, and on the medical costs to which they are subjects, indicate clearly that the aged simply lack the means to pay for adequate medical care from their retirement incomes and savings. Primary reliance should not be placed on welfare programs which give public assistance based on means tests. If applied by all states at the requisite level of medical care, such programs would be inordinately expensive—both because of the medical costs involved and because of the high costs of administering means tests.
>
> Moreover, the committee believes that the aged of modern America should not be forced to exhaust all savings and be reduced to a state of demonstrable poverty before they can qualify for help toward meeting medical costs. Public assistance can play an important role, but it must be to supplement a broad, national program for the aged which meets their health needs without detracting from their dignity and self-respect. After all, dignity, self-respect, and a feeling of economic security are just as important

> to the health of our elder citizens as is care for their physical ills. (P. 25)

The committee's solution was insurance, but due to market failure, federal intervention was necessary. Their language in the second quote below seems to allude to prepaid insurance.

> The solution to the health needs of the aged lies in insurance. If private insurance could do the job there would be no need for a federal program. But it is clear that adequate private insurance plans for aged are beyond the means of most. (P. 25)

> What the aged need is a plan which would permit them to acquire insurance protection against the high medical costs of old age for modest premiums paid during their long working lives, without the need to pay heavy premiums after retirement. Such insurance is now virtually unknown among private carriers. (P. 26)

Finally, bringing health insurance for the aged under the umbrella of Social Security was the committee's preferred course of action as reflected in the following statement.

> Health insurance for aged under the Social Security System would seem to offer one effective and efficient response to the need. This system has proved its capacity to administer, at low cost, broadly based social insurance programs. It would provide uniform benefits for Americans, regardless of their location. And it would free private insurance companies from some of their present expense burdens and enable them to offer plans supplementing the basic coverage. (Joint Economic Committee, p. 26)

Several developments took place between 1964 and 1965 which helped foster Medicare's passage. Lyndon Johnson won in a landslide election against Barry Goldwater in November of 1964 and his administration continued to place Medicare high on its agenda. The new Congress included more Democrats than at any time since Franklin Roosevelt's 1936 reelection, and Mills indicated his willingness to work with the Johnson administration on Medicare legislation (Fiengold 1966, p. 138). Hospitalization, skilled nursing home care for a limited number of days, home health care, outpatient diagnostic services, and a dedicated financing source through Social Security were the primary components of the 1965 version of the King-Anderson bill being backed by the administration—a package similar to the Hospital-

ization Insurance portion of Medicare as it now exists (Derthick 1979, p. 331).

What is today known as Supplementary Medical Insurance, which covers physician fees among other services, did not enter the legislative mix until 1965 when John W. Byrnes (R-Wisc.), the ranking Republican on the Ways and Means Committee, introduced an alternative bill. Byrnes' bill offered benefits patterned after those provided to federal government employees by Aetna Life Insurance. The coverage specified in the Byrnes bill included the provisions in the administration's bill with the additional provisions of physician services and prescription drugs. The distinguishing feature of the bill was that the aged could choose whether or not to participate. If they chose to participate, their premiums, about one-third of the total cost, would be related to the size of their Social Security benefits, with general revenues covering the remaining two-thirds of the program's costs (Derthick 1979, p. 331; Fiengold 1966, p. 142; Marmor 1973, pp. 63–65). The contrast between the Byrnes and King-Anderson bills were significant. The Byrnes bill was voluntary rather than universal. Its financing came from general revenues and premium payments, rather than from a dedicated payroll tax, and premium payments were income-adjusted rather than uniform among individuals.

Instead of choosing between the administration's and Byrnes' bill, in executive session Mills proposed a combination of the two. The combined bill, renamed the Mills bill, was reported out of the committee on March 23, 1965, on a straight party vote. The bill included a scaled-back version of the administration's bill that would be financed through Social Security taxes and voluntary supplementary insurance covering 80 percent of physician fees and other services. The supplementary insurance had a $50 deductible and a $6 monthly premium, half of which would be paid by the beneficiary and half paid through general revenues (Fiengold 1966, p. 142). During the house debates on the bill beginning on April 7, 1965, Republicans quoted from the Mills' 1964 speech (referenced above) to remind the Ways and Means Chairman of his longstanding opposition to the reliance on Social Security financing and to highlight their continued opposition to such a financing arrangement.[6] Byrnes argued that, "Under the payroll tax an erroneous concept has been sold to the people that they have paid for their benefits, that they have bought something as a matter of right,

under such a concept there is no flexibility to make changes because the people will tell you, 'We have bought this, and you cannot make any change except to liberalize it'" (Derthick 1979, p. 333). Before voting on the Mills bill, the house voted on the Byrnes bill; it lost in a 191 to 236 vote. The vote on the Mills bill followed, and on April 8, 1965, it passed 313 to 115.

Hearings in the Senate began at the end of the same month, and by July 9, 1965, the Senate version of the Medicare bill had gained approval on a 68 to 21 vote. However, before the final version was approved, two amendments were added, one temporarily, in the Finance Committee. The first amendment provided for payments to four categories of specialists under hospitalization insurance, and the other amendment, sponsored by Senator Russell Long (D-La.), would have moved Medicare towards means-tested, catastrophic insurance. Long's amendment would have required higher-income beneficiaries to pay a larger proportion of their bills than those with lower incomes, with those having incomes above $10,000 paying the full cost unless they had higher than average expenditures (Fiengold 1966, p. 145). On the first vote in the committee, both amendments were approved, but on a re-vote on June 23, 1965, taken at the behest of the administration, the Long amendment failed. On July 6, 1965, the full Senate approved a slightly modified version on the bill that came out of the Finance Committee. The House and Senate conference committee agreed to include some of the Senate's extensions but retained the House's coverage of the four specialty categories under Supplementary Insurance. The conference committee report was approved by over 70% of the House and the Senate on July 27, and July 28, 1965, respectively (Fiengold 1966, p. 147). On July 30, 1965, President Johnson signed the bill into law.

1965 to 1997

Between 1965 and the present, many of the concerns Wilbur Mills raised in his 1964 speech were realized. Benefits per capita rose and the covered population expanded. As Mills had expected, Congress was periodically placed in the predicament of debating tax hikes to keep up with the system's costs. Congress is again in the position of considering major changes to Medicare as it deliberates on how to deal

with future commitments. In 1964, Mills projected that the unfunded liability was in the neighborhood of $33 billion, but based on data reported in the 1998 Trustees report (Board of Trustees 1998a), the unfunded liability of the Hospitalization Insurance program out to 2075 is in excess of $4 trillion. The trustees suggest that an immediate 72% increase in the tax rate is required to bring the Hospitalization Insurance Trust Fund into actuarial balance over the next 75 years.

The number of enrollees grew from 19 million in 1966 to over 38 million in 1997. In 1972, Medicare coverage was extended to eligible disabled individuals under the age of 65, an expansion which accounted for 5 million of the 38 million enrollees in 1997. While covering the disabled represents the major legislative change since 1965, other provisions have worked to incrementally expand the program. For example, in 1981 Medicare became the secondary payer for beneficiaries with end-stage renal disease; liver transplants were covered beginning in 1985; and, in 1986, mandatory coverage was extended to state and local government employees not covered under Social Security (Social Security Administration 1996).

Expenditures per beneficiaries were rising at the time. From 1967 to 1997, the average Part A expenses per enrollee, adjusted for price level changes using the personal consumption expenditures implicit price deflator, grew by a factor of 4.81 (or 5.37% on an annual basis), and the per enrollee Part B expenses, adjusted for price level changes, grew by a factor of 6.41 (or 6.39% on an annual basis). The combination of the growth in the number of enrollees and the growth in real per capita Parts A and B expenditures produced Medicare expenditures in 1997 that were 1040% of those in 1967, implying that total Medicare expenditures (adjusted for the price level) have grown at a real annual rate of 8.12%. This growth rate in total Medicare expenditures compares with a 2.22% combined real growth rate in wages and the number of workers.

To keep pace with the growing expenditures per capita and the growing number of enrollees, Congress chose to raise the payroll tax rate numerous times. The portion of payroll taxes dedicated to Hospitalization Insurance (HI) started at 0.7% of taxable earnings (split equally between employer and employee) and was raised to its current level of 2.9% in 1986. Besides the tax rate hikes, the level of earnings subject to the tax rose from $6,600 in 1966 to the current unlimited

level in 1994. Therefore, future HI revenue increases can only come as the result of a tax rate increase. However, because of Medicare's two-part structure, Congress can shift part of the HI cost to Supplementary Medical Insurance (SMI), as it did in moving part of the home health care program to SMI as a provision of the 1997 Balanced Budget Act. Originally, premium payments were intended to cover 50% of the SMI expenditures. Over time, the percentage paid by beneficiaries declined and the percentage paid by general revenues rose, so that premiums now cover 25% and are slated to cover that amount into the future.

A brief look at the components of the change in per-capita expenditures is presented in the following graphs. Average real reimbursements per aged enrollee for selected years between 1967 and 1995 are presented in Figure 2.2. Per-capita reimbursements under SMI are growing more rapidly than HI reimbursements, but as of 1995 they were equal to 57% of HI payments. Figures 2.3 and 2.4 present the components of the average. Figure 2.3 presents the average real reimbursements conditional on reimbursable services being greater than zero. As this graph indicates, the HI reimbursements have become much larger, while SMI reimbursements per person served have risen much less dramatically.

Figure 2.2 Medicare Reimbursement per Aged Enrollee (constant 1995 $)

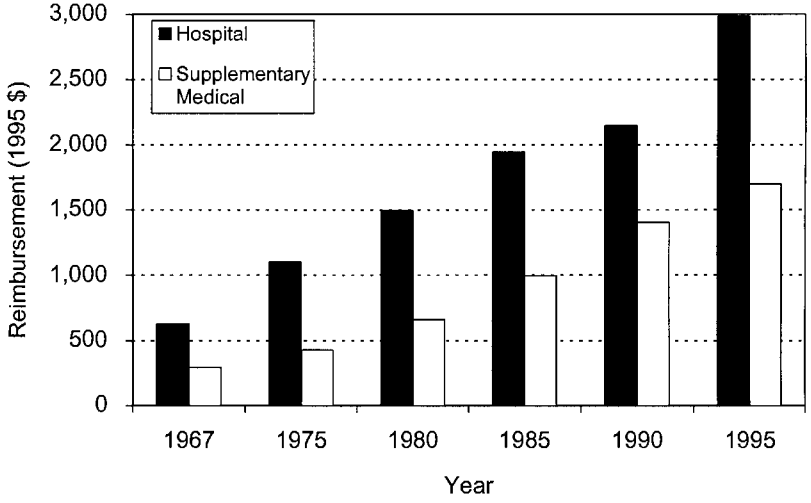


Figure 2.3 Medicare Reimbursement per Aged Enrollee Served (constant 1995 $)

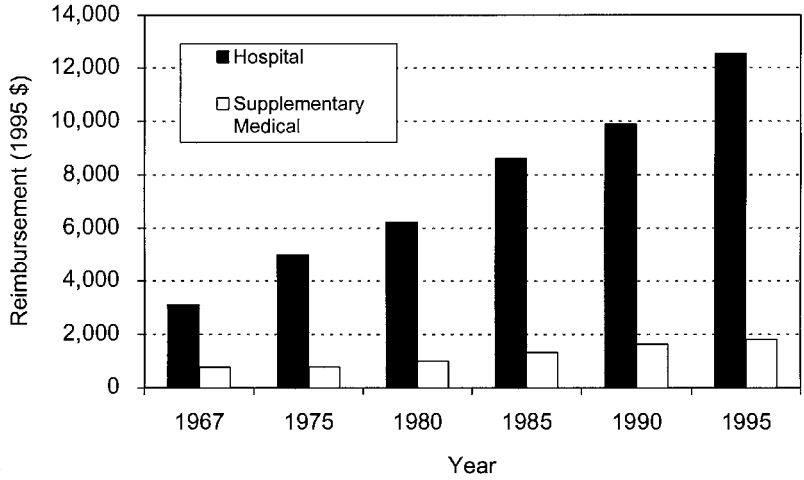


Figure 2.4 Percent of Aged Enrollees Who Received Reimbursed Services

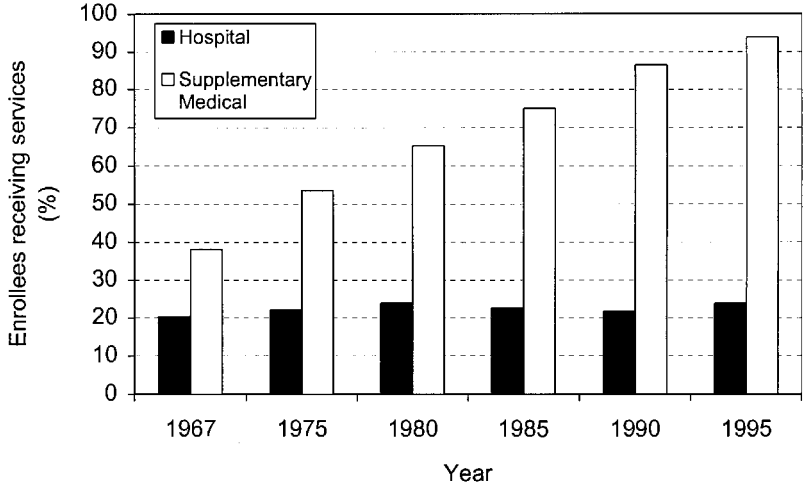


Figure 2.4 presents the percentage of enrollees who received reimbursable services. Over Medicare's first 30 years, the percentage of enrollees who received HI reimbursable services has hovered just above 20%. In contrast, SMI utilization has risen from 38% to 94%. Taken together, these three figures indicate that the increased costs of a hospital stay are producing the rise in HI reimbursements per beneficiary, while increased utilization in general is producing the rise in average SMI reimbursements.[7]

CONCLUSION

As the preceding account illustrates, Medicare and Social Security share a common heritage and structure. They both provide social insurance benefiting the aged population and rely primarily on pay-as-you-go financing. The historical accounts also establish that most of the contemporary Medicare reform proposals were at one time or another debated prior to its passage. Means testing, the option to choose private insurance providers, and vouchers all received serious consideration. Mills's reluctance to finance a service benefit with payroll taxes through the Social Security system is a well established part of the historical record. His interest in prepayment most likely referred to a trust fund type arrangement, but as Social Security's history indicated, Congress typically chooses to postpone tax increases as long as possible. Thus, meaningful prepayment through a common pool invested solely in government bonds, which ultimately must be retired with tax revenues at a later date, is unlikely. In addition, Medicare's history from its passage to the present have fulfilled Mills's predictions. What is new in this contemporary round of Social Security and Medicare reform proposals is the interest in private, individually based savings and/or insurance accounts.

Notes

1. The historical account here relies on two excellent sources: *Policy Making for Social Security* by Martha Derthick (1979) and *Medicare: Policy and Politics* by Eugene Feingold (1966).

2. The original article was unsigned; the attribution to Willcox is from Musgrave (1959). Interestingly, the same article presented the Ways and Means Committee's projections of the future population. The percentages of the population projected to be 65 or older in 1960 and 1990 were 9.3 and 12.6, respectively. The projections were quite close to the actual percentages of 9.1 in 1960 and 12.3 in 1990. However, the actual number of individuals 65 and above were 17.2 million in 1960 and 31.9 million in 1990, compared with the 1937 projections of only 13.6 million for 1960 and 19.1 million for 1990.
3. Committee on the Costs of Medical Care (1932), pp. 120–121. Most notable among its other four recommendations was the proposal that medical services be furnished by groups of physicians organized around hospitals. The eight foundations sponsoring the committee were the Carnegie Corporation, the Josiah Macy Jr. Foundation, the Milbank Memorial Fund, the New York Foundation, the Rockefeller Foundation, the Julius Rosenwald Fund, the Russell Sage Foundation, and the Twentieth Century Fund.
4. The integral role of the Social Security Board and later the Social Security Administration in the preparation of the key health insurance related bills should be noted. According to Derthick (1979, p. 320), Wilbur Cohen, then an economic analyst, and I.S. Falk, director of research and statistics with Social Security, with the backing of board member Arthus J. Altmeyer, drafted the Wagner-Murray-Dingell bills (p. 317). The Forand bill was drafted again by Cohen (who had moved to Ann Arbor, Michigan) and Falk (who had been replaced as the Social Security Administration's director of research and was then teaching at Yale) in addition to Nelson Cruikshank, a Social Security director in the AFL-CIO, and Robert Ball, who would become commissioner of Social Security in 1962.
5. On a related matter, during a May 8, 1964, telephone conversation between Lyndon B. Johnson and his congressional liaison, Larry O'Brien, the two discussed a proposal being talked about in the Ways and Means Committee that would have allowed Social Security beneficiaries an irrevocable choice between the Medicare insurance or cash. O'Brien mentions that originally the choice would have been between the insurance, valued at $7.50 per month, or an increase in Social Security benefits in the same amount. As of the day of the conversation, the cash option under consideration had been reduced to $5.00. (Lyndon B. Johnson recordings of telephone conversations, tape WH6405.08, no. 3472.)
6. Derthick (1979) interprets Mills's drastic change of position on the financing issue as the result of his recognition that Medicare's passage was inevitable and that by taking the lead he would control any expansion. The expansion to include Brynes's bill could be justified in that it would define the limits of coverage (p. 332).
7. Reimbursement and utilization data are from Social Security Administration (1997), Table 8B, and reflect only individuals in the fee-for-service sector.

3
The Theory of Paying for Retirement

One of the fundamental tenets of economics is that there is "no free lunch," meaning that when we make institutional changes, we can expect there to be winners and losers, especially in the short run. This fundamental tenet does not mean that changes cannot be made that make everyone better off, but that such changes are not the general rule. The no-free-lunch dictum has both theoretical and empirical content. In this chapter, we address the theoretical aspects of changing the way that most of the world finances the consumption of their aged population. It is important that, at least in theory, the changes we propose later in this book can improve the lot of both the generation that pays and the generation that receives. Here we develop the pure theory of providing for the retirement of the elderly. Because this is pure theory, the rest of the book can be read without this chapter if the reader is willing to accept the proposition we prove here: that at least some of the real resources required for the transition from an intergenerational transfer system to a prepaid system of providing for the elderly will be forthcoming as a result of the greater income generated under the new system. If you accept this proposition, you can move onto Chapter 4; if not, read on.

The provision of retirement living expenses and health care in the United States—and most of the rest of the developed world—is financed through contemporaneous taxation of the working population. This form of financing affects the incentives of the working population to set aside resources for use during their retirement years. We summarize the literature on the economics of financing benefits for the retired population. We begin with a discussion of the intergenerational transfer inherent in a system that has current taxpayers (assumed to be the currently employed population) financing the health care expenditures of the elderly population (assumed to be retired from the workforce). This form of retiree financing is referred to as "pay-as-you-go." We show that whatever form of financing is used to transfer resources

from the working generation to the retired generation, the result is a reduction in the nation's capital stock. This lower capital stock implies that the level of consumption available both for the working generation and the retired generation is reduced. In the long run, then, when retirement benefits are financed through a system that transfers resources from the working generation to the retired generation, both generations suffer a loss.

We summarize the theory of pay-as-you-go financing of retirement benefits so as to lay the groundwork for a better understanding of the benefits of intragenerational (rather than intergenerational) financing. As a basis of comparison, we begin with a discussion of intergenerational financing that is based on individual choice in the provision of retirement consumption. In order to demonstrate that the capital stock reduction is not the result of a bad choice of a tax instrument, we discuss three forms of financing a transfer from the working generation to the retired generation: lump-sum taxes, general income taxes, and payroll taxes. We show that any form of a generational transfer system reduces the capital stock when compared with individual choice. While some of the discussion will be technical, the majority of the technical aspects of the problem are relegated to Appendix A.

FREE MARKET INTERGENERATIONAL TRANSFERS

Medicare, for all practical purposes, is a pay-as-you-go financing system that is based on a transfer payment from a younger working population to an older retired population. Traditional economic analysis of transfers from one group to another does not consider different generations and thus is not relevant to our problem. The recognition of the special characteristics of intergenerational transfers led to the development of what are referred to in economics as overlapping generations models.[1] The generations of interest here are the working generation and the retired generation. There is an extensive literature that addresses the optimality of the generational transfers inherent in a pay-as-you-go system when compared with a system in which each generation provides for its own retirement expenditures.[2] The basis of these comparisons is the welfare generated by a system of transfers

from the young to the old relative to the welfare generated by a system in which each generation sets aside capital to pay its own retirement expenditures. The conclusion of this literature is that intergenerational transfers reduce welfare, but that once you are in such a system, it may not pay to leave it because the adjustment costs may outweigh the benefits.

As a way of analyzing the effect of an intergenerational transfer system on welfare, we begin by assuming a two-period, overlapping-generations world where goods are produced by the working generation using capital and labor. The working, or young, generation then ages and becomes the retired, or old, generation. The question we address in this chapter is how the younger generation provides for consumption during its subsequent retirement years. By considering only two periods, we collapse an individual's entire working life into the first period and the entirety of retirement into the second. While such a simplification may seem a stretch, it captures the very limited question that we are addressing here, namely, the effect of the form of the financing of consumption by the retired population on the nation's means of production. We will further simplify the discussion by not considering differences among individuals in either earning ability or tastes. As a result, the model considered here cannot be used to analyze alternative ways of achieving intergenerational financing for retirement consumption; it only deals with the benefits of the greater means of production that results from a move away from the pay-as-you-go financing of such consumption.

Since we are not concerned at this time with differences in earning capacity, but only with how a private system would impact the nation's capital stock, we assume that all working individuals have identical preferences for consumption during their working life, denoted as c_W, and consumption during retirement, denoted as c_R. We write the function that describes these preferences as

Eq. 3.1 $U = U(c_W, c_R)$.

Assume that each individual supplies labor during a working period of life. During this working period, individuals consume and save for retirement; then the generation ages and retires. We assume that only capital can be carried over from period to period.[3] Thus, in

order to pay for their retirement consumption, individuals accumulate capital in their working life and use that capital to purchase consumption during their retirement. The assumption that only capital moves from generation to generation places emphasis on the fact that once the retired population stops working, their only contribution to the output of the nation, from which their retirement consumption must come, is the capital they own. If they own no capital, they are completely dependent on the largess of the working generation for their sustenance.

We assume each individual is virtually an island with an individual production function that, given their labor and any capital purchased from the retired generation, permits the production of output that can either be consumed or be carried over into retirement as capital, to be sold to the next young generation in return for consumption. Denote this production function as

Eq. 3.2 $y = f(k)$,

where y and k are, respectively, the output produced and the capital stock purchased by the representative individual. The amount of capital an individual carries over into retirement is the sum of purchased capital less depreciation plus any additional saving done during the individual's working life. We express this constraint on first-period consumption and capital acquisition as

Eq. 3.3 $y = c_W + P_W k + \delta k = f(k)$,

where P_W is the working-period price of capital in terms of consumption units and δ is the rate at which capital depreciates. Each individual must forego consumption in the amount of δk in order to maintain a level k of capital stock. Given that each working generation individual carries capital stock k into retirement, consumption during retirement is simply the product of the price of capital at retirement, P_R and an individual's stock of capital, which can be written as

Eq. 3.4 $c_R = P_R k$.

When the economy is in a steady-state equilibrium, the price of capital will remain constant, which allows us to combine the constraints on consumption in an individual's working and retirement years. In this way, we write a single constraint that reveals all the available choices between working and retirement consumption,

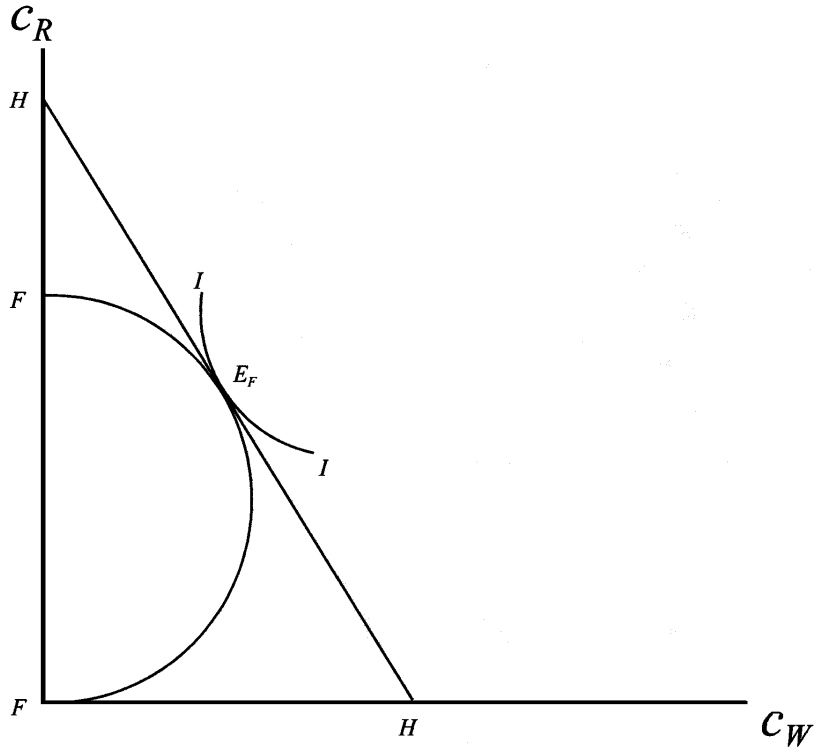
Eq. 3.5 $c_W = y - (c_R + \delta k)$.

This constraint fully describes the opportunity for individuals to trade consumption in their working life for consumption during their retirement years.

We assume that individuals choose the level of working and retirement consumption to maximize their lifetime utility (represented by the general function given by Eq. 3.1 above). In Appendix A, we derive the mathematical solution to this problem. Here, however, we show the solution to the individual's choice problem graphically (Figure 3.1). The concave line labeled *FF* in the figure is a representation of the constraint (Eq. 3.5) on the ability of individuals to trade consumption in working years for consumption during retirement. The constraint line *FF* passes through the origin because consumption during retirement is only zero if no capital is held, which implies that income and therefore working life consumption is also zero. As the capital stock increases, both working life consumption and retirement consumption increase. Eventually, however, increased consumption in retirement must be paid for by reduced working life consumption. In fact, the negatively sloped section of *FF* is the only relevant part of the constraint; the positively sloped section is included to remind us of the critical role the capital stock plays in retirement consumption choice.

The convex curve labeled *II* in the figure represents the combinations of working life consumption and retirement consumption at which, according to the preference function (Eq. 3.1), individuals are indifferent. This curve is characterized by the property that the less retirement consumption an individual has, the more an additional unit is worth in terms of working-life consumption, a property economists usually describe as diminishing marginal value of working-life consumption. The equilibrium combination of working-life and retirement consumption is shown in the figure as the point E_F, which forms the basis of comparison for our subsequent consideration of the effect

Figure 3.1 Free Market Intertemporal Consumption



of intergenerational transfers. At this point, the *II* and *FF* curves are tangent, indicating that the willingness of individuals to trade retirement consumption for working-life consumption, the slope of the *II* curve, is equal to their ability to make such a trade, the slope of the *FF* curve. This common slope is depicted in the figure by the line *HH*, the slope of which must equal *–P*, since the cost of increasing retirement consumption by one unit is the cost of acquiring an additional unit of capital to sell during retirement.

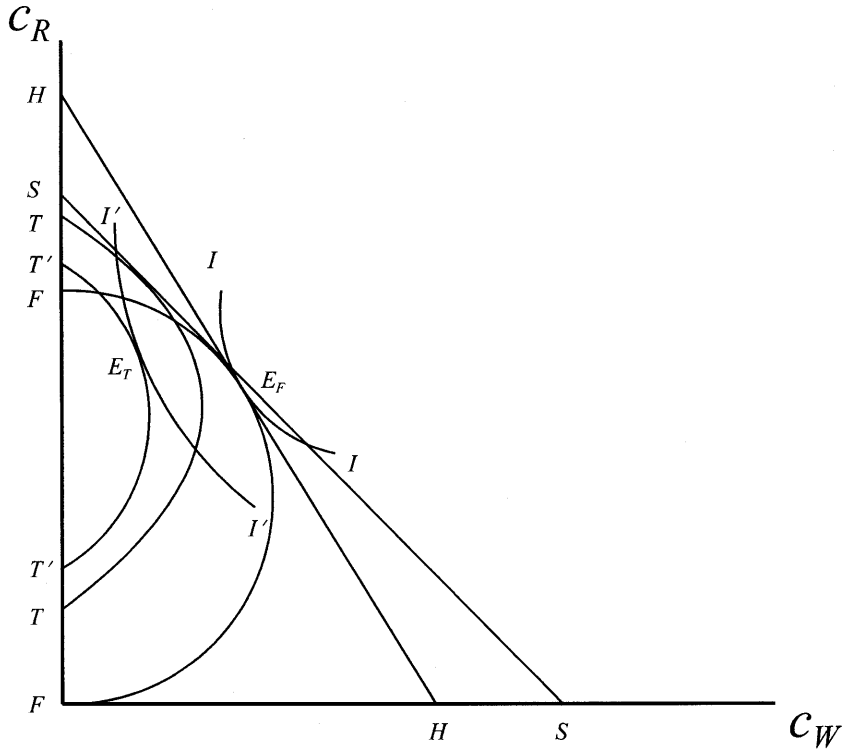
LUMP-SUM INTERGENERATIONAL TRANSFERS

We now have a base case, individual provision of retirement consumption, to compare with a system that transfers consumption from the working generation to the retired generation via some system of taxation. Although we do our analysis for a constant-population world, it applies equally well to a world where population is growing. Importantly, however, current fertility rates in the developed world are uniformly below population-sustaining levels. In our analysis, we concentrate on the effect on the capital stock, which in this simple model totally determines the potential for the population to trade between consumption while working and during retirement. Specifically, we derive the effect on the capital stock of moving from a system of self-financed retirement consumption to a system of generational-transfer-financed retirement consumption in a constant-population world.

As a first approximation to the answer to this question, consider a simple per-capita lump-sum tax, *T*, imposed on the working generation and distributed to the retired generation. In Figure 3.2, which adds the constraint facing individuals when an intergenerational transfer is imposed, we show the effect of this transfer. The curves labeled *FF*, *TT*, and *T´T´* represent, respectively, the constraint for our base case of individual provision of retirement consumption, the constraint for the intergenerational transfer world before any change in the price of capital occurs, and the constraint after the price of capital adjusts as a result of the transfer.

Each point on the *TT* curve is derived from a point on the *FF* curve by subtracting the amount of the transfer, *T*, from working life consumption and adding this same transfer to retirement consumption. Thus, by construction, both the *FF* and *TT* frontiers are tangent to a line of slope –1, shown in Figure 3.2 as the line *SS*. The point E_F represents, as in Figure 3.1, the pretransfer, steady-state-equilibrium levels of working life and retirement consumption. This point either lies to the right of the tangent point of *SS* and *FF* or is at that tangent point.[4] The straight line tangent to *FF* through the point E_F, *HH*, is strictly to the right of *TT*, and therefore to the right of *T´T´*. The generational transfer equilibrium point $E_{T,}$ occurs at the point of tangency between

Figure 3.2 Free Market Versus Intergenerational Transfers, the Case of Lump-Sum Tax Financing



the indifference curve $I'I'$ and frontier $T'T'$ and identifies the steady-state-equilibrium levels of working life and retirement consumption, when intergenerational transfers are in effect. Because E_F lies strictly outside both frontiers TT and $T'T'$, it is associated with greater consumption for both workers and retirees. Therefore, the prepaid-retirement equilibrium point E_F strictly dominates the intergenerational-transfer-financed equilibrium point E_T.

The striking result of this analysis is that even if we achieve a generational transfer with a lump-sum tax, which is supposedly nondistortionary, the result is a reduction in the per-capita capital stock and, hence, reduced per-capita goods available for consumption to both the

working and retired generations. Moreover, the reduced capital stock results in a higher price for capital, which translates into a higher interest rate. This higher interest rate in the transfer world further distorts individuals' choices toward consumption in their working years.

It is worth noting that our analysis ignores the effect of any generational transfer system on fertility. If we assume that in addition to capital, individuals can acquire resources for their retirement years through a contract with their children, then the existence of an extrafamilial transfer will reduce the retirement consumption motive to have children. As a result, the introduction of a generational transfer may reduce the fertility rate and therefore the steady-state population. Because our model has constant returns to economy size, the steady-state per-capita capital stock is not affected by the fertility rate. However, Social Security and Medicare systems throughout the world rely heavily on population growth to provide future retirement consumption. Thus, any fertility rate reduction resulting from the introduction of a generational transfer system would reduce the population growth rate and reduce the viability of these programs.[5]

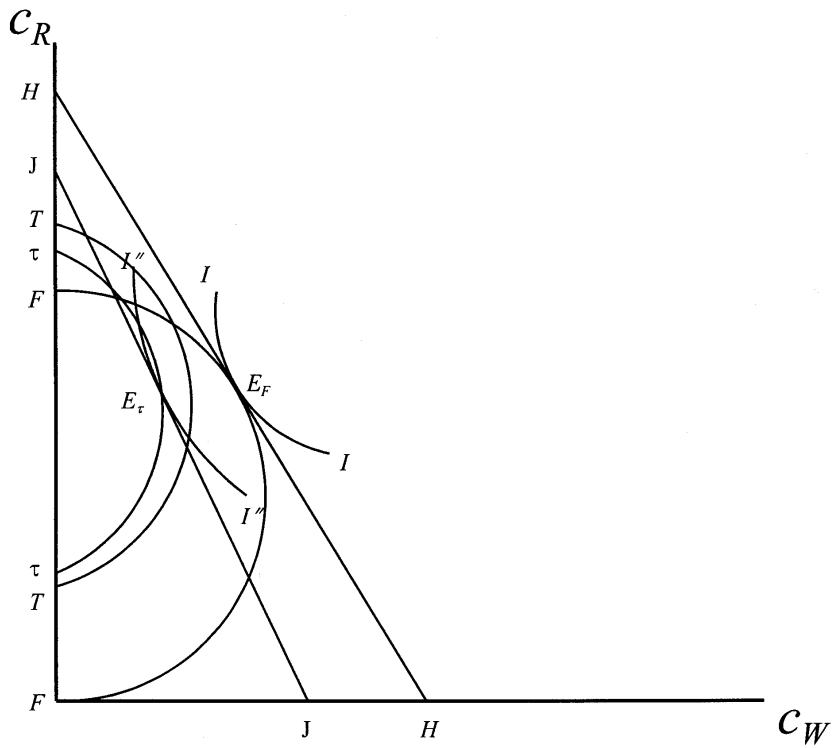
INCOME-TAX-BASED INTERGENERATIONAL TRANSFERS

Before we use the result that intergenerational-transfer-based social security systems are inefficient (in that they result in lower capital and income), we must show that our result is not due to the special tax we analyzed. This is especially true because lump-sum taxes are not prevalent and most pay-as-you-go social security systems are financed with some form of income tax. The great advantage of lump-sum taxation is that there is no escape from it and nothing individuals do has any effect on the amount of tax paid. However, as the above analysis shows, even though lump-sum taxes cannot be escaped, they affect the equilibrium capital stock and are welfare-reducing. One might expect that intergenerational transfers financed by taxes that have additional incentive effects will reduce welfare further through their impact on the choice of capital and labor. Here we extend the discussion of intergenerational transfers to include financing by income-based taxation.[6] As we will show below, however, an income-tax-financed intergenerational trans-

fer actually works better than one financed by a lump-sum tax, because the income tax reduces the equilibrium price of capital, which in turn alleviates some of the distortion resulting from the lump-sum transfer. Nevertheless, even with the less distorting income-tax financing, intergenerational-transfer-financed retirement still results in consumption levels for the working and retired generations that are lower than when a generation's retirement consumption is prepaid by that same generation during its own working years.

We illustrate the equilibrium in the income-tax-financed transfer case in Figure 3.3; the trade-off frontiers *FF* and *TT* are the same as those in Figure 3.1. Frontier ττ in Figure 3.3 represents the trade-off frontier when income taxation is used to finance the transfer to the

Figure 3.3 Free Market Versus Intergenerational Transfers, the Case of Income-Tax Financing



retired generation. Frontier $\tau\tau$ is strictly to the left of *TT* because the equilibrium price of capital stock is greater than when retirement consumption is prepaid. Because of the higher equilibrium price of capital, the capital stock with an income-tax-financed transfer is smaller than with an individual prepaid system (see the discussion of the relative position of *T´T´*and *TT* for Figure 3.1).

The equilibrium under income-tax-financed intergenerational transfer, E_τ, is a point on $\tau\tau$ at which the relevant indifference curve I´´I´´ has a slope of $-P_\tau$. To illustrate this, a straight line *JJ* is drawn tangent to the indifference curve at E_τ; hence, *JJ* also has a slope of $-P_\tau$. It is obvious that E_τ is dominated by E_F. It is also obvious that the indifference curve is not tangent to $\tau\tau$ at E_τ. This outcome results from the fact that the income tax changes the terms of trade between that consumption during working life and consumption during retirement.[7]

We have established in this and the last section that no matter what kind of financing is used, individuals are worse off in a world with young-to-old intergenerational transfers than they would be if each generation prepaid its own retirement consumption. Within the transfer world, however, the form of financing makes a difference because different financing methods have different economic effects. Intuitively, income-tax financing will make intergenerational transfers even less attractive than the lump-sum tax financing due to the identified negative incentive effects of income taxes. However, this intuition in favor of the lump-sum tax is no longer correct in an overlapping-generations economy.[8]

Although we will not present the proof of the generality of the proposition that an income-tax-financed generation transfer is superior to a lump-sum-financed transfer, the following simulation demonstrates this result for simple production and preference functions. For purposes of this simulation, we assume the preference function is homogeneous and has zero fundamental time preference, as indicated by the equal weights on working life and retirement consumption,

Eq. 3.6 $U(c_W, c_R) = (c_W)^{1/2} (c_R)^{1/2}$.

Although the underlying production function is homogeneous in capital and labor, the transformed production function as a function of the capital/labor ratio is not homogeneous. For this simulation, we assume

the following production function, which has diminishing returns and the possibility of a negative marginal productivity of capital:

Eq. 3.7 $f(k) = 81.65k^{1/2} - 1.5k.$

Finally, we assume a constant depreciation rate of capital, $\delta = 0.1$.[9] Using these assumed functions, we derive the steady-state values of relevant economic variables in the prepaid, lump-sum-financed, and income-tax-financed equilibria. Table 3.1 contains the steady-state values and the level of utility using a transfer of 100 consumption units for each of the two transfer situations.

Since in theory intergenerational transfers are always welfare reducing, it is not surprising that in the simulation individuals are worse off with either form of generational transfer than when retirement consumption is prepaid. The simulation also shows, as expected, that the income-tax-financed transfer results in higher utility than the lump-sum-tax-financed transfer, with the former having a higher capital stock, a lower capital price, and a higher utility. Income-tax financing does better than the lump-sum-tax financing exactly because it alleviates the capital stock distortion.

Table 3.1 Simulated Effect of Lump-Sum and Income-Tax-Financed Transfers (Fixed Labor Supply)

Variables	Prepaid retirement	Lump-sum-tax-financed transfer	Income-tax-financed transfer
Per-capita capital stock	625	454.0	477.2
Price of capital (units of consumption per unit of capital)	1.40	1.75	1.64
Transfer/tax rate (%)	0/0	100/0	100/7
Working-period consumption	625	511.1	538.2
Retired-period consumption	875	893.0	882.8
Utility	739.5	675.8	689.3

INTERGENERATIONAL TRANSFERS WITH VARIABLE LABOR SUPPLY

An important argument in the policy debate concerning the pay-as-you-go financing of current Social Security and Medicare programs is the negative effect of the payroll tax on the supply of labor. In order to account for the impact of any negative incentive effects of taxation on labor supply on our results, we drop our assumption that workers supply the same level of labor no matter how that labor is taxed. We incorporate labor supply incentive effects by considering an extended model that features variable labor supply. We add free time (leisure) during an individual's working life to the individual's preference function while retaining the assumption that individuals supply no labor during retirement.[10] Denote the level of leisure taken during an individual's working life as ℓ and rewrite the individual's preferences as

Eq. 3.8 $U = U(c_W, c_R, \ell)$.

To be consistent with our previous discussion, per-capita output must depend on labor supplied, which we write as

Eq. 3.9 $y = (1-\ell) f\left(\frac{k}{1-\ell}\right).$

Using this extended model, we show in Appendix A that, at equilibrium, the capital stock with variable labor supply for prepaid retirement, *k*, lump-sum-tax-financed retirement $k_{T\hat{L}}$, and income-tax-financed retirement $k_{\tau\hat{L}}$, has the property that $k_{T\hat{L}} < k_{\tau\hat{L}} < k$. Considering our results when we ignored the effect of taxes on labor supply, one might expect that because an income-tax-financed transfer treats labor and capital symmetrically, it would be superior to a tax on the income attributable only to labor. Surprisingly, as we show in Appendix A, at least one form of a payroll tax is superior to both the lump-sum tax and the income tax as a method of financing an intergenerational transfer. The logic of this result follows from two attributes of the model. First, because payroll is less than total income, it follows that the tax rate required to finance any given transfer to the retired generation must be larger than if all income was taxed. Second, increases in the capital

stock result in increases in total payroll. Therefore, if the equilibrium price of capital remained the same with the income tax and the payroll tax, the payroll-tax capital stock would have to exceed the income-tax capital stock in order to raise the required revenue. Indeed, this is exactly what happens in the following simulation.

In order to illustrate the effect of a payroll-tax-financed transfer, we use the simulation equations above with the addition of leisure consumed during working life. For purposes of consistency with the simulation done in the fixed labor supply case, we retain the assumption of a homogeneous utility function. Let $U(c_W, c_R, \ell) = 1.732\,(c_W)^{1/2}\,(c_R)^{1/2}\,(\ell)^{1/2}$ be the common utility function. Assume a production function $f(k) = 100k^{1/2} - 1.5k$, and as in the last simulation, let $\delta = 0.1$ and $T = 100$.[11] The results of the simulation are shown in Table 3.2.

Inspection of these results confirms the two conclusions reached in our prior simulation. First, no matter what financing method is adopted, an intergenerational transfer from the young to the old always reduces the capital stock and total utility. Interestingly, both the income tax and the payroll tax are better than a lump-sum tax in that they result in less distortion.[12] However, all forms of transfer are inferior to a system of prepaid retirement benefits. The negative welfare effects of generation-transfer-financed retirement benefits are due to the higher capital price that is associated with such a transfer. All intergenerational transfers distort the optimal capital stock and reduce the availability of consumption for both working life and retirement.[13]

Table 3.2 Simulated Effect of Lump-Sum and Income-Tax-Financed Transfers (Variable Labor Supply)

Variables	Prepaid retirement	Lump-sum tax financing	Income tax financing	Payroll tax financing
Capital stock	416.7	255.5	258.3	280.5
Price of capital	1.40	1.99	1.80	1.62
Income tax rate (%)	NA[a]	NA	11	15
Working-period consumption	416.7	305.3	313.9	342.2
Retired-period consumption	583.3	607.3	564.3	554.4
Utility	493.0	419.3	433.9	449.2

[a] NA = not applicable.

DOES THE SIZE OF THE RETIRED GENERATION MATTER?

In view of the decline in fertility and the population bulge (the so-called baby boom), both of which are worldwide phenomena, the impact of temporary population size changes on the well-being of the elderly is of significance. In particular, how does the fact that the entire developed world faces a pending significant increase in the population of retirees, while at the same time looking at a reduced workforce, affect the results we have derived above? To provide some answer to this perplexing question, we use a simple version of the model above. As a base case, we note that when all generations are the same size and technology is constant, the equilibrium per-capita capital stock will be that capital stock which maximizes the value of lifetime consumption per capita for any given level of leisure.[14]

Begin by assuming that the economy is in a steady-state equilibrium with a constant population of size N_0. Assume further that a generation size shock occurs, so that the new population is $N_1 = (1 + \eta)N_0$. Without loss of generality, assume that $\eta > 0$.[15] At the new larger population, the price of capital will rise because the supply is unchanged and there are more demanders. If there were no further changes in population, the per-capita capital stock would return to its original equilibrium. During the adjustment to the new equilibrium steady state, however, the price of capital is above its cost of production. Thus, until we reach the original equilibrium, each successive retired generation benefits from the larger population.

The baby boom generation is not the equilibrium population size but is a temporary increase in generation size. If the equilibrium capital stock is chosen so that it maximizes the mean size of generation's consumption per capita, then a generation's lifetime consumption will depend on generation size relative to the mean. For a generation that is larger than the mean, such as the baby boomers, the capital stock will be too small, resulting in larger retirement consumption for the retired smaller generation but smaller lifetime consumption for the baby boom generation.[16] Also, when the baby boomers retire and attempt to sell off their capital to the smaller working generation, the price of capital will fall.

The only way that a society can prepare to pay for the retirement consumption of a larger-than-normal generation is to add to the capital stock. This larger capital stock would then be consumed during the retirement years of the larger-than-normal population. As we have shown above, a pay-as-you-go financing system takes away the incentive for a generation to add to its capital stock to pay for its retirement expenses and thus will result in a reduced capital stock in the steady state.[17]

If generational transfers are non-optimal in the sense that they are welfare reducing, is there any role for intervention in intertemporal markets? The work in this area has addressed this question using the concept of insurance across generations.[18] In effect, the unborn generation buys insurance against the risk that they will be too large or too small. There are two issues for an unborn generation: the price they must pay for capital during their working period and the price they will receive for capital during their retirement period. As we have shown above, a generation that is too large, in the sense that the inherited capital stock commands a market price in excess of the long-run price of capital, transfers income to the retired generation. To compound the problem, the generation that is too large will also expect to face a price of capital during their retirement period that is below their purchase price.

To consider the problem of social insurance, assume that population size is the result of a Markov process that is pure Martingale, which implies that the expected size of the about-to-be-born generation is equal to the size of the most recently born generation. In this case, if the unborn generation is larger than the current generation, each unborn will pay higher prices for capital and transfer resources to the current generation. On the other hand, if the unborn generation is smaller than the current generation, then each unborn will pay lower prices for capital and receive a subsidy from the current generation. Since the two generations are affected in opposite directions by the size of the unborn generation, there is room for a contract between the two generations assuming risk aversion. Such a contract would involve the price of capital and reduce the flows between generations. Importantly, the direction of the flows would be dependent on generation size differentials, so that fixed generational transfers would be non-optimal. Therefore, the proven non-optimality of the current generational transfer system cannot be rescued by appealing to generational size insurance. Further,

intergenerational insurance does not solve this problem, because the diversification of risk usually involved in insurance cannot take place across generations because of the small number of generations.

CONCLUSION

Our focus in this chapter has been on the pure theory of intergenerational transfers. The analysis allows for a comparison between prepaid retirement and retirement financed by intergenerational transfers. The results we obtained are unequivocal in showing that intergenerational transfers are always welfare-reducing when analyzed by comparing the steady-state equilibria. More important to the work in our subsequent chapters is the fact that intergenerational transfers, no matter how financed, lead to reductions in the nation's capital stock. This fact suggests that in moving from a Medicare or Social Security system that is financed through an intergenerational transfer to a system that is prepaid by each generation, there will be an increase in the nation's capital stock. This increase in the nation's capital stock will result in an increase in national income that will help provide the resources required as the baby boom generation retires. Thus, the primary issue in the debate concerning the privatization of the provision of retirement benefits should be the effect of the institutional change on the nation's stock of capital and subsequent national income. The actual debate at both the academic and political levels has concentrated on the fact that private accounts could yield higher rates of return than current government-held funds. Unfortunately, the fundamental issue is not about rate of return; it is about capital and income.

The next chapter describes in detail the forecasts required to provide an analysis of the existing U.S. Medicare program. We are suggesting changing the program from one based on intergenerational transfers to a prepaid system. Any evaluation of our proposal requires that we forecast into the future the existing system and our proposed system. We accomplish these forecasts by a thorough analysis of data on employment and life-cycle earnings for both males and females. This work is of necessity detailed, and the reader may wish to accept the validity of the underlying analysis and move immediately to Chap-

ter 5. With that said, however, we encourage any reader who takes this approach to return to Chapter 4 whenever there is a question concerning the basis of our forecasts.

Notes

1. These models were first suggested in a seminal paper by Samuelson (1958).
2. See Myles (1995), Chapter 14, for an excellent summary of this literature.
3. This approach was first introduced by Diamond (1965, 1977).
4. The equilibrium is at the tangent point of *SS* only if the rate of interest is zero.
5. In a provocative paper, Philipson and Becker (1998) do a thorough analysis of the substitution of capital and children as providers of retirement annuities.
6. In the United States, at least, intergenerational transfers are financed through a payroll tax. However, as we demonstrate in Appendix A, when labor is completely inelastically supplied, in at least one form the payroll tax is equivalent to a lump-sum tax.
7. The indifference curve has a slope of $-P_\tau$ at the equilibrium, while frontier $\tau\tau$ has a slope of $-P_\tau / [1 + \tau(\delta - f')] < P_\tau$; hence, $\tau\tau$ is steeper than *JJ* at equilibrium.
8. For an excellent discussion of optimal taxation, see Ordover and Phelps (1979) and Park (1991).
9. This specification of the production function may look strange, but it is constructed to be comparable with a later simulation where labor supplied is an endogenous variable.
10. Because we do not consider second-period labor supply, our analysis will not shed light on the retirement decision. For demonstrating the non-optimality of intergenerational transfers, discussion of the retirement decision is not required, although this decision is important for the financing of retirement consumption. There is extensive literature on the retirement decision; see, for example, Crawford and Lilien (1981), Diamond and Mirrlees (1986), Feldstein (1974), and Sheshinski (1978).
11. This utility function, except for the scalar constant, is the same as that used in the previous simulation for any fixed level of leisure. The scalar constant was set to make the utility values comparable to those contained in Table 3.1. Since utility is strictly ordinal in nature, the actual values are unimportant. Note also that the values of all variables in Table 3.2, save those for utility, are unaffected by this scalar.
12. When the payroll tax is defined as in note 7, individuals ignore the effect of changing the capital stock on the marginal product of capital. This simpler form of the payroll tax for the variable labor case is the most distortionary of all methods of financing the transfer, because individuals ignore the effect of their capital choice on the return to capital. See Flemming (1977) for a discussion of optimal payroll taxes.
13. The welfare implications of transfers is more usually conducted using the dynamic adjustment of the system. Under certain conditions, even though the

comparison of steady-state solutions indicates a gain in welfare is possible, the present value of the losses during the adjustment period will outweigh the subsequent gains. See Karni and Zilcha (1986) for a comparative statics approach to the welfare implications of Social Security.

14. For the case where it is assumed that no leisure is taken in period t by a generation-t individual, this maximum lifetime consumption is the global maximum. However, when leisure is taken, lifetime consumption is less than the global maximum.
15. The observation that generation size shock has significant effects on the welfare of a generation that is too large was first investigated by Smith (1982).
16. These results depend on the existence of a consumption per capita maximizing per-capita capital stock. Previous results have assumed that capital is always productive, so that a smaller generation inherits more capital and gets greater consumption. See Brandts and de Bartolome (1992) for an excellent discussion of uncertain population size on social insurance results.
17. Feldstein (1996) estimated that the loss to the economy of reduced capital stock is of the order of 1% of gross domestic product.
18. See Green (1988) and Brandts and de Bartolome (1992) for examples of this work.

4
Forecasting Earnings

The analysis of a system of providing retirement health care, whether through a pay-as-you-go income transfer or through a prepaid system, fundamentally involves seeing into the future. The effect of the current system on future taxpayers requires that we understand the fundamental relationship between the tax rate, earnings, and the size of the working population on the one hand and the benefit structure and the size of the retired population on the other. We must then place into this relationship forecasts of each of the relevant factors: earnings, population by age, labor force participation, retirement population, and future benefit cost. By the same token, the contribution required to prefund a retirement health care system requires these same forecasts, with the exception that after the transition, the age distribution of the population does not play any role in contribution levels.

Given the critical importance of forecasting future levels of the components of the retirement health care equation, any effort to understand the existing Medicare crisis and to suggest changes that will provide a permanent solution must be based on sound actuarial foundations. With a sound actuarial foundation in place, institutional changes (such as moving toward or to a system that is prepaid, the benefits of which are shown in Chapter 3) can be evaluated in terms of their cost and feasibility. In this chapter, we begin the analysis by developing forecasts of the earnings component of the retirement health care equation. In this development, issues of life-cycle earnings by education and sex must be considered. Further, since Medicare benefits do not depend on work life history, we must account for everyone, whether or not they spent any time in the labor force.

Our approach is to forecast average annual earnings over the entire population of males and females for each birth cohort. The forecasts by birth cohort allow us to evaluate the future of the current system and our proposed prepaid system of financing Medicare. In addition, during the transition from the existing pay-as-you-go Medicare system to a prepaid system, the birth cohorts alive at the time of the transition

will have to pay the cost of the transition. The forecasts of life-cycle earnings for males and females will allow us to estimate the contribution rates that allow an individual already in the workforce to convert to prepaid Medicare and to derive tax rates that will pay for the transition.

The data on which our forecasts of the life-cycle age earnings profiles for any birth cohort are based cover the period from 1964 to 1995 and are taken from the Current Population Survey. As we discuss at length in this chapter, these data reveal a consistent upward trend in female average annual earnings. This upward trend is especially important because women have become a major factor in the nation's labor force. Over the period of our data, the labor force participation of women has increased more than 47%, and their education level has risen to equal that of the male population.

We produce estimates of life-cycle earnings and labor force participation (this chapter), estimates of future benefits under several plausible Medicare programs (Chapter 5), and the cost and benefits of a transition from the current pay-as-you-go generation transfer system to a system based on prefunding by birth cohort (Chapter 6). In the discussion, we present alternative proposals for reform of the health care system that make the transition to a prepaid system less costly while simultaneously increasing the efficiency of the health care system.

PAY-AS-YOU-GO VERSUS PREFUNDING MEDICARE

In the spring of each year, the Social Security and Medicare Trustees issue their reports on the status of the two programs. Their long-run actuarial projections rely on several key assumptions about population trends, real wage growth, and real benefit growth. Similarly, any estimate of the cost of a prefunded Medicare program must be based on best estimates of these same demographic, income, and benefit components. The importance of each of these components on the financing of Medicare can be seen by examining the following pay-as-you-go accounting identity:

Eq. 4.1 $Tax\ Rate \times Workers \times Earnings = Beneficiaries \times Benefits.$

The left-hand side of Eq. 4.1 identifies tax revenues as the product of tax rates, the number of workers, and average earnings. The right-hand side of Eq. 4.1 identifies the gross Medicare benefits as the product of the number of beneficiaries and the average benefits paid. By rearranging this fundamental equation, we can derive the relation of the tax rate required to finance a pay-as-you-go Medicare system to the ratios of benefits to income and retirees to workers,

Eq. 4.2 $$Rate = \left(\frac{Beneficiaries}{Workers} \right) \left(\frac{Benefits}{Earnings} \right) = \frac{Total\ Benefits}{Taxable\ Income}.$$

The required tax rate is simply the product of the beneficiaries/workers ratio and the average benefits/average earnings ratio. If the tax rate is held constant, then gross benefits can only grow at a rate that is equal to the growth in the tax base.

The sensitivity of the required tax rate to the beneficiary/worker ratio and the benefit/income ratio is well known and is the source of concern for many policymakers. Under the current pay-as-you-go Medicare financing system, the effects of the pending retirement of the baby boomers on the beneficiaries/worker ratio and the expected rapid growth of average benefits relative to average earnings will require higher tax rates or a substantial reduction in benefits. When considering Medicare, it is important to consider that the size of the benefit stream is not tied in any way to previous work history (unlike Social Security). Thus, future Medicare benefits are unrelated to the future labor force participation of the population and are therefore unrelated to earnings. In contrast, Social Security benefits are at least partially determined by future labor force participation. The fact that Medicare benefits are divorced from earnings allows us to forecast future benefits, ignoring work history. Further, the fact that all labor earnings are subject to the Medicare payroll tax allows us to project the growth in tax receipts by simply analyzing the expected growth in annual earnings.[1]

In contrast to pay-as-you-go financing, consider the problem of prefunding the future Medicare benefit stream for new labor force entrants. For illustrative purposes, consider the prefunding of Medicare for each labor force member of a specific age cohort, defined as all individuals born between January 1 and December 31 of a given year (i.e., all those born in the same calendar year). Define the benefit that

must be funded by a stream of contributions as consisting of a retirement medical insurance policy that will provide for their health insurance needs upon a specific age cohort reaching age 65. We can simplify the problem by considering a representative worker in the cohort. For this case we can assume that the number of beneficiaries and the number of workers are both equal to 1, the one representative individual. The required "tax rate" is the ratio of the present value of expected retirement medical costs to the present value of expected earned income, both adjusted for the probability of survival.[2] If this required tax rate is applied to the mean cohort member's income for each remaining year, the proceeds will be adequate to fund the retirement medical benefits of the cohort.

Thus, the ratio of the expected present value of benefits to the expected present value of income yields the appropriate tax rate to fund all members of the cohort, which is what would be needed to replace the current pay-as-you-go financing for Medicare with a system of prepaid Medicare. To calculate the required contribution rate, a cohort's earnings over its remaining work life (its work life-cycle earnings, so to speak) and its expected retirement medical benefits must be estimated. In the final analysis, the cohort's life-cycle earnings and its expected retirement medical benefits are on equal footing in determining the contribution rate. We begin by decomposing cohort annual earnings among three components: cohort labor force participation, cohort annual hours worked, and cohort real hourly wages.

ESTIMATING FUTURE EARNINGS

Forecasting future earnings is fraught with uncertainties. To cover these uncertainties and perhaps make them even more apparent, we have developed several alternative aggregate earnings forecasts that differ as a result of using alternative estimates of the growth rates of historical wages, labor force participation, and hours worked. Note that the method used to account for the rapid changes in the labor market for women has a significant effect on any estimate of the growth in wages, labor force participation, and hours worked. For our estimates, we use two decision rules to capture the convergence of the men's and

women's annual earnings components. We present alternative forecasts to indicate how sensitive the aggregate forecasts are to differing assumptions. These alternative forecasts will be evaluated before we choose the projections on which the final forecasts are based.

Over the last 20 years, the cross-sectional evidence indicates that the annual earnings life-cycle profile for women is trending toward the life-cycle earnings profile for men, both for full-time, full-year workers and for the working population as a whole. Further, among women, the cohort-based life-cycle profiles tell a very different story than do the cross-sectional profiles. The rise in female labor force participation, coupled with their increased human capital investment and greater labor force continuity, makes the cross-sectional age/earnings profiles underestimate the real earnings and labor force participation of women during the latter years of their work life. This disparity between cross-sectional age earnings profiles and cohort-based age earnings profiles that characterizes the data for women is also true for certain subsets of men, except that here we have the estimation error going the other way. In particular, MaCurdy and Mroz (1995, pp. 34–35) suggested that for men with lower education levels, the 1980 and 1990 cross-sections for men with the same education levels would have overestimated future earnings potential.

The data we use to calculate the growth rates in wages, labor force participation, and hours worked are taken from the 1964 to 1996 March Demographic Supplements to the Current Population Survey (CPS). The CPS is conducted by U.S. Census Bureau for the Bureau of Labor Statistics. It is a monthly survey conducted at the household level. Households are surveyed for four months, are not surveyed during the subsequent eight months, and are then surveyed for four more months. Between 50,000 and 60,000 households are surveyed in a given month. The March Supplement includes the variables of interest for this chapter: average weeks worked, average hours worked per week, annual wage and salary, self-employment and farm earnings, and an indicator for participation in the labor market. The March Supplement questions pertain to labor market behavior during the previous year, and thus the years for which we have data are 1963 to 1995. In order to account for inflation, all earnings data are converted to 1995 dollars using the Personal Consumption Expenditures implicit price deflator.[3] Using this CPS data, we develop a technique that allows us

to track the historical changes in labor force participation, hours worked, and wages for different categories of workers. The historical record of labor force participation, hours worked, and wages by worker category allows us to treat each of the components of total earnings separately and allows subsets of the labor force to experience differing growth rates by earnings component.

In order to forecast the total tax base, and ultimately the cohort profiles required for the contribution rate estimates, we must combine our estimates of the number of individuals in a category with the proportion that participate in the labor market. The product of these two yields the number of individuals in a specific category that are expected to be employed. Combining the estimated number of employed individuals in a specific category with the wage and hours worked for that category completes our estimated tax base for that category. The total tax base is then the sum of all the categories. For purposes of our estimation procedure, we utilize 11 age groups and 5 education cells for each sex, yielding 116 separate age $\times$ education $\times$ sex categories.

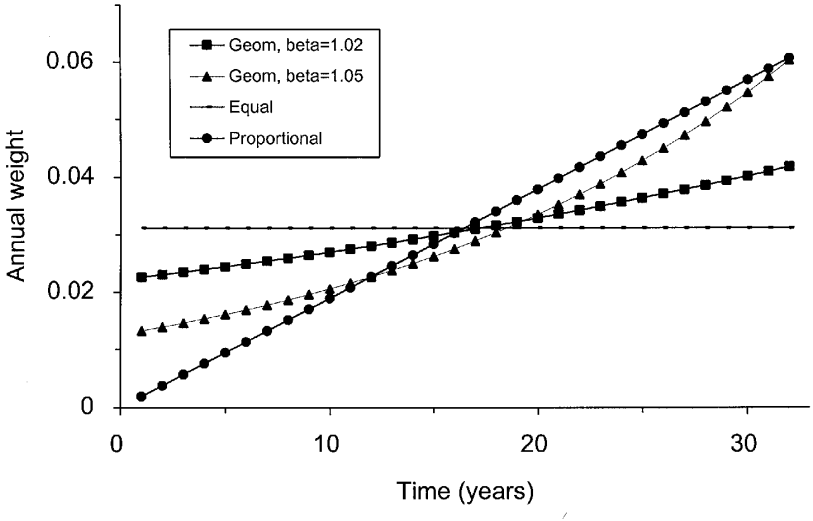
ESTIMATING EARNINGS-COMPONENT GROWTH RATES

With the historical record for 116 categories of the population in hand, the problem of forecasting the future for all categories requires that we forecast the future path for each of the three components of annual earnings. We base our forecasts of future performance of wages, labor force participation, and hours worked using four different methods of weighting the past record.[4] Three of these growth rate estimates weight recent growth more heavily than growth in the early years, and the last is simply the measure of growth obtained using only the two endpoints of each series. By calculating the growth rates for each age/education category, we allow the shape of the age earnings profile to change over time. These age/earnings profiles allow us to create projections for each cohort.

The validity of growth rate estimates that weight recent growth more heavily have been investigated by Murphy and Welch (1992). Their initial growth rate calculations for real hourly wages, annual

hours, and annual earnings were updated in Murphy and Welch (1996).[5] We build on their work using three weighting schemes, the first two of which weight the annual growth rates in each of the three components of annual earnings, while the third applies the weights to the levels of the components of annual earnings and then calculates the resulting growth rate. The first growth rate calculation relies on weights which are proportional to the time period measured from the beginning of the period covered by the data. As an alternative to the time-period proportional weights, the geometric weights also weight recent annual growth rates more heavily, with the adjacent weights differing in an exponential fashion. For this geometric weighting scheme, the discounting factor is chosen by the user. In order to assess the effect of the choice of discount, we present in Figure 4.1 two discount choices, 1.02 and 1.05, and compare to the outcome with proportional weights and equal weights. Inspection of the estimates in Figure 4.1 reveals that growth rates calculated using geometric weights with a discount factor of 1.05 produces a series similar to that with proportional weights.

Figure 4.1 Types of Weighting Used to Calculate Average Growth Rates



In Table 4.1, we present the estimated growth rates for each of the three components of annual earnings, calculated using time-period proportional weights, the two alternative geometric weights, and equal weights for one of the education/age cells (college graduates between the ages of 40 and 44). As shown in the table, even for prime-age men with a college education, labor force participation and work hours have declined. Real hourly wages for this age/education category have grown between 0.657% and 0.841% for men and between 0.842% and 1.180% for women. The fact that women are gaining on men is evident in that for all components of annual earnings, the growth rates among the women in this category have outpaced the growth rate for the men. In a following section, we address how we deal with situations in which, for a given age/education category projected women's hours, participation, or wages exceed that for men.

IN-SAMPLE FORECASTS OF EARNINGS

In our discussion of the transition to a prepaid Medicare program, we will rely on forecasts of future earnings over a long period. In order to provide some indication of the accuracy of using past growth rates to forecast future growth, we have split the period for which we have data into two parts: an estimate base part, either 1963–1985 or 1963–1990, and an in-sample forecast part, either 1986–1995 (the most recent 10-year period allowed by our data) or 1991–1995 (the most recent 5-year period allowed by our data). We use the estimate base part of our date to estimate the future growth rates of the three components of annual earnings. Then, using these estimated growth rates, we estimate annual earnings for the 5 and 10 in-sample forecast periods.

The differences between the in-sample annual earnings forecasts and actual annual earnings for all men and women, based on the various growth rates, are presented graphically in Figure 4.2a–d. The average annual earnings for men and women are calculated using total male and female population, respectively, independent of labor force participation; as a result, an increase (decrease) in labor force participation will increase (decrease) mean annual earnings. Therefore, the labor force participation rate is an important factor in the determination

Table 4.1 Alternative Growth Rate Estimates for College Graduates Ages 40–44 (%)

	Men			Women		
Weighting Scheme	Participation	Hours	Hourly wage	Participation	Hours	Hourly wage
Equal	0.034	–0.074	0.768	1.222	0.374	1.180
Time proportional	–0.089	–0.047	0.657	1.212	0.607	0.864
Geometric 1.02 discount factor	–0.003	–0.066	0.753	1.208	0.443	1.087
Geometric 1.05 discount factor	–0.045	–0.059	0.811	1.151	0.517	0.979
Geometric, levels 1.02 discount factor	–0.093	–0.047	0.715	1.169	0.613	0.858
Geometric, levels 1.05 discount factor	–0.099	–0.049	0.841	1.101	0.615	0.842

Figure 4.2a Actual and Predicted Earnings for Men 16–64 (1986–95)

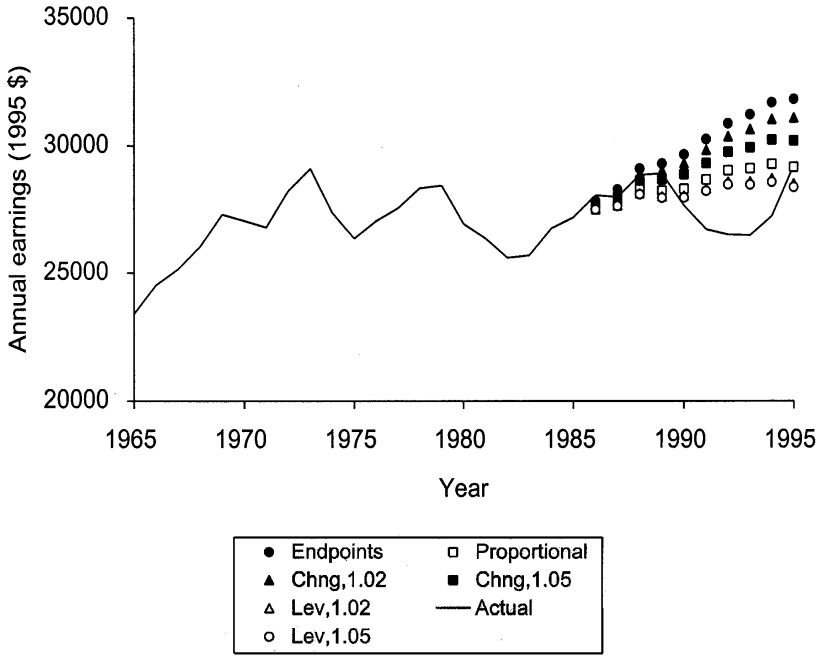


Figure 4.2b Actual and Predicted Earnings for Women 16–64 (1986–95)

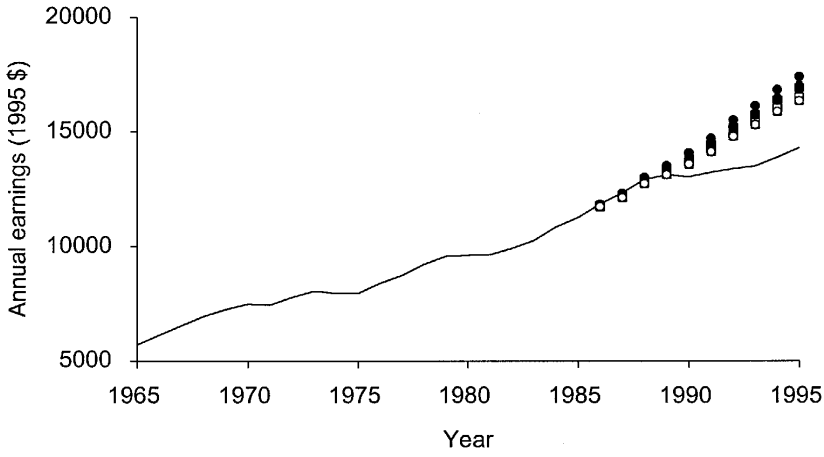


Figure 4.2c Actual and Predicted Earnings for Men 16–64 (1991–95)

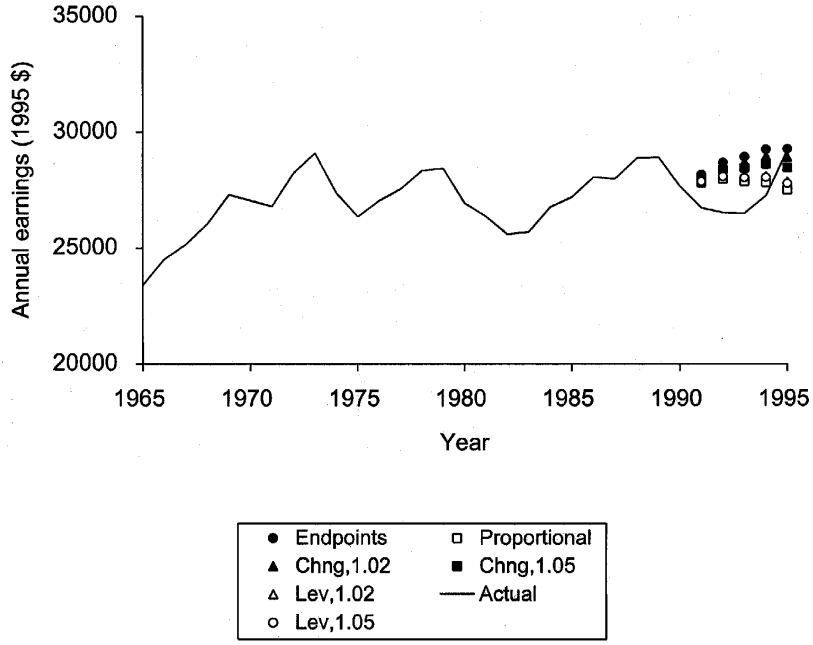
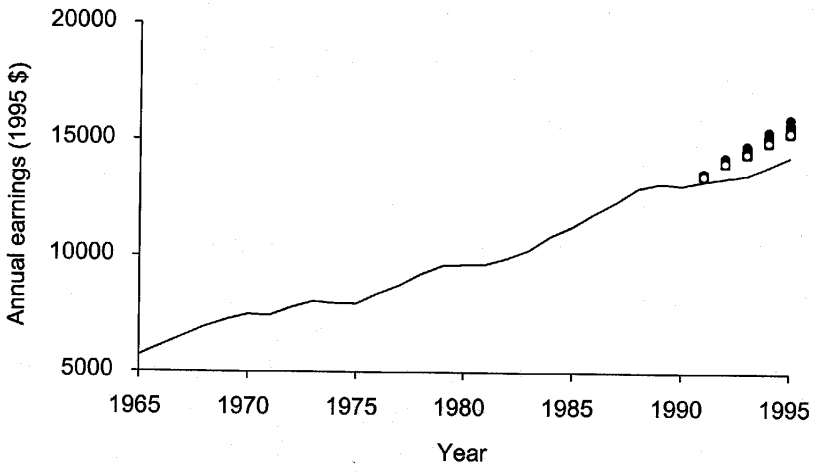


Figure 4.2d Actual and Predicted Earnings for Women 16–64 (1991–95)



of the time path of mean annual earnings. In Figure 4.2, the two sets of in-sample forecasts are overlaid on the path of the actual mean average annual earnings; one set of overlays is for the most recent 10-year period, using the 1963–1985 portion of our CPS data, and the second set of overlays is for the most recent 5-year period, using the 1963–1990 portion of our CPS data.

Each set of forecasts was constructed by first calculating the growth rates for labor force participation, annual hours worked, and real hourly wages based on the relevant portion of our CPS data for each age/education/sex category. The growth rates calculated using these methods were then applied to the 1985 and 1990 labor force participation, annual hours worked, or real hourly wage to produce the forecast levels for each age $\times$ education $\times$ sex category. The forecast levels were then weighted (using the weights discussed above) to form the forecasts of total annual earnings. Finally, total annual earnings were divided by the total male and female working-age population to arrive at the male and female mean annual earnings.

While the data displayed in Figure 4.2 are designed to aid us in the selection of the appropriate weighting scheme for forecasting future annual earnings for both men and women, the results depicted are clearly different for men and women in at least two ways. First, annual earnings for men show much more cyclical variation. Second, after rising during the first five years of our data, real mean annual earnings for men levels off and remains approximately constant over the business cycle for the remainder of the data period. In contrast, real mean annual earnings for women rises steadily during the entire period, showing little cyclical impact and no leveling effect. These striking differences are the result of three facts. One, over the period of our data, the labor force participation rate for women has risen more than 47%, while labor force participation for men has declined 2.2% (a fact that will prove significant in our later forecasts). Two, education levels for women have been rising relative to those for men over the entire data period. Three, women's hourly wages have been rising relative to men's over the entire data period. The secular increases in female labor force participation, hours worked, and real wages have overcome the business-cycle effects, allowing the mean annual earnings for women to rise throughout the period, though a slowdown in mean

women's annual earnings' growth does occur during the recessionary periods.

Examination of the graphs for the male working-age population in Figure 4.2 reveals that the projected annual earnings, which rely on growth rates calculated using geometric weights on annual levels, appear to produce the superior forecasts over the 10-year period. In fact, for the male working-age population, the forecast and actual end of period values are almost identical. For the female working-age population, however, all of the forecast methods fail to catch the slowdown in mean female annual earnings, although the geometric weights on annual levels yield the smallest overestimate of the actual level of female mean annual earnings. The reason for the disparity between the forecast and actual mean female annual earnings is that the forecast base is failing to capture the recent slowdown in mean female annual earnings. This slowdown reversed itself in the last few years of our data, but not enough to overtake the forecast. Based on our analysis of the forecast errors (the details of which are presented in the third section of Appendix B), we have chosen the geometric weights applied to annual levels of labor force participation, annual hours worked, and real hourly wages to forecast annual earnings for our discussion of the transition to prepaid Medicare in Chapter 6.

POPULATION AND EDUCATION PROJECTIONS

In order to estimate the cost of a transition to a prepaid Medicare system, we must understand the future of the current Medicare revenue stream. The future Medicare tax revenues are a combination of the earnings of individuals and the number of individuals. For the earnings part, we apply the forecast growth rates to the 1995 values for labor force participation, annual hours worked, and real wage for each age/sex/education category to predict future levels of individual earnings. To forecast aggregate earnings, however, we must also estimate the final component, the number of individuals in each category. The U.S. Census Bureau publishes population projections for the 1995–2050 period; these projections are based on assumptions concerning fertility and immigration. To account for the uncertainty concerning future fer-

tility and immigration on the projections, the bureau publishes three levels of projections: high, intermediate, and low. For our estimates, we have relied on the Census Bureau's intermediate population projections by age and have combined these projections into the age groups for which we have calculated growth rates in labor force participation, annual hours worked, and real wages. Since we also account for sex and education, we must assign the total future population of males and females in any age group to one of our five education categories.

In the assignment of the total population forecasts to each of our age/education/sex categories, we must deal with several considerations. First, female educational attainment has been rising relative to male educational attainment for the more recent birth cohorts. The assumptions we make concerning the continuation of female educational attainment will affect the female earnings forecasts. Second, education levels within a cohort rise as the cohort ages for two reasons: mortality rates are lower for the more highly educated and individuals continue to pursue education as they age. Individuals alive in 1995 are distributed across all education levels, with this distribution changing over the remaining life of each cohort, especially for the younger cohorts as a result of the increase in continuing education. A final consideration concerns the yet-to-be-born cohorts and their education progression by age and sex.

We can use the extensive data concerning individual characteristics contained in the CPS to deal with many of these issues. Based on the annual CPS data, we have calculated the proportion of each of our age groups that are in our five education cells—i.e., 0–11 years (did not graduate from high school), 12 years (high school graduate), 13–15 years (some college), 16 years (college graduate), and 17 and more years (some postgraduate work)—for each of the years for which we have data (1968 to 1995). Using this data, we have identified the weighted average progression in education achievement by age and sex for the members of the baby boom generation.

Figure 4.3 and Figure 4.4 show, for men and women, respectively, the weighted average distribution of educational attainment by age, expressed as a percentage of all individuals of the specified age and sex (derived from the CPS using the baby boom cohorts). Since, in 1995, the oldest of the baby boom cohorts was 49 years of age, the age range for each figure is from 16 to 44 years of age. Note also that in calculat-

Figure 4.3 Percentage of Men in Each Education Cell

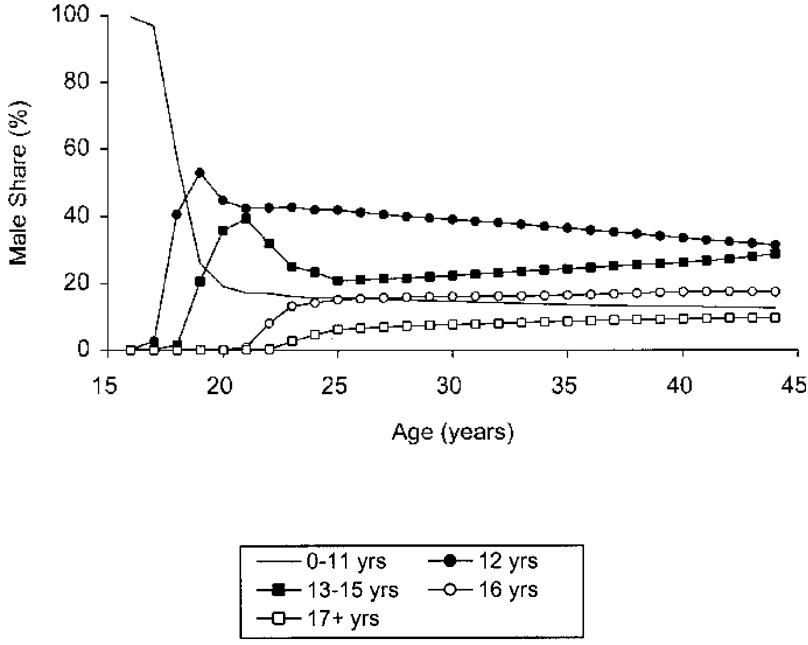
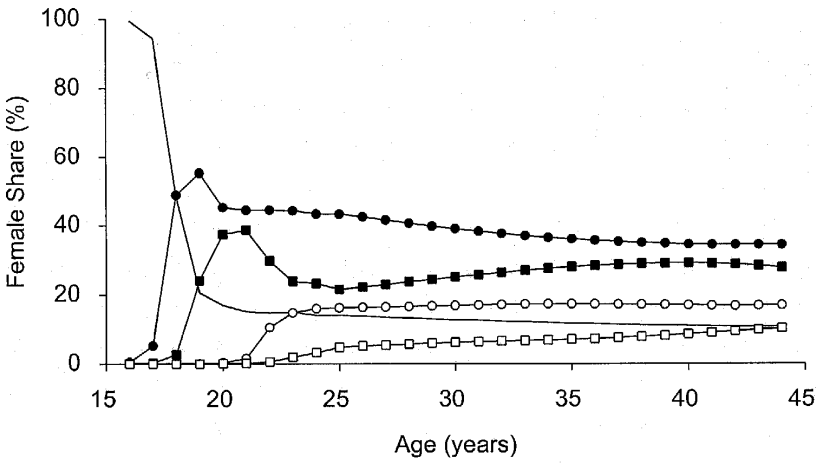


Figure 4.4 Percentage of Women in Each Education Cell



ing the weighted averages, we have excluded the birth cohorts born between 1946 and 1950. These birth cohorts, while part of the baby boom, were the cohorts most affected by the Vietnam War, which would be expected to result in greater-than-normal levels of education for males as they attempted to avoid military service.

The first step in forming the weighted average percentage in each education category is to find the percentage in each category when a specific birth cohort—for example, the cohort of which all members were born in 1950 (hereafter, the 1950 birth cohort)—is a given age, say, 35 years old. Then, we find the percentage in each education category when the 1951 birth cohort was 35 years of age. We continue this process until we have, for each age and birth cohort, the percentage in each education category. Then, the observed percentage in each education category for a given age is weighted using the proportional weight structure described above, where the observation for a birth cohort receives a weight proportional to birth year minus 1950. In this manner, the more recent birth cohorts are given a greater weight. In fact, the weight for the youngest birth cohort is 20 times that for the oldest birth cohort. Because the sample size falls as the age being considered rises, the variation between adjacent ages rises. To account for this problem, we have applied a smoothing technique to the percentages in each education category for all ages greater than 25.[6]

Each line in Figures 4.3 and 4.4 represents the percentage of the population that attained a given education level for every age from 16 to 44. As expected, at 16 years of age, the entire sample (for both men and women) had less than a high school education, indicated by the value of 100% at age 16 for the "less-than-12-years education" line and the value of 0% for all other levels of educational attainment. The proportion of both the male and female populations with less than a high school education falls throughout the aging process, but most rapidly as the population ages from 16 to 19 years of age. The "some college" line rises rapidly for both men and women beginning at age 17; peaks at age 21; falls as those attending college graduate; and finally begins to rise and continues to rise for the entire range of ages as the population engages in continuing education. The "college graduate" and "some postgraduate work" lines for both men and women rise rapidly at first and then continue to rise slowly for the remainder of the ages considered. Not only is the basic structure of the educational

attainment over the life cycle similar for males and females, but the male and female age/education distributions themselves are quite similar. In fact, at age 32, the percentages of men and women having education levels above high school are essentially the same (44.8% and 46.1%, respectively). The percentages of men and women at age 32 with at least a college education are 24.3% and 23.6%, respectively.

The weighted average age/education progression reflected in the graphs above will be used as the basis for forecasting future earnings for all individuals born in 1951 and later. Since our age/education progressions do not extend past age 44, the education distribution at age 44 will be used for all ages 45 and above. For the 1950 and earlier birth cohorts, the education distributions as they existed in 1995 will be used as the basis for forecasting the education component of the earnings forecast for their remaining years in the labor force. The details of the earnings forecast are presented in the next section.

EARNINGS FORECASTS FOR 1996–2050

Using our estimates of life-cycle education, labor force participation, hours worked, and real wages, we can forecast individual earnings by sex over an individual's entire work life cycle. Then, using our population forecasts, we can forecast the total of taxable earnings. However, before any forecasts are made, there is an additional problem that must be solved: the decomposed structure we have adopted produces situations in which the women's earnings component in a given age/education category exceeds that of men. While there is nothing in theory that suggests that such an outcome is not reasonable, the issues involved merit some discussion.

The literature on male/female wage differentials attempts to explain the greater male earnings on the basis of education and job tenure, the null hypothesis being that when these two factors become the same, the male/female wage differential will vanish. If no male/female wage differential is the long-run expected outcome, given education, then forecasts based on components that result in a negative male/female wage differential will be inconsistent with the expected long run and should be discarded. To account for this potential problem

with our long-run forecasts, we have adopted two alternative decision rules for handling those cases in which our estimating technique results in wages for females exceeding wages for males, all other factors staying the same.[7]

Our first decision rule caps female real wages (or hours worked, or labor force participation) at the level forecast for men when the female earnings (hours worked, labor force participation rate) component would have surpassed that for males, if in a given age/education category male wages (hours worked, labor force participation rate) are growing. The decision rule depends on whether or not the forecast of male earnings (hours worked, labor force participation rate) is rising or falling over time. The following example, based on real wages, illustrates the way Decision Rule 1 works. In the example, either of the other two components (labor force participation or annual hours worked) can be substituted for real wages.

> **Decision Rule 1, Example**. Using geometric weighted levels to forecast real wages, by the year 2041 the real wages of women college graduates ages 45 to 49 are forecast to exceed the wages of male college graduates aged 45 to 49. Because male wages are growing in this category, we cap female wages at the forecast male wage level for all years 2041 and beyond. For an education level for which male wages are forecast to be declining, we cap female wages at the wage achieved at the time when female wages are forecast to exceed male wages and then set male wages equal to female wages from that time forward. This decision rule also establishes a lower bound for men's earnings components and an upper bound for women's in cases in which men's are falling and women's are projected to surpass men's. An example of this case is the wages for high school graduates ages 45 to 49. Male wages in this education category are projected to fall at an annual rate of 0.77% while women's are projected to rise modestly at a rate of 0.14%, so that by the year 2035, female forecast wages would exceed the wages of males. With this decision rule, wages of female high school graduates are capped at the forecast 2035 wage, and wages for male high school graduates are not allowed to fall below the female cap.

Decision Rule 2 establishes the projected values for males in labor force participation rate, hours worked, and real wages as the dominant trend and fixes the female maximum level for any category as a fixed

percentage of the value for males. With this rule, if projected real wages, hours worked, or labor force participation for females reach a given percentage of that for males, then the female values are set equal to a percentage of the comparable male forecast value. This decision rule caps each of the components of female earnings in each age/education category at 95% of the male earnings component in the same age/education category, while no lower limit is placed on any projected earnings component in an age/education category.[8] By the construction of these two decision rules, if Decision Rule 1 applies to any category, Decision Rule 2 must also apply. Because Decision Rule 2 results in a lower level of the comparable female component than Decision Rule 1, any projections made under the second decision rule will, by construction, be less than or equal to those made under the first decision rule; they will be equal when neither decision rule comes into play; and strictly less when a decision rule applies. The following example based on real wages will clarify the working of Decision Rule 2. As in the case of Decision Rule 1, either of the other two components can be substituted for real wages.

> **Decision Rule 2, Example Based on Real Wages**. Using geometric weighted levels to forecast real wages, by the year 2035 the real wages of women college graduates ages 45 to 49 are forecast to exceed 95% of the wages of male college graduates aged 45 to 49. Thus, this decision rule caps female wages at 95% of the forecast male wage level for all years 2035 and beyond.

The 1995 age profiles for labor force participation, hours worked, and real hourly wages in each of the five education cells form the starting points to which the estimated growth rates for each component can be applied. However, due to the size of the CPS sample, the relation between age and any one of the components as observed in 1995 cannot be expected to be represented by a smooth curve, even if such a smooth curve represented the population as a whole. We used a smoothing technique based on regression analysis to make the curves smooth around each age while still allowing for considerable variation in the relation between age and any component over the entire range of ages considered.[9] In Table 4.2, we summarize the aggregate projected growth rates for annual earnings, labor force participation, hours worked, and real wages over the 1996–2030 period for men and

Table 4.2 Annual Change in Earnings Components, 1996 to 2030[a] (%)

Sex/growth rate		Annual earnings	Participation	Hours	Wage
Male					
Proportional,	D.R. 1	–0.070	–0.097	0.005	0.346
	D.R. 2	–0.222	–0.207	–0.008	0.327
Geometric,	D.R. 1	–0.009	–0.103	0.047	0.418
	D.R. 2	–0.171	–0.215	0.037	0.391
Female					
Proportional,	D.R. 1	1.226	0.230	0.495	0.563
	D.R. 2	0.749	–0.018	0.354	0.488
Geometric,	D.R. 1	1.227	0.230	0.495	0.547
	D.R. 2	0.740	–0.025	0.386	0.455

[a] Education distribution fixed at the 1996 levels.

women, holding the age and education distributions of each earnings component constant at 1996 levels. The table contains results for the four possible combinations of the two growth rates considered and the two decision rules. The two growth rates considered are those calculated using proportional weights applied to the growth rate of each of the earnings components and geometric weights (with a discount factor of 1.05) applied to the levels of each of the three earnings components.

As seen in the table, the difference between the projections based on the alternative growth rates is small, holding the decision rule constant, especially for women. When Decision Rule 1 is in effect, men's annual earnings are projected to fall at an annual rate of 0.070% when proportional weighting is used and to fall 0.009% (essentially no change) when geometric weighting is used. When Decision Rule 2 is used, the projected rates are –0.222% and –0.171% for proportional and geometric weighting, respectively. For women, the differences on projected annual earnings growth, holding the decision rule constant, are even smaller.

The two decision rules produce noticeably different results. The Decision Rule 2 values reveal what will happen if the historical trends for men continue without the minimums imposed in Decision Rule 1. Using Decision Rule 2, annual earnings for males will fall by 0.22%

per year, while using Decision Rule 1 annual earnings will fall by only 0.07% per year, one-third as fast. Surprisingly, we forecast a decline in male annual earnings using either decision rule. The forecast decline in male annual earnings is due to the current downward trend in male labor force participation that is continued using either of our forecast growth rates. Since Decision Rule 2 imposes the declines in male labor force participation on the female labor market forecasts, the annual earnings growth rate for females drops from approximately 1.2% under Decision Rule 1 to approximately 0.7% under Decision Rule 2, no matter which growth rate estimate is used.

Because the baby boomers are highly educated and are currently in their peak earnings years, fixing the age and education distribution of each earnings component at 1996 levels has the effect of heavily weighting high-skilled age and education categories. Even with a projection that heavily weights some of the higher skilled categories, we project that hourly wages will only grow between 0.327% and 0.418% for men and between 0.455% and 0.563% for women (Table 4.2). These rates are less than one-half of the 0.9% growth rate assumed by Medicare's trustees for their intermediate estimates in 1998 (Board of Trustees 1998a,b). The trustees' low and high cost estimates are based on a 1.4% and a 0.4% real wage growth, respectively. Thus, any earning projections we make using the decomposition presented here will be below those produced by the Social Security actuaries.

To account for any bias resulting from fixing the age and education distribution, we apply the education progression results we derived above to the Census Bureau's intermediate population estimates. We show these alternative estimates of future growth rates in Table 4.3. When the forecast age and education distributions are used, the growth rates decline across the board. The 2030 distribution is weighted by smaller proportions in the highly skilled categories. With the projected age and education distribution, all of the estimates of participation and hours growth are negative for men. As in Table 4.2, the use of Decision Rule 2 rather than Decision Rule 1 affects annual earnings for men and women, primarily through the participation effect.

Relative to the Medicare and Social Security trustees' wage growth assumption, our projections of wage growth rates are quite conservative. Additionally, the decision rules they employ to handle the convergence of men's and women's series will produce different projections

Table 4.3 Annual Change in Earnings Components, 1996 to 2030[a] (%)

Sex/growth rate		Annual earnings	Participation	Hours	Wage
Male					
Proportional,	D.R. 1	–0.082	–0.165	–0.056	0.272
	D.R. 2	–0.252	–0.291	–0.070	0.254
Geometric,	D.R. 1	–0.023	–0.168	–0.012	0.334
	D.R. 2	–0.206	–0.300	–0.024	0.308
Female					
Proportional,	D.R. 1	1.210	0.228	0.445	0.599
	D.R. 2	0.732	–0.036	0.331	0.531
Geometric,	D.R. 1	1.222	0.225	0.471	0.588
	D.R. 2	0.729	–0.044	0.363	0.503

[a] Uses forecast population and education distributions.

than the projections based on the two decision rules described above. To illustrate these differences, we show in Figure 4.5 three sets of labor force participation forecasts for men and women ages 45 to 49. The first set is drawn from the Office of the Actuary's 1992 economic projections (Social Security Administration 1992, Table 4, pp. 65–70). The other two sets are based on our forecasts using Decision Rule 1 and Decision Rule 2 with growth rates calculated with geometric weights. The two vertical lines represent the starting year (1991) for the Social Security Administration (SSA) forecasts and the starting year for our forecast (1996). The SSA's forecasts indicate that the historical trends are allowed to continue for the first few years and are then held essentially constant over the remaining periods. In contrast, with Decision Rule 1, the projected participation rates for men and women continue to converge out to 2050. Relative to the SSA's projections, Decision Rule 1 produces a more pessimistic projection of male labor force participation but a more optimistic projection of female labor force participation. As expected, the use of our Decision Rule 2 produces the most conservative projections because of its forcing the decline in male labor force participation on the female labor force.

Figure 4.5 Out-of-Sample Estimates of Labor Force Participation, Ages 45–49

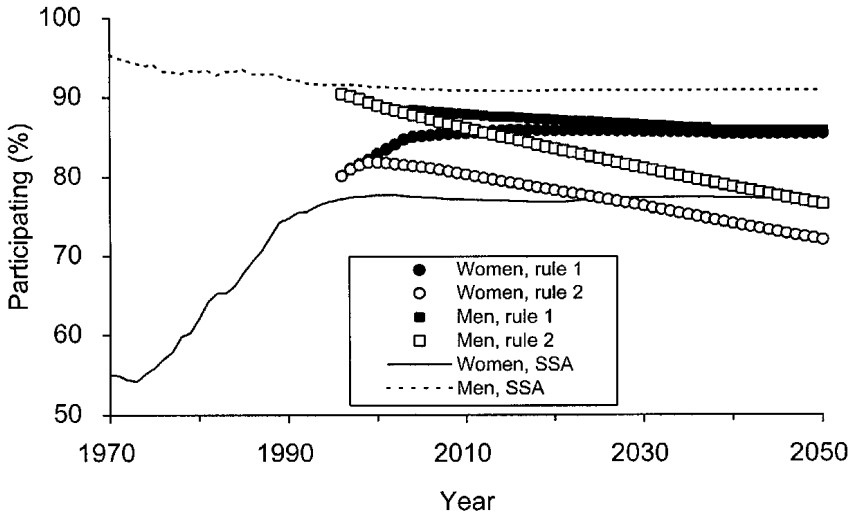
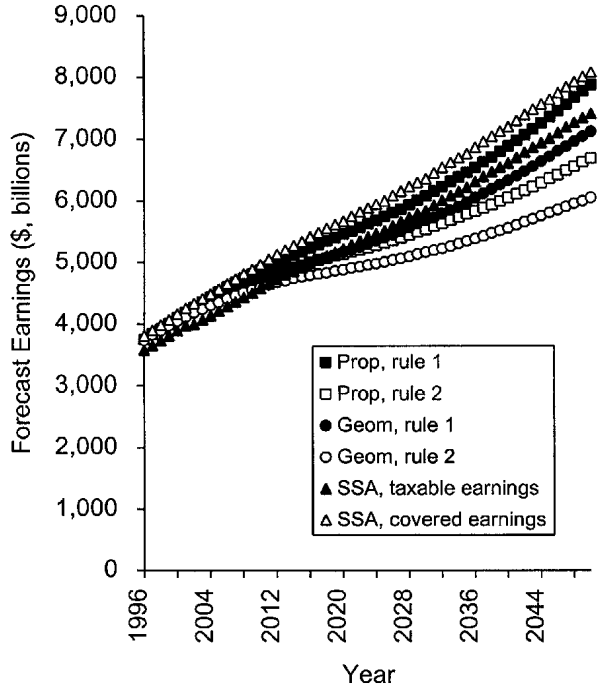


Figure 4.6 presents our four forecast total earnings series when all of the earnings components are aggregated across the age, sex, and education cells. It also presents the SSA's projection of taxable income under the hospital insurance tax and covered income.[10] The tax rate times the taxable income produces the projected revenues to the system. Our two projections using Decision Rule 1 most closely follow the SSA's taxable earnings series.

The two series based on Decision Rule 2 produce substantially lower estimates in the years beyond 2020. Beyond 2020, the women's earnings components, within the age/education cells, begin to approach and overtake men's; thus, imposing the second decision rule will dampen or reverse the gains made in some cells. Of the two series that rely on Decision Rule 1, the one using geometric weighting provides a reasonable alternative to the SSA projection. This growth rate also produces the best in-sample forecast over the 10-year period. In the remainder of this chapter, the forecasts based on Decision Rule 1 and on geometric weights use a calculated discount factor of 1.05.

Figure 4.6 Comparison of Total Earnings Forecasts (1996 $)



Projected cross-sectional age/earnings profiles for the years 1996, 2000, 2010, and 2020 are depicted in Figure 4.7. The profiles reflecting the average earnings by age are for all individuals, including nonworkers and part-time workers. The discontinuities apparent in the projected profiles result from our use of separate growth rates by age and education cells. Again we utilize locally weighted regressions (in which each point is predicted using 30% of the adjacent data) to produce a smoothed series. The smoothed series are represented by the connected line in the profiles for men and women. As the successive cross sections indicate, the female profile continues to approach the men's. This trend is an extension of the historical convergence. Due to the more rapid growth experienced at younger ages for men and

women, the cross-sectional profiles are projected to exhibit a steeper slope in the future for individuals up to 44 years of age.

In Figure 4.8 we present, for four birth cohorts, examples of projected annual age/earning profiles based on our forecasts of annual earnings. The first graph is a projection of the expected average earnings for the 1945 birth cohort; the next three graphs show the lifetime earnings for individuals born at 10-year intervals (1955, 1965, and 1975). The progression of these profiles illustrates the continuing convergence of female average annual earnings to male average annual earnings. This convergence is especially apparent for the younger ages in the life cycle.

THE FINAL GROWTH RATE AND DECISION RULE CHOICE

The forecast cohort age/earnings profiles of the type presented in Figure 4.8 form the primary element in the denominator of the contribution rate required to finance a prepaid Medicare system. For each cohort, we have an estimate of the path that average earnings for men and women will follow over their remaining lives. In Appendix B, we present a table detailing the smoothed annual earnings series for two future cross sections and for two birth cohorts.[11] Those projections are based on geometrically weighted growth rates calculated for each earnings component within age × education cells. After evaluating several candidates which weighted recent experience more heavily than the changes occurring early in each series, we chose to use geometric weights applied to the levels of each of the three components of annual earnings, on the basis of the accuracy of its in-sample forecasts relative to the others considered. When the chosen growth rate and Decision Rule 1 are used in tandem, they produce a forecast aggregate earnings series quite similar to the one forecast by the Social Security Administration.

Figure 4.7a 1996 Cross Section

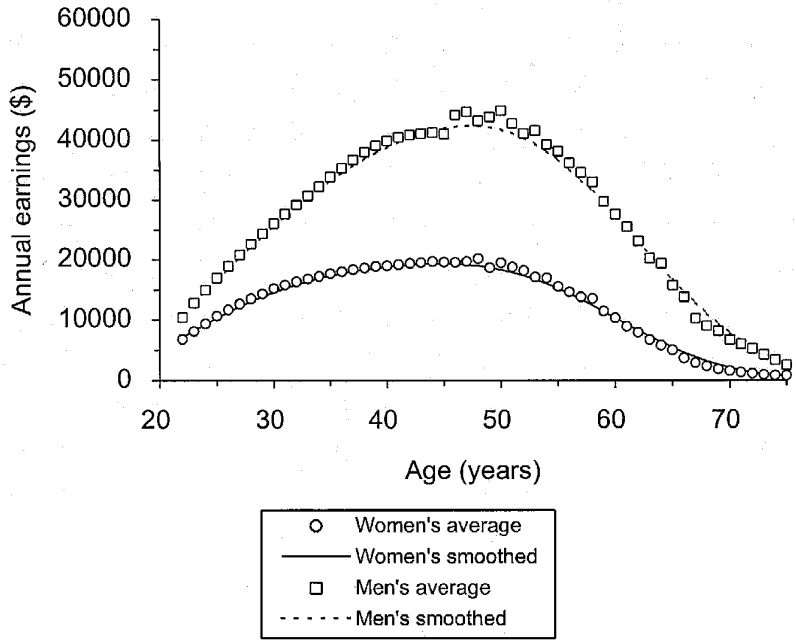


Figure 4.7b 2000 Cross Section

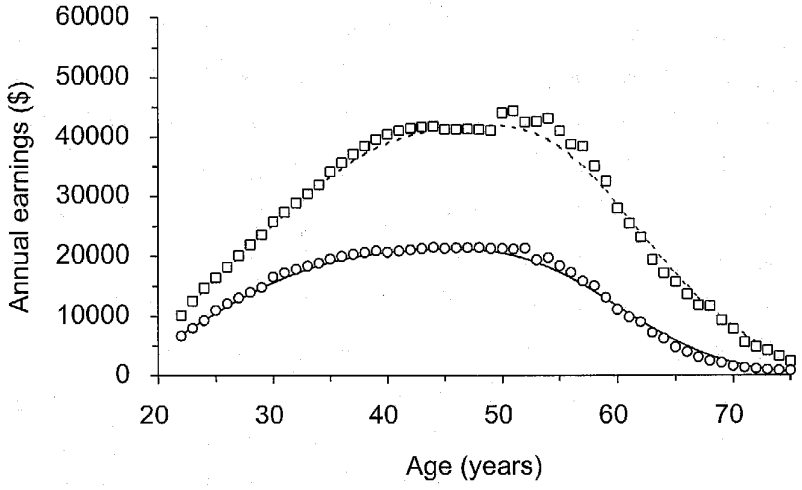


Figure 4.7c 2010 Cross Section

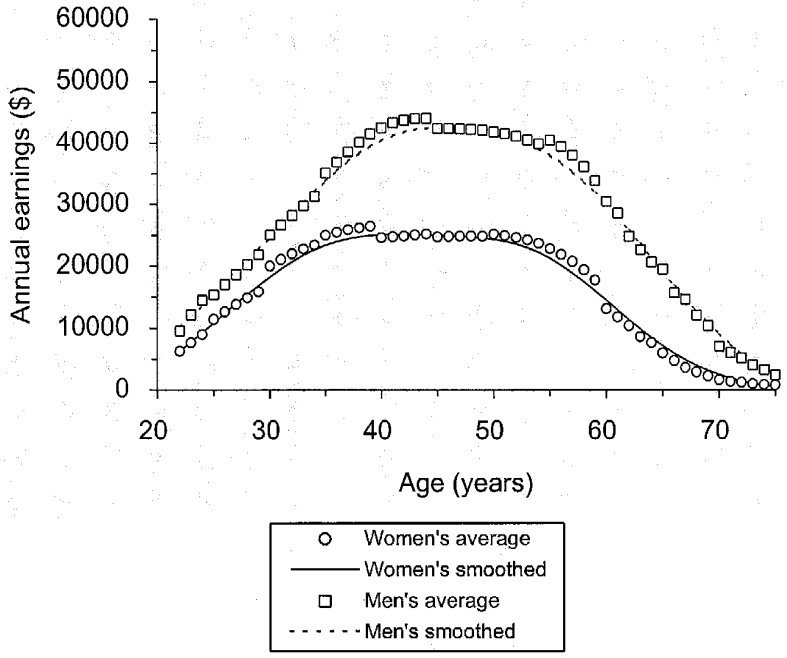


Figure 4.7d 2020 Cross Section

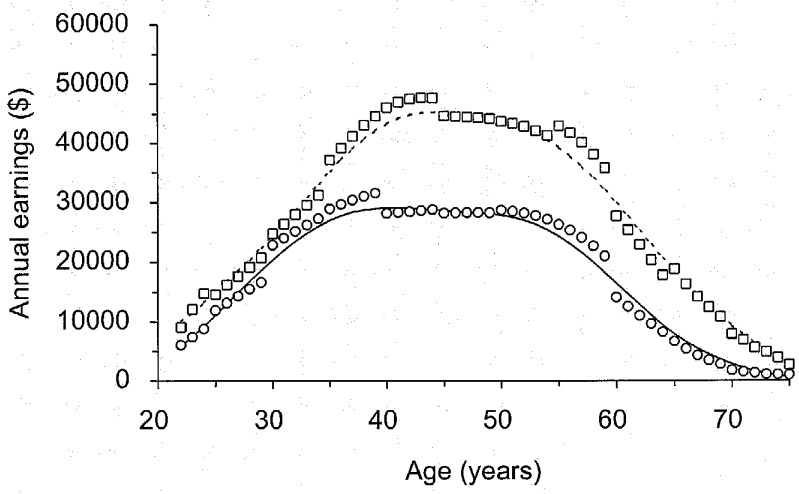


Figure 4.8a 1945 Birth Cohort

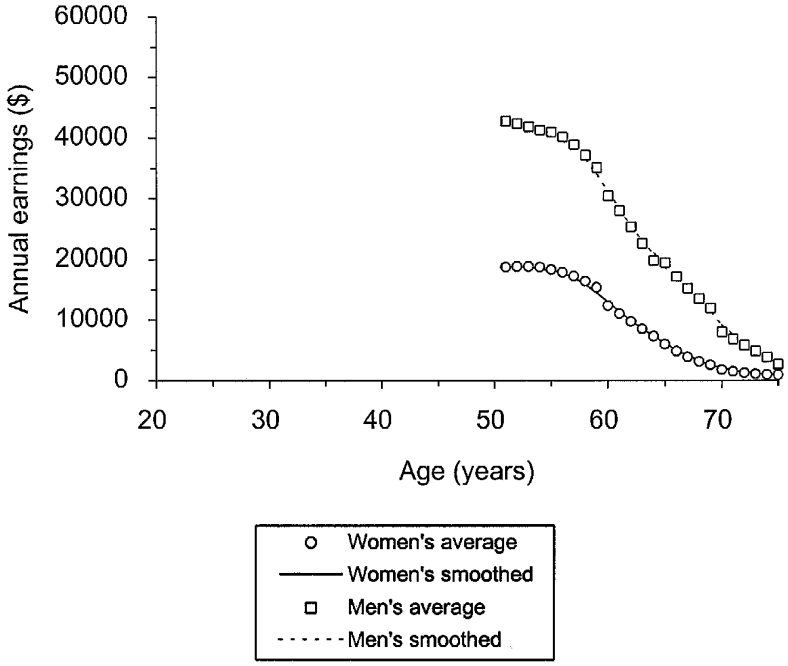


Figure 4.8b 1955 Birth Cohort

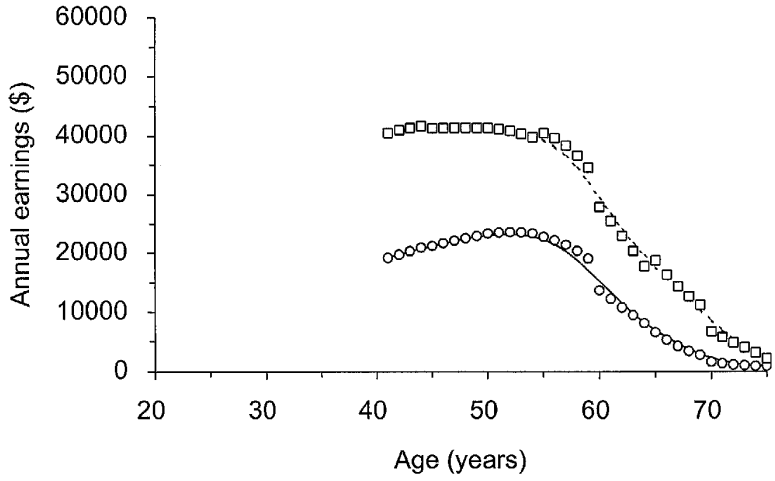


Figure 4.8c 1965 Birth Cohort

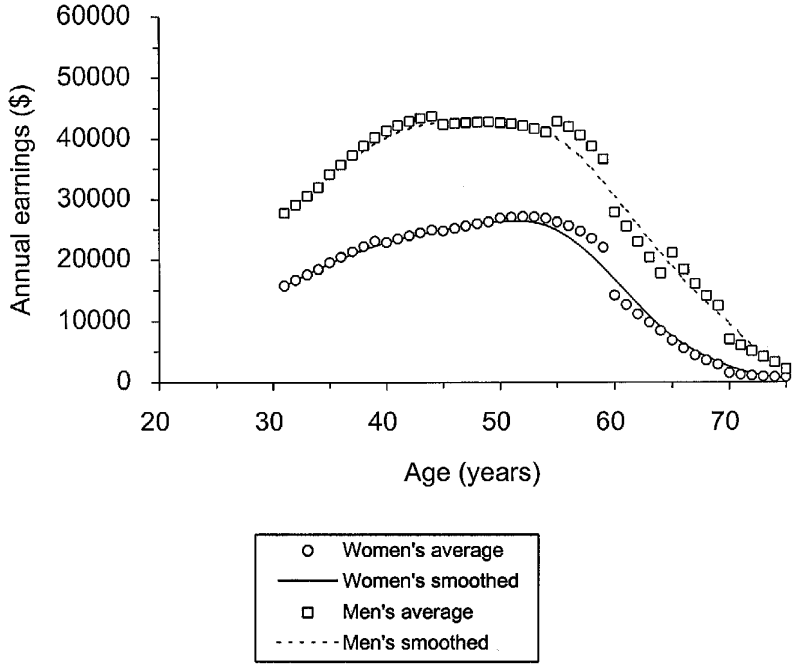
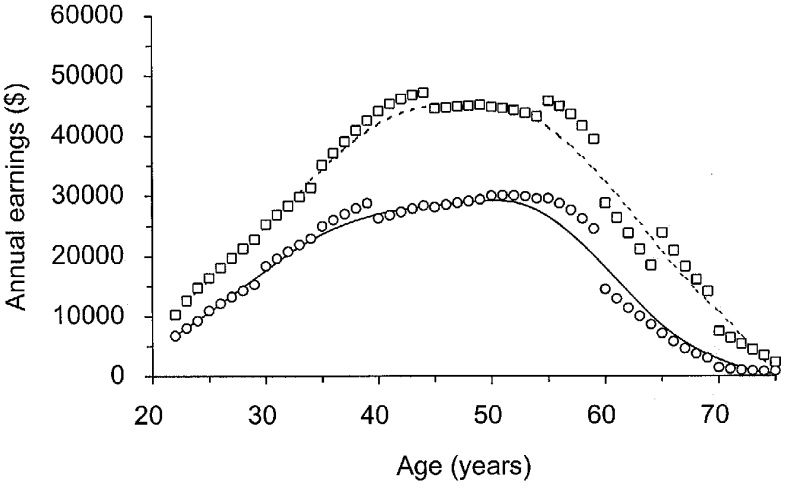


Figure 4.8d 1975 Birth Cohort



CONCLUSION

In order to forecast the contribution rate that will be required to prefund the retirement health care expenditures of the population, we must estimate the life-cycle earnings of both the male and female populations. Importantly, since Medicare benefits do not depend on work life history, we must account for everyone, whether or not they spent any time in the labor force. Thus, we have created a method for forecasting the average annual earnings over the entire population of males and females for each birth cohort. During any transition from the existing pay-as-you-go Medicare system to a prepaid system, the birth cohorts alive at the time of the transition must take part in the transition. In order to estimate what contribution rate will allow an individual already in the work force to convert to prepaid Medicare, we must have estimates of that birth cohort's future earnings.

We also provided the basis for forecasting the longitudinal age/earnings profiles for any birth cohort. We based these forecasts on data from the Current Population Survey, which contains extensive information on labor force participation, hours worked, and real wages. The average annual earnings for males or females in a particular birth cohort is composed of the product of average hours worked, average wages, and labor force participation divided by the total size of the cohort. Using the information contained in the CPS for the period from 1964 to 1995, we calculated growth rates for each of the three components of average annual earnings. It is important to separately estimate each of the components of average annual income, because labor force participation and hours worked are the result of decisions made by individuals. In the process of constructing our growth rate estimates, the upward trend in female average annual earnings becomes very apparent. This upward trend occurs in all three components of annual earnings. For women, over the period of our data, labor force participation has increased more than 47%. This increase in labor market participation, coupled with increased annual hours worked and hourly wages, accounts for the convergence of male and female annual earnings so obvious in the data.

The application of the estimated growth rates to the three components of annual earnings allows us to forecast annual earnings for the

entire period of the transition from the current system of pay-as-you-go Medicare to prepaid Medicare. Before finalizing our estimates, we had to recognize the fact that labor market differences between males and females are rapidly disappearing. Any forecast that failed to account for the convergence of male and female labor market behavior and outcomes would be far from the mark in the later years of the forecast. We experimented with two decision rules to account for the rapid convergence of female labor market outcomes to the outcomes of males. In the final analysis, we chose to assume that once the differences in education and continuous job tenure equalized, the earnings components of males and females would be equal. Thus, we capped each component of annual earnings at the level for males. This does not imply that female average annual earnings are not allowed to exceed those of males—they would if females were more educated, for example—but only that, other things being equal, equal behavior is predicted.

The contribution rate required to prepay Medicare is determined by the ratio of the present value of expected benefits to the present value of annual earnings. In this chapter, we constructed the methodology for forecasting the annual earnings part of the contribution rate equation. What remains is forecasting future retirement health care expenditures; this final forecast is the subject of the next chapter.

Notes

1. Only the Hospitalization Insurance (HI) portion of Medicare has a dedicated payroll tax. In 1994, the maximum earnings subject to taxation was raised from $135,000 to its current unlimited level.
2. The mathematical details of this computation are presented in the first section of Appendix B.
3. Annual earnings were defined as the sum of wage and salary income and self-employment income. Earnings above a given threshold in each survey year are "top-coded" to prevent identification of individuals using other characteristics such as age, sex, and location variables. Top-coded wages and salaries were inflated by a factor of 1.5 and top-coded self-employment income by a factor of 2 to estimate average earnings above the top-coded value. Individuals younger than 16 and older than 75 were excluded.
4. Weighted averages of each annual earnings component for each age × sex × education cell were calculated using the person weight in the March data.

5. The exact form of these weighting schemes is presented in the second section of Appendix B. For a more detailed discussion, see Murphy and Welch (1992), pp. 65–69.
6. For ages 25 to 49, the empirical proportions in education cells 0–11 years, 13–15 years, 16 years, and 17 and above years are smoothed using locally weighted regression. In the regressions, the high school graduate category is treated as an omitted category and is set equal to $[1-(p_{0-11}+p_{13-15}+p_{16}+p_{17+}\}]$, where p_n is the proportion in age category n. See StataCorp. (1999), Reference H-O, pp. 152–156, for the details of this smoothing technique.
7. The details of these decision rules are presented in the fourth section of Appendix B.
8. Several caveats are worth mentioning. Projected real hourly wages are not allowed to drop below 80% of the 1995 minimum wage, projected participation must be greater than or equal to zero and less than or equal to 1, and the minimum and maximum projected annual hours are zero and 3,120, respectively, for any age $\times$ education cell.
9. Each of the 15 age $\times$ earnings component profiles was smoothed using locally weighted regressions based on 30% of the surrounding data points.
10. The series in the graph reflect the SSA's intermediate projections (Social Security Administration 1992, Table A15, pp. 110–111) which are re-based to 1996 dollars using the GDP deflator presented in Table A10, p. 98 of that volume.
11. Because the cross-sectional series presented in Table 4.5 are smoothed within cross sections and the birth cohort series are smoothed within the birth cohorts, the corresponding values do not match exactly. For example, individuals born in 1965 will be 45 years old in 2010. In the cross section, 45-year-old men are projected to earn $43,090, but in the cohort profile they have a projected value of $43,032. In the contribution rate calculations and total tax base calculations, we use the actual forecast values rather than the smoothed.

5
Estimating the Future Cost of Retirement Health Care Benefits

Up to this point, our analysis has concentrated on aspects of intergenerational finance that are relevant for both Social Security and Medicare. However, Medicare differs in one critical way from Social Security: it is an open-ended in-kind transfer. Medicare is open-ended because the benefits are specified by what is subsidized, not by the quantity of the subsidized item consumed. As a result, benefits paid vary as preferences for health care change and as the technology of delivery changes. This open-ended characteristic of Medicare means that forecasting future benefits involves more than predicting the future cost of various medical procedures; it extends to forecasting medical technology and changing preferences for health care. This open-endedness also makes cost containment more difficult because, to contain costs, one must control technological advancements that increase the class of things that are health-related on the one hand and consumer preferences for health care on the other.

The current Medicare system is beset with two problems: first, the issue of financing the coming retirement health care expenditures of the baby boom generation, and second, the rapidly rising benefits per Medicare recipient. Since the retirement of the first of the baby boomers is some 15 years away, most recent initiatives to reform Medicare have concentrated on ways to reduce per capita expenditure growth among current beneficiaries. Historically, the Health Care Financing Administration (HCFA) has attempted to slow per-capita spending by controlling reimbursement rates. More recently, however, the emphasis has been on moving Medicare away from its original fee-for-service basis to a greater reliance on managed care. As has been occurring in the private sector, managed care enrollment of Medicare beneficiaries has expanded in recent years. From 1992 to 1996, the percentage of Medicare beneficiaries enrolled in managed care plans grew from 6.4% to 12.7%. Additionally, with the Balanced Budget Act of 1997, beneficiaries are able to choose among an expanded set of

insurance instruments including, in a limited way, Medical Savings Accounts (MSAs).

In this chapter, we develop estimates of the cost of an alternative to current Medicare that is designed to make users of the system more aware of its cost and, as a result, make health care providers compete on a price basis for Medicare dollars. Moving to a retirement health care system that makes users and providers care about cost has advantages beyond the possibility that total health care expenditures may be reduced. The current Medicare system, and much of the nonretirement health care, is based on users never facing the full cost of their decisions. As a result, they make marginal decisions using prices that are significantly below the social cost of production. In effect, we have (through the tax treatment of health insurance and through legislation and regulation) insured a "tragedy-of-the-commons" outcome, in which consumers treat health care as a common property resource and overconsume medical care. Unlike the usual tragedy-of-the-commons outcome, where resources are depleted, in this case we reallocate resources from other parts of the economy into the health care sector.

DEMOGRAPHIC FACTORS IN THE COST OF RETIREMENT HEALTH CARE

Because of the dynamically changing age distribution of the retired population, estimating the current value of the future retirement health care costs under both current Medicare and alternative retirement health care plans requires an estimate of benefits by age for the retirement population. A natural candidate for a starting point in estimating retirement life-cycle health care expenditures is the average reimbursement by age for the current Medicare population. Since this data forms the basis of much of the subsequent forecasts in this chapter, we present a detailed discussion of the data-set properties.

The Medicare Current Beneficiary Survey

There are several sources for Medicare's reimbursements by age. First, in setting its reimbursement rates for Health Maintenance Orga-

nizations (HMOs), HCFA annually publishes the United States per-capita costs (USPCC), along with demographic cost factors that allow HMOs to determine the average reimbursement they will receive per client of a given age and sex. Second, HCFA produces summarized reimbursement data in the form of an Annual Person Summary (APS) file, which contains reimbursements by age and information on average reimbursements by level of reimbursement. In previous work, we used the summarized APS data to impute the expenditure distribution by age, and from these age-expenditure distributions estimated the premiums necessary to purchase no-first-dollar-coverage insurance (Rettenmaier and Saving 1997, Appendix). However, obtaining an accurate representation of the effects of changing the deductible requires knowing actual expenditures at the individual level. Individual level data is available from HCFA in their Cost and Use file, which we rely on in this section to describe the age progression in average expenditures.

The Cost and Use file is based on Medicare Current Beneficiary Survey (MCBS) data supplemented with claims information from HCFA's administrative files. The MCBS survey provides, at the individual level, a thorough accounting of health status, demographic characteristics, health insurance coverage, and health care use and expenditures on both covered and noncovered services, the primary noncovered health-related service being long-term care. An individual participant in the MCBS can be surveyed for up to four years, providing a longitudinal profile of expenditures.[1] HCFA supplements the reported benefits received in the MCBS with actual claims information from its administrative files, thereby improving the accuracy of the reported benefits in the survey data and overcoming the problem of systematic underreporting of benefits by those surveyed.

The Age Distribution of Medicare Expenditures

Because of data availability, we limit our analysis of the age distribution of Medicare expenditures to the 1995 Cost and Use file. The 1995 Cost and Use file includes information on a total of 12,096 individuals, of which 9,999 are 65 years of age or above (recall that Medicare also covers individuals who are younger than 65 years of age but qualify for reasons such as disability or end-care renal disease). The sample was designed to represent the entire Medicare population, and

when person weights are applied, the 9,999 represent the 34 million aged beneficiaries.[2] With these data it is possible to identify total expenditures separately by type of event and by sources of payments. For example, there are nine event or service categories: dental, long-term care facility, home health, hospice, inpatient hospital, institutional, medical provider, outpatient, and prescribed medicine. The source of payments include Medicare, Medicaid, Medicare and private HMOs, Veterans Administration, private employer-based insurance, private individual insurance, out-of-pocket, and other source. Table 5.1 summarizes the distribution of total expenditures across type of service and source of payment.

As indicated in Table 5.1, inpatient hospital expenditures and medical provider services account for the majority of the elderly's medical related expenditures. Note that almost 29% of the total expenditures are in categories (dental, prescription drugs, and long-term care) which are not covered by the current Medicare package. Table 5.1 also identifies the amount and the percentage of total expenditures in six payment source categories. Medicare pays for 52.7% of the elderly's medical-related expenditures when dental, prescription drugs, and long-term care are included in the total. Medicare beneficiaries pay for almost 20% of the total out of their own pockets. Dental, prescription drugs, and long-term care are excluded from the expenditure distributions we analyze below because they are not covered by the Medicare package. Excluding them reduces the average 1995 total expenditures 29% from $8,151 to $5,789.

We estimate the average expenditure in 1998 by inflating the 1995 expenditure distribution by the growth rate in average per-capita benefits and annualizing expenditures for individuals who were in the sample for fewer than 12 months, which results in average expenditures of $7,086 in 1998 dollars. The median expenditure in 1998 dollars is only $1,437 while the mean is $7,086, indicating that, as expected, the distribution is skewed toward high expenditures. Figure 5.1 presents the cumulative proportion of the Medicare population's total expenditures accounted for by individual annual reimbursements of increasing levels. Only 6.8% of the total expenditures are incurred by beneficiaries who spend less than $2,500, 22.5% are incurred by beneficiaries spending less than $10,000, and 87% of total expenditures are incurred by beneficiaries who spend less than $90,000. Thus, a full 13% of the

Table 5.1 Total Expenditures of the Medicare Beneficiaries 65 and above

Distribution by expenditure category	Average annual amount per beneficiary (1995 $)	% of Total
Expenditures		
Inpatient hospital	2,449	30.05
Outpatient	650	7.98
Medical provider	1,911	23.44
Dental	183	2.24
Prescription drugs	539	6.61
Hospice	40	0.49
Home health	457	5.61
Long-term care	1,641	20.13
Institutional	281	3.45
Total expenditures	8,151	100.00
Payment source		
Medicare	4,296	52.70
Medicaid	925	11.35
Private insurance[a]	714	8.76
HMOs[b]	285	3.49
Out-of-pocket	1,618	19.85
Other source[c]	313	3.84
Total expenditures	8,151	100.00

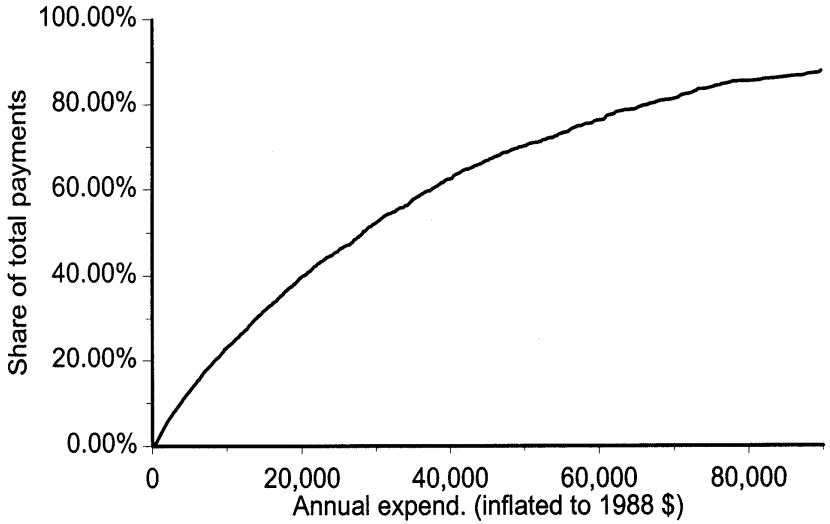
SOURCE: 1995 Cost and Use File.

[a] The private employer-based insurance, private individual insurance, and private other insurance variables were summed to form the "Private insurance" category.

[b] Private and Medicare HMO payments are included in the "HMOs" category.

[c] The "Other source" category includes the other, Veteran's Administration, and uncollected liability variables.

Figure 5.1 Cumulative Density in Payments, Medicare Beneficiaries 65 and Above



total expenditures are incurred on individuals whose reimbursements exceeded $90,000. Figure 5.2 presents the cumulative proportion of all beneficiaries who received benefits based on increasing annual individual expenditure levels. The figure reveals that 61.4% of the beneficiaries have annual expenditures of less than $2,500, 82.6% have annual expenditures that fall below $10,000, and 99% have expenditures of less than $90,000. Thus, the 1% of Medicare beneficiaries whose reimbursements exceeded $90,000 accounted for a full 13% of all Medicare expenditures.

That a small percentage of beneficiaries account for a bulk of the total expenditures is common in insurance markets. Individuals buy insurance to avoid large risks such as those reflected in these distributions. The relation between the proportion of total expenditures and the proportion of total enrollees is identified by the Lorenz curve in Figure 5.3. The Lorenz curve is based on the total expenditures of all enrollees 65 years of age and above. It shows that 80% of the individuals account for 19.2% of total expenditures, or conversely, 20% of the individuals account for 80.8% of the expenditures. By way of compar-

Figue 5.2 Cumulative Density in Beneficiaries, Medicare Beneficiaries 65 and Above

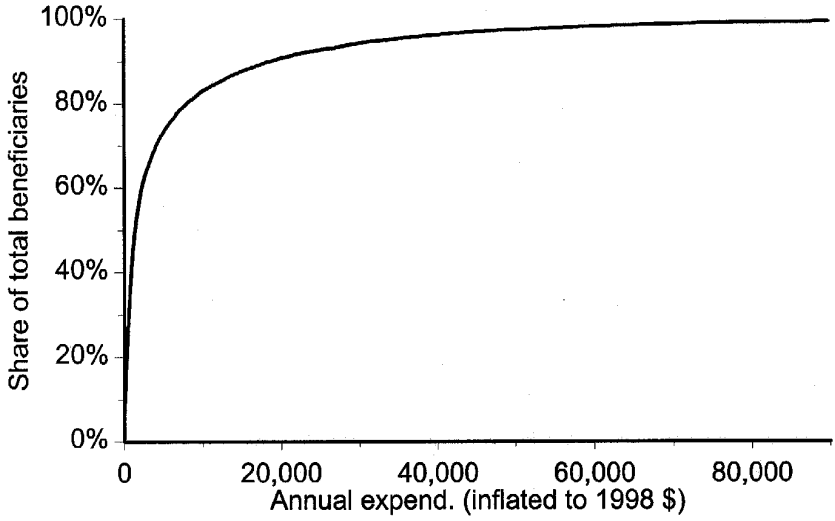
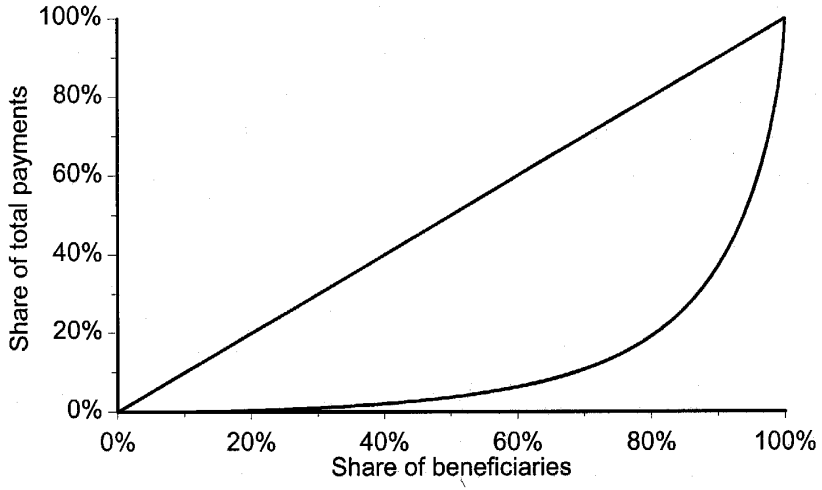


Figure 5.3 Percentage of Payments by Percentage of Beneficiaries



ison with the working age population, 10% of working age individuals account for 80% of the group's health care expenditures (Eichner, McClellan, and Wise 1996, p. 10). Thus, the concentration of expenditures among a few beneficiaries is less severe among the aged than among younger individuals. One would expect that the degree to which total expenditures are concentrated among a small percentage of the beneficiaries would decline with age. Among young beneficiaries, medical care is typically purchased in conjunction with some no-first-dollar-coverage event or accident, but as individuals age and persistent conditions begin to dominate health care expenditures, the "inequality" in expenditures will decline.

The decline in expenditure inequality that is associated with age is further borne out in the evidence presented in Table 5.2, where the percentages of total expenditures at various points in the beneficiary distribution are presented for progressively older age groups. The values in the table's first row reflect points along the curve in Figure 5.3. The Gini coefficient is also presented, and it indicates that over 75% of the area below the line reflecting perfect equality lies between the line and the Lorenz curve. The remainder of the table shows how the shape of the Lorenz curve and the Gini coefficient changes with age. On the whole, the Lorenz curves of successively older age groups lie above each other. The single exception is at the 50th percentile between age

Table 5.2 Total Expenditures[a] at the 50th, 80th, and 90th Percentile in the Expenditure Distribution

Age range	50th percentile (% of total expend.)	80th percentile (% of total expend.)	90th percentile (% of total expend.)	Gini coefficient
All 65+	3.7	19.2	37.3	0.752
65–69	3.5	16.8	32.1	0.782
70–74	3.6	17.0	33.5	0.781
75–79	4.1	20.0	38.1	0.750
80–84	4.7	23.6	44.1	0.719
85+	4.4	27.6	49.2	0.701

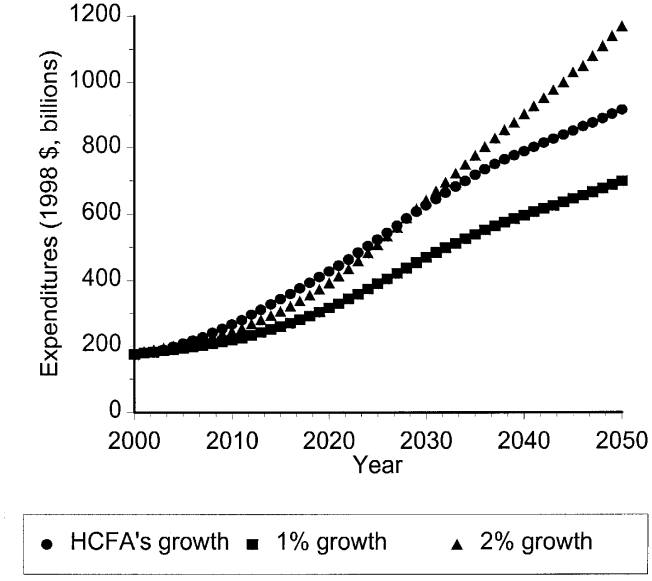
[a] Total expenditures are the sum of expenditures in the following categories: home health, hospice, inpatient hospital, institutional, medical provider, and outpatient hospital.

groups 80–84 and 85+. Inequality as measured by the Gini coefficient also declines with age, falling over 8 percentage points between age groups 65–69 and 85+.

FORECASTING REAL MEDICARE EXPENDITURES UNDER CURRENT MEDICARE

The first step in generating the expenditure estimates is multiplying the Medicare benefits by age net of Part B premium payments times the Census Bureau's forecasts of population by age. The next step is applying one of three real growth rates in per-capita expenditures. We present three forecasts of total real Medicare expenditures for beneficiaries 65 and above in Figure 5.4. The forecasts are based on assumptions concerning the future growth in the real costs of providing the services covered under current Medicare. Over the past

Figure 5.4 Total Real Medicare Expenditures



decade, the real costs of Medicare benefits per recipient have grown at an annual rate of approximately 6%, although this growth rate has slowed recently due to changes in the structure of Medicare. Most forecasts of future Medicare benefits (per recipient) in real terms are growing at rates considerably below this 6% figure. The expected reductions in growth are due to several factors, including the introduction of competition in health care plans and the fact that the 6% growth in real per recipient benefits would imply that the share of Medicare in real Gross Domestic Product would reach unreasonable levels.

The lower series presented in Figure 5.4 is based on a constant 1% growth rate in per-capita expenditures. The series that ultimately produces the highest expenditures is based on a constant 2% growth rate. The remaining series is based on the growth rate assumptions used in the 1998 Trustees reports (Board of Trustees 1998a,b). From 1998 to 2002, the trustees use a growth rate of 1%, from 2003 to 2010 they project a growth of 3.5%, and then from 2011 to 2022 the trustees assume that the growth gradually declines to 0.9% and remains at that rate for all years beyond 2022.

ESTIMATING THE COST OF NO-FIRST-DOLLAR-COVERAGE RETIREMENT HEALTH INSURANCE

We believe that any real solution to the Medicare crisis must deal with both the level of per capita medical expenditure growth and the issue of financing Medicare for the future. A transition to prefunded medical care insurance provides the opportunity to introduce an alternative form of insurance for those cohorts who move to the prefunded system. In this chapter, the estimated cost of no-first-dollar-coverage insurance for future aged beneficiaries is presented along with the cost of standard Medicare reimbursements. The advantages of no-first-dollar-coverage health insurance are twofold. By avoiding the tragedy-of-the commons effect, no-first-dollar-coverage health insurance reduces expenditures relative to health insurance with first-dollar coverage or health insurance with low coinsurance rates. Also, by forcing consumers to recognize the real cost of care, higher deductibles may affect the rate of expenditure growth through provider competition.

A benchmark for the relative effects of coinsurance rates and some level of no-first-dollar coverage (a deductible, so to speak) on the level of medical expenditures can be estimated from the RAND Health Insurance Experiment (HIE). The HIE was conducted to control for the selection bias which had hampered earlier attempts to quantify the effects of differing health insurance policies on beneficiaries' expenditure patterns. Keeler et al. (1988, pp. 104–105) estimated that, relative to free care, a policy with 100% coinsurance up to a $500 maximum dollar expenditure in 1983 (in effect, no coverage for the first $500 of covered expenditures) would reduce total expenditures by 27.17%. Even imposing a 25% coinsurance rate and a modest $50 maximum dollar expenditure produced a 12.76% expenditure reduction relative to free care.

The results of the RAND study suggest that the cost of providing retirement health care can be substantially reduced by making beneficiaries' behavior when buying health care the same as when buying any other product. However, the use of the RAND study to estimate the impact on retirement health care expenditures can be questioned on two grounds. First, it was conducted more than 15 years ago. Second, the population in the experiment was not the elderly. In response to the age of the study, we can adjust the deductibles used in the RAND study for price level changes using several alternative price indices. The fact that the RAND study was conducted using the general population rather than a population 65 years of age or older is of more concern. However, we can use work done on the effects of Medigap policies on the health expenditures of the Medicare population to corroborate the general population results of the RAND experiment.

There are 10 standard types of Medigap plans, referred to as Plans A through J, which cover to varying degrees the gaps produced by Medicare's two-part structure. For example, Plan C covers the Part A and Part B deductibles and coinsurance amounts. The average price of such a policy was $1,100 in 1997 (American Medical Association 1998, p. 14). Individuals with Medigap insurance face the same prices—essentially zero—as those with free care in the RAND experiment. Christensen and Shinogle (1997) found evidence that beneficiaries with Medigap plans used 28% more services than those with no supplement. They also find that Medicare beneficiaries with employer-based supplements used 17% more services.[3] Medicare beneficiaries

with no Medigap or employer-based supplements face the deductibles imposed in Medicare Parts A and B and the 20% Medicare Part B coinsurance rate, as well as the Medicare Part A coinsurance rate that comes into effect during hospital stays in excess of 60 days. Since the RAND experiment results are amazingly consistent with the Medigap study, we will use the results of the RAND study in our subsequent estimates of the cost of no-first-dollar-coverage health insurance alternatives to current Medicare.

In order to estimate the cost of our proposed no-first-dollar-coverage health insurance, we must account for the changes in the age distribution of expenditures and for the expected reduction in expenditures resulting from the introduction of no-first-dollar-coverage in each age category. The descriptive statistics presented above show that medical expenditures for the Medicare population are concentrated among a small portion of the population and that this concentration declines with age. The effects of the introduction of no-first-dollar-coverage insurance on these expenditures must take into account the change in the distribution of expenditures across the service categories by age. For example, home health expenditures rise from about 3% of the total expenditures of those 65 to 66 years old to over 15% of the total of the beneficiaries 85 years of age or above. To adjust our cost estimates for no-first-dollar-coverage health insurance, we use the simulation model output from the RAND experiment presented in Appendix G of Keeler et al. (1988). In effect, we first place current Medicare in its appropriate place in the RAND simulation model and then compare a $2,500 deductible health care plan's predicted expenditures to those of Medicare. The difference between the simulated Medicare results and the results for our alternative plan as a percentage of simulated Medicare is our estimate of the expected percentage reduction for each category of expenditures.

The first step in applying the RAND experiment results to the Medicare population is to place Medicare into the context of the RAND simulation model's output. The output is organized by plan type and total expenditures, divided into the following categories: hospital expenditures, acute care, well care, and chronic care. There are 28 plan types considered in the RAND experiment, each of which has a maximum out-of-pocket dollar expenditure (MDE) and a coinsurance rate. The MDEs identify the maximum total payment exposure for

each beneficiary. The three coinsurance rates considered are 25%, 50%, and 100%, and they reflect the percentage of the expenditures up to the MDE for which beneficiaries were responsible. The nine MDEs are $50, $100, $200, $500, $1,000, $1,500, $2,000, $3,000, and all. The remaining category is the free plan with no coinsurance and no deductible.

Because of Medicare's two-part structure, the comparison between current Medicare and the plans considered in the RAND experiment requires careful consideration. Without the additional purchase of Medigap insurance, basic Medicare Hospitalization (Part A) has a $736 deductible and coinsurance that comes into effect after 60 days in the hospital, and basic Medicare Supplemental Medical Insurance (Part B) has a $100 deductible and then a 20% coinsurance rate. In placing current Medicare within the parameters of the RAND experiment, we must determine what kind of budget constraint beneficiaries respond to in making their expenditure decisions. Christensen and Shinogle (1997) suggested that, for the individuals represented in the 1994 National Health Interview Survey, 85% of Medicare enrollees had some form of supplemental coverage, either in the form of private insurance or Medicaid coverage. They found that individuals with Medigap insurance used 28% more services than those with no supplement and that those with employer-based supplemental insurance used 17% more services. Using the 1996 Medicare Current Beneficiary Survey, Eppig and Chulis (1997) reported that 87% of Medicare's fee-for-service sector and 81% overall had some form of supplemental insurance. The overall percentage drops because HMO enrollees purchase less supplemental coverage due to the HMO's expanded benefits packages, which reduces the incentive to supplement.

The more comprehensive the supplemental coverage of the Medicare population, the closer the total package moves to free care. In the estimates that follow, we treat the expenditures of individuals with supplemental coverage as if they arose from first-dollar coverage.[4] Individuals without supplementary coverage face the deductibles and coinsurance under Medicare Parts A and B. As a proxy for basic Medicare, we choose the simulation results from the RAND study for a policy with a 25% coinsurance rate and a $1,000 maximum dollar expenditure in 1983 dollars. The 25% coinsurance rate is 5 percentage points higher than the 20% rate for Medicare Part B, and the maximum

dollar expenditure is three times the 1983 average out-of-pocket expenditures for Medicare beneficiaries.

Identifying the effects of a $2,500-deductible policy is less complicated than Medicare because the RAND simulation model contains policies similar in structure to our proposed alternative to Medicare. Between 1983 (the year in which the simulation model expenditures are denominated) and 1998, per capita Medicare expenditures grew by a factor of 2.94. In relation to the simulation model output, the current dollar $2,500-deductible policy would be described by 100% coinsurance with a MDE of $851 in 1983 dollars. While the RAND experiment did not contain this exact policy, it did contain policies that bounded this policy. Specifically, the RAND experiment contained a policy with 100% coinsurance and a $500 MDE and a policy with 100% coinsurance and a $1,000 MDE. Their simulations also distinguished among hospital, acute, well, and chronic care expenditures. We interpolate the effects of the $851 deductible on hospital and on all other expenditures grouped together, using the results for the $500 and $1,000 MDE, 100% coinsurance policies. The simulated 100% coinsurance/$851 MDE policy produces hospitalization expenditures equal to 78.92% of a free care policy and other expenditures equal to 51.61% of a free care policy. Weighting these two percentage estimates by total expenditures in each category implies that the simulated 100% coinsurance/$851 MDE policy will produce total expenditures that are 64.61% of a free care policy.

Our basis for forecasting the cost of providing our proposed 100% coinsurance/$2,500 MDE policy will be the percentage reduction in Medicare expenditures predicted by the RAND study. Supplemented Medicare is represented in the RAND simulation by free care, and basic Medicare is conservatively represented by the 25% coinsurance and $1,000 MDE. Our 100% coinsurance/$851 MDE policy results in hospital expenditures equal to 97.21% of the basic Medicare proxy policy (the 25% coinsurance/$1,000 MDE policy) and 78.92% of the supplemented Medicare proxy policy, with remaining expenditures equal to 73.43% of the basic Medicare proxy policy and 51.61% of the supplemented Medicare proxy policy. Once again, weighting these two percentage estimates by total expenditures in each category implies that the simulated 100% coinsurance/$851 MDE policy will produce total expenditures that are 85.61% of the basic Medicare

proxy policy and 64.61% of the supplemented Medicare proxy policy. These results are presented in the last column of Table 5.3.

Table 5.4 presents total expenditures, Medicare reimbursements, and the premiums that would be necessary to pay for policies that incurred the expenditure levels forecast using the approach presented above. We base our estimates on the estimated 1998 Medicare expenditures and apply the percentages in Table 5.4. The average premiums for our Medicare alternative are equal to the adjusted expenditures in each category, using the percentages presented in Table 5.3, less the $2,500 deductible averaged over all beneficiaries for each age group in the Medicare population. Thus, the premium is calculated by adjusting individual Medicare expenditures using the percentages presented in Table 5.3. The hospitalization effect is used to adjust total inpatient hospital expenditures, and the "other" effect is used to adjust all remaining expenditures.

Table 5.4 shows our estimates of the cost of the proposed 100% coinsurance/$2,500 deductible policy by age group and for the entire Medicare population. As a point of comparison, current Medicare benefits are also presented. As indicated in the table, average 1995 Medicare reimbursements were $5,475 in 1998 dollars, or 80% of total health care expenditures by the Medicare population. The estimated cost of our proposed policy based on our extrapolation between the two bracketing policies used in the RAND study is equal to 61% of the current health care expenditures by the Medicare population and to 76% of current Medicare reimbursements.

CHOICE AND ADVERSE SELECTION

Our proposed Medicare alternative is a retirement health insurance package that is comparable to today's high-deductible policies. The important feature of these policies is that they have no first-dollar-coverage so that users of the health care system care what it costs at the first dollar level. As shown in the RAND study, insurance of this kind significantly reduces expenditures on health care. In addition, because the retirement health care we analyze is provided through a genuine insurance contract where the insurance provider is at risk, that provider

Table 5.3 Relative Medical Expenditures under Four Policies from the RAND Health Insurance Experiment Simulation Results[a]

Base	Expenditure category	(100%/$851) Expenditures as % of base coinsurance rate, MDE
Supplemental Medicare	Hospital	78.92
Proxy	Other	51.51
(Free care)	Total	64.61
Basic Medicare proxy	Hospital	97.21
(25%, $1,000)	Other	73.43
	Total	85.61

[a] See Keeler et al. (1988), Table G.2, pp. 104–105, for expenditures by type of episode and type of coverage.

Table 5.4 Total Expenditures, Medicare Reimbursements, and Estimated $2,500 Deductible Policy Premiums by Age ($)[a]

Age group	Total expenditures[b]	Medicare benefits[c]	$2,500 ded. policy premium
All 65+	6,836	5,475	4,170
65–66	4,460	3,464	2,714
67–68	4,964	3,769	2,914
69–70	5,429	4,163	3,102
71–72	6,619	5,297	4,018
73–74	7,147	5,691	4,387
75–79	7,063	5,742	4,296
80–84	8,398	6,852	5,243
85+	9,596	7,871	6,022

SOURCE: 1995 Cost and Use File.

[a] Inflated to 1988 dollars.

[b] Total expenditures are the sum of expenditures in the following categories from the 1995 Cost and Use File: home health, hospice, inpatient hospital, institutional, medical provider, and outpatient hospital.

[c] Medicare benefits are the sum of Part A and Part B reimbursements for fee-for-service patients and are equal to Medicare payments to HMOs for the HMO patients.

will also be cost-conscious. A further component contributing to expenditure reduction of our proposed alternative to current Medicare is the impact on the price of health care services due to competition for the very large first-dollar pool.[5] For example, by the year 2030, the retired population will number almost 70 million, which implies that the first-dollar-coverage market will total $175 billion in 1998 dollars.

At the mean, prefunding of retirement health care ensures that retirees have the resources necessary to provide for their health care during their retirement years. However, how do we insure that, at the time of retirement, retirees with health care risks that are greater than the average are able to find insurance providers willing to take them? Put differently, if each cohort member chooses among a set of alternative health care packages, how do we ensure that all levels of risk are served?

One approach to ensuring that all individuals are served upon retirement is to require that they choose their insurer at age 22, when neither they nor their insurance providers know what their medical care needs will be at ages 65 and beyond. Such early commitment will result in individuals being dispersed across insurers randomly, implying that the average premium will cover the expected expenditures each insurer may face. However, there is a considerable question concerning the cost of such early commitment since the provision of the services will not begin for more than 43 years.

Alternatively, and more realistically, we should expect that individuals choose their insurer at age 65, when both they and their insurance provider know more about their medical care risks. In this case, however, the familiar problems of adverse selection on the part of patients and screening on the part of insurers surface. Thus, our proposed solution to the Medicare crisis must deal with both problems. Ultimately, the solution to both problems requires that premiums be risk adjusted in a manner that is not currently allowed. However, the Balanced Budget Act (BBA) of 1997 calls on the Secretary of the Department of Health and Human Services to "implement a risk adjustment methodology that accounts for variations in per capita costs based on health status and other demographic factors for payment [to Medicare+Choice organizations] starting no later than January 1, 2000" (Health Care Financing Administration 1999, p. i). In addition, the act allows for more private sector options in the Medicare market, such as

preferred provider organizations (PPOs), provider-sponsored organizations (PSOs), and even private fee-for-service (PFFS) plans, in addition to health maintenance organizations (HMOs).

In 1985, HCFA established a limited risk-adjustment methodology for reimbursing HMOs in which reimbursements vary by an enrollee's age, sex, Medicaid eligibility, disability status, and the county in which the HMO is located. Initially, an HMO is reimbursed at 95% of the risk-adjusted county average cost among fee-for-service patients which is further adjusted by risk factors associated with a particular enrollee's age, sex, Medicaid eligibility and disability status. However, since the reimbursement is not fully risk-adjusted for a beneficiary's health status, HMOs have historically screened patients to lower their risk exposure. In addition, because the annual re-estimation of the county factors does not include HMO patients, the HMOs' potential cost reductions do not result in lower county factors or in lower growth rates.

The current risk-adjustment mechanism, known as the Principal In-Patient Diagnostic Cost Group (PIP-DCG), takes into account an enrollee's age, sex, Medicaid eligibility, location, and inpatient diagnoses. This mechanism, now under review by HCFA, is considered a first step in developing a more robust risk-adjustment mechanism that will incorporate full additional health parameters in addition to inpatient diagnoses. However, in the final analysis, any risk adjustment methodology must include the experience of all participating private providers.

As an alternative to simply posting the reimbursement rates that HCFA is willing to pay, the demand side of the equation, it is possible to elicit supplier responses through a competitive bidding process that is totally lacking in the current formulation. However, a form of competitive bidding was outlined in the final report of the National Bipartisan Commission on the Future of Medicare. While the Commission's final proposal did not garner the needed super-majority of votes among the commission members for a formal recommendation to Congress, some of its provisions will likely be incorporated in upcoming legislation. One key provision in the proposal, now known as the Breaux-Thomas proposal (the Commission's chairmen), is a premium support system. Under the proposal, supply-side responses would be elicited

through bidding for Medicare beneficiaries through annual negotiations with a new Medicare Board.

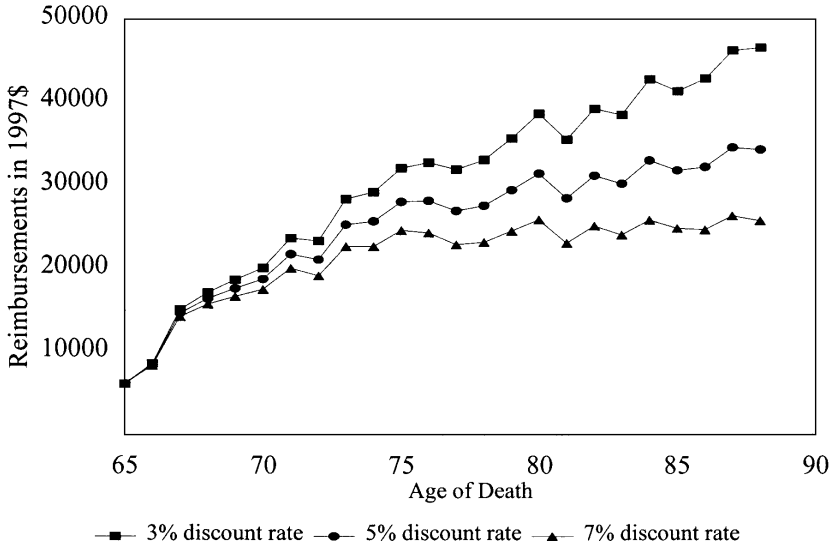
As the BBA and the Breaux-Thomas proposal illustrate, incremental changes are occurring in the way medical insurance is provided to Medicare patients. With prefunding, at retirement, beneficiaries will have an account designed to fund the present value of average remaining lifetime reimbursements. How each group of new retirees is dispersed across insurers is contingent, in part, on the length of the contract period. With long-term contracting, particularly lifetime contracts, risk adjusting would have an added dimension. Besides evaluating a beneficiary's health risks, insurers would also have to consider longevity risks. Healthier individuals reduce short-run risks for the insurer, but because they live longer, insurers face more years of coverage. Longevity risk and health risk work in opposite directions, reducing the incentives for providers to screen applicants since insurers bidding for clients must consider the distribution of the present value of remaining lifetime expenditures, not just the next year's expenditures.

We can see the effect of considering remaining lifetime rather than single-year expenditures by reviewing the relation between age and expenditures. In Figure 5.5 we illustrate the path of average annual reimbursements by age of death for Medicare beneficiaries born in 1909. The data are from the Continuous Medicare History Sample (CMHS). The CMHS contains individual-level longitudinal data from the time any individual enters the sample, at age 65, until death. This data begins in 1974 and the last available year is 1997. Thus, it is possible to track the annual reimbursements of individuals born in 1909 from the time they turn 65 until the age of 88 or their deaths. Up to 24 annual observations are available for each sample member in this birth cohort. Using the data underlying the figure, we can see the after-the-fact average costs of a long-term contracting insurer by age of death, where actual reimbursements were converted to 1997 dollars using the personal consumption expenditures (PCE) implicit price deflator.[6] Given that per-capita Medicare reimbursements have risen more rapidly than the general price level, these reimbursement profiles for higher death ages include some real reimbursement growth in addition to pure age effects.

Figure 5.5 Average Annual Medicare Reimbursements for Individuals Born in 1909

As the series in the figure illustrate, regardless of the age of death, the high cost of dying is the dominant factor in reimbursements. For survivors at any age, average reimbursements are greatest for those who are closest to death, indicating that there is something more than just the year or two immediately preceding death to reimbursement levels. From the figure it is easy to see why, with annual contracting, insurers prefer the healthier individuals—defined as those with longer life expectancies. But with lifetime contracts, it is the present value that matters. In Figure 5.6, we present the present value of lifetime reimbursements by age of death using 3%, 5%, and 7% discount rates, where we have excluded individuals who are still alive at the end of the sample period. Interestingly, those who die young have lower remaining lifetime reimbursements. With this information alone it appears that with lifetime contracting, insurers would have a preference for individuals expected to die young, the polar opposite of the incentives of one-year contracting insurers.

Figure 5.6 Present Value of Reimbursements for Individuals Born in 1909



The above discussion is based on average profiles. However, the problem for insurers at the beginning of a contract is to determine the expected present value of each individual, not the overall average. This is what risk adjustment is all about. We can use the same data that underlies Figures 5.5 and 5.6 to estimate the extent that past reimbursements predict the present value of remaining lifetime reimbursements. Since the CMHS does not include preretirement expenditure data, we address this question by examining the relation between the first five years of retirement reimbursements (65 to 69 years of age) and the present value of future expenditures for the subset of individuals who survive to at least the age of 70. Again we use the 1909 birth cohort as our point of reference. In interpreting the results, we must bear in mind that the oldest surviving individual in the 1909 sample is 88 years of age and that some 30% of the sample was still alive in 1997. Thus, we underestimate the present value of lifetime reimbursements for all survivors. Since those in the lower quartiles of reimbursements from 65 to 69 years of age are more likely to survive, we underestimate their present values relative to those in the fourth quartile.

The row headings in Table 5.5 identifiy the quartiles in the distribution based on total reimbursements between the ages of 65 and 69.[7] The four data columns identify the quartiles based on the present value of lifetime reimbursements at age 70 to death or the age of 88 (the end of our sample). Approximately 30% of the individuals who survive to age 69 survive beyond 88 years of age. Each cell in the table identifies the movement between quartiles in the two distributions. For example, 38.89% of the individuals ranked in the first quartile based on Medicare reimbursement between age 65 and 69 are again ranked in the first quartile based on expenditures up to the age of death or to the age of 88, if still alive. At the other end of the distribution, 35.13% of the beneficiaries in the top quartile during the first five years are again in the top quartile based on the present value of remaining expenditures. If reimbursement in the first five years had no predictive power, then we would expect approximately 25% in each of the table's cells. As seen in the table, location in the middle two quartiles during the first five years does not appear to predict future reimbursements, but location in the tails of the distribution does. However, this result must be viewed in light of the fact that the present values of survivors is underestimated.

Table 5.6 identifies the present value of reimbursements for survivors and decedents from the age of 70 on, by quartile during the first five years. It also presents the percent of beneficiaries in each quartile who survive beyond 88 years of age and the average age of death among decedents. As indicated in the table, the present value of remaining reimbursements rises with location in the initial distribution,

Table 5.5 Mobility between Medicare Reimbursement Quartiles for Beneficiaries Born in 1909 (%)

Quartile based on reimbursements between 65 and 69 years of age	Quartile based on the present value at age 70 of remaining lifetime reimbursements			
	First	Second	Third	Fourth
First	38.89	26.14	20.36	14.61
Second	24.70	27.18	25.88	22.24
Third	19.45	25.07	27.45	28.02
Fourth	16.97	21.59	26.32	35.13

Table 5.6 Present Value of Remaining Lifetime Reimbursements at Age 70 by the Quartile Based on Reimbursements during the First Five Years of Medicare Coverage

Quartile based on reimbursements between 65 and 69 years of age	Present value of reimbursements ($)		Survivors (%)	Average age of decedents (years)
	Survivors	Decedents		
First	18,224	24,860	34.38	79.93
Second	26,791	32,411	33.86	80.24
Third	33,749	38,627	30.72	79.66
Fourth	45,944	42,734	19.29	77.92
Average	29,231	35,137	29.56	79.36

and in general, decedents spend more than survivors. The only exception are the survivors in the top quartile who, on average, had higher reimbursements than the decedents in the top quartile. The last two columns in the table indicated that reimbursements are negatively related to survival.

Though prepaid long-term contracts combine health care risk and longevity risk, the descriptive statistics indicate that past reimbursements provide some information about the present value of future expenditures, although the omission of the remainder of survivors reimbursements will reduce the information content of past reimbursements. The evidence presented in Tables 5.5 and 5.6 suggests that long-term contracts by themselves will not completely overcome incentives for provider screening. One approach that will overcome this problem is to treat the contributions to private accounts in two parts. First, each individual has a private account to pay for the present value of retirement health insurance if the individual is healthy. Second, the remainder of the contribution is used to purchase insurance to pay for the difference, if any, in the age-65 risk-adjusted premiums and the healthy premiums.

Cochrane (1995) showed that long-term contracts can solve both the renewability problem and the adverse selection problem that are common in one-year contracts. For his analysis, Cochrane utilized a long-term contract with fixed periodic payments (similar to a house

mortgage). Whenever a change in health status occurs, one side of the contract makes a payment to the other side equal to the change in expected costs. For example, if an individual suffers a decline in health status—implying that the expected costs of care will exceed the contracted fixed payment—the insurer must make a payment to the individual equal to the expected deficit should the individual elect to switch insurers. Conversely, if an individual experiences a positive health shock, and decides to switch insurers, he or she must pay their current insurer an amount equal to the expected surplus. With severance payments of this type, individuals have the ability to move among insurers.

With prefunding, individuals enter the retirement health care market with sufficient funds to purchase lifetime coverage. Rather than a fixed annual payment, all individuals in a cohort sign up for health insurance and place their entire account in the hands of the health insurer. Any time an individual desires to change health care providers, his or her current provider would be willing to pay them the present value of all expected future benefits. Any other provider offering the same level of quality will take such an individual for a once-and-for-all premium equal to the present value of all future expected benefits.

Should an individual elect to upgrade health care providers, their original provider gives them a severance payment equal to the present value of all future expected benefits at their level of care. The new higher quality provider will charge the present value of expected benefits, which will exceed the severance payment received from a lower quality provider, and therefore have to be supplemented. By the same token, an individual desiring to reduce quality will receive a severance payment greater than the cost of lower quality care, the only requirement being that a specified minimum quality of care must be purchased. Thus, how sick one is has no bearing on the availability of choice. With long-term contracts, a market based on age and health status would develop in which uniform market prices prevailed. These market prices would determine the enrollment cost of a new health care provider and the severance payment to be made by an existing health care provider.

CONCLUSION

Forecasting either the tax rate that will be required to fund current Medicare as the current baby boom generation enters retirement or the contribution rate that would be required to fully prefund retirement health care requires that we know both sides of the fundamental equations of generational transfer finance and prefunding. In Chapter 4, we developed the earnings side of these equations and in this chapter we have laid the foundation for the benefit side of the equations. This chapter also introduces an alternative to traditional Medicare in the form of a no-first-dollar-coverage health insurance policy. Thus, Chapter 5 discusses the benefit side of both of the fundamental problems facing current Medicare.

We base our estimates of the future costs of current Medicare and of our alternative on data from the Health Care Financing Agency's 1995 Cost and Use file and on a 1983 experiment of the effect of alternate health insurance parameters on the level of health care expenditures. The future costs of current Medicare are based on the age distribution of benefits and the demographic factors inherent in the coming retirement of the baby boom generation. The impact of moving to our proposed alternative to Medicare—the introduction of a 100% coinsurance/$2,500 deductible policy—was estimated from data contained in the RAND experiment. By deflating our proposed $2,500 deductible by the growth in Medicare expenditures of 2.94, the appropriate deductible for comparison with the RAND study is $851 in 1983 dollars. The RAND study deductibles were $500 and $1000, so that interpolation results in the $851 deductible policy reduced health care expenditures by almost 35%. In the next chapter we use the benefit vectors presented in Table 5.4 and the cohort age earnings profiles from Chapter 4 to estimate the contribution rates new labor force entrants would face if they were to prefund their retirement medical care.

Notes

1. See the introduction of Health Care Financing Administration (1998) for a description of the survey and of the matching of survey and administrative data.

2. Individual responses are weighted throughout this chapter using the full sample weight as suggested in the data documentation (Health Care Financing Administration 1998, pp. 6–8).
3. It might be argued that the choice of Medigap is made on the basis of health status so that those choosing more Medigap coverage do so because they are in poorer health. To test this hypothesis, we have regressed Medigap coverage on health status and found no effect.
4. Included in this category are individuals who had Medicaid, private supplemental insurance, or HMO coverage.
5. The RAND study offers no information on the competition effect because the scale of the experiment was too small to induce competition for its first-dollar pool.
6. The choice of deflator deserves further comment. In Lubitz, Beebe, and Baker (1995), annual reimbursements for decedents in 1989 and 1990 were re-based to 1990 dollars using the growth rate in per-capita Medicare payments as the deflator. They then compared average expenditure profiles by age of death. Both quality and quantity changes affect the size of the annual growth rates they use to deflate reimbursements, which leads to overstated reimbursements in early years.
7. Quartiles are chosen rather than quintiles or deciles because more than 20% of the beneficiaries had zero Medicare reimbursements between the ages of 65 and 69.

6
The Transition to Fully Funded Medicare

The fundamental issues that are being discussed in the ongoing debate over prepaying Social Security have a direct bearing on prepaying Medicare. As we pointed out in Chapter 3, the capital stock and individual welfare in the steady state are higher in a prepaid system of retirement pensions than they are when transfers to the elderly are financed by taxing the young. If we could move in an instant to the prepaid steady state from the transfer-financed steady state, everyone would be better off. But the instantaneous transition is not possible, and the transition between two steady states is the sticking point. The transition path taken determines who bears the cost and whether the transition can actually improve welfare for all generations.

In the recent wave of Social Security reform proposals, much has been made of the difference between the rate of return on capital and the rate of return that is offered by Social Security. Assuming that the tax rate is fixed, Social Security can offer a rate of return equal to the growth rate in the economy. A prepaid system can offer a rate of return equal to the marginal product of capital. If the return on capital exceeds the growth rate of the economy, then some have argued that private accounts would make workers better off. Unfortunately, the accrued benefits of current retirees have to be financed. So, if current workers divert their tax payments into private accounts, the government must raise additional taxes or borrow to pay for the accrued benefits of current retirees. Borrowing by itself would result in no net increase in the capital stock, and raising additional taxes is never popular, but apart from a benefit reduction, borrowing or taxation appear to be the only options.

The approach taken by most reformers is to require workers to establish private saving accounts for their retirement expenses and at the same time pay taxes sufficient to support current and soon-to-be retirees. The new mandatory savings would reflect additions to the capital stock. Feldstein and Samwick (1997), and subsequently Feld-

stein, Ranguelova, and Samwick (1999), have suggested that all current workers establish mandatory Personal Retirement Accounts (PRAs) and continue paying payroll taxes at the current rate. Initially, the contribution rate to the private accounts as a percentage of wage earnings is low, in the range of 2%. As funds accumulate in the private accounts, two things happen. As the system matures, the annuities that can be purchased at retirement offset an increasing proportion of the scheduled Social Security benefits, thus reducing the financing requirements of the current system.

The aggregate PRAs also represent additions to the capital stock and, as such, they generate capital taxes that can be used to further lower future payroll tax rates. Over time, the contribution rates to the private accounts can rise to a level that would allow the average worker to prepay his or her retirement pension. During the early years of the transition, the combination of the contributions to PRAs and the modified payroll taxes would exceed the scheduled payroll taxes. In later years the modified payroll taxes would be eliminated, leaving a contribution rate of about 4.25%, a rate that is much lower than the pay-as-you-go tax rate (which is estimated to rise to 19% by 2070). Current workers bear a greater burden than they would under the pay-as-you-go system, but future workers would be much better off under a prepaid system than under the current system. So, such a transition is not necessarily Pareto-improving. The gradual reduction in the payroll tax will reduce the deadweight loss due to the reduced labor supply under the current tax rate. Feldstein and Samwick (1997) estimated the efficiency gains from such tax rate reduction to be about 2% of the tax base.

Laurence Kotlikoff and Jeffrey Sachs (1996) offered another transition path. Focusing exclusively on the retirement portion of Social Security, they suggested eliminating the payroll tax and replacing it with mandatory contributions to private accounts. The transition cost associated with the accrued benefits is financed by a new federal business cash flow tax. Since both retirees and workers engage in consumption expenditures, the tax burden for the transition is shared by both workers and retirees. In addition, the business cash flow tax is less distortionary than the payroll tax, and therefore the switch in the tax by itself produces an efficiency gain. Over time, the tax rate associ-

ated with the new cash flow tax would decline as the liabilities of the phased-out system are eliminated.

When enacted, Medicare provided benefits to a population of retirees who had not paid into the system. Even today's new retirees have only paid into the system for 33 years, two years fewer than the number of years in the formula used to calculate Social Security benefits. A transition to prepaid Medicare today would have been equivalent to requiring the working population of 1965 to prepay their own retirement health care while at the same time paying for the health care used by the then-retired population. As the statements by Wilbur Mills quoted in Chapter 2 revealed, he for one was interested in a prepayment option and recognized that a promise of benefits to retirees represented an unfunded liability equal to $33 billion; but, rather than prefunding for Medicare, pay-as-you-go financing was adopted. This chapter explores several paths for the transition from pay-as-you-go Medicare financing to prefunding and evaluates the consequences.

Prepaying Medicare has its own set of unique issues. First, unlike Social Security, Medicare benefits are not tied in any way to lifetime earnings. Further, Medicare is an in-kind benefit: the benefits one receives from the system are conditional on use. As a result, benefit growth is affected by changing preferences and changing technology. Given that the current Medicare system has been in place for 33 years, it is too late for the current retired population and the soon-to-be-retired population to be placed in a fully funded system. Thus, any proposal to change the fundamental nature of financing retirement health care benefits must contain a mechanism for dealing with the years required to move from the existing system to the new system. In what follows, we present a proposal that keeps intact the benefit structure for the currently retired population and the soon-to-be-retired population.

Because the population boom represented by the baby boom generation represents a significant source of current federal revenue and also because they will create a surge in the retired population, we define soon-to-be-retired to exclude the baby boomers. In effect, during the transition, younger members of society will be paying twice, in the sense that they will be prepaying for their own retirement health care benefits and paying for the retirement health care benefits of those currently and soon to be retired. However, because of the efficiencies

to be gained from prepaid retirement health care, at least the younger of those being double-taxed (so to speak) may be better off on net, because the increased capital stock allows them to enjoy increased consumption during their latter working years by enough to offset the decrease in consumption during their early working years. As a result, their extra payments into the system have a significantly lower present value than remaining with the status quo.

In the next section we develop the contribution rates necessary to prefund both the current Medicare system and our no-first-dollar-coverage alternative to current Medicare. Using the earnings forecasts generated in Chapter 4 and the benefit series presented in Chapter 5, we calculate the required contribution rate under several rate-of-return and growth-rate assumptions.

THE COST OF PREPAYING RETIREMENT HEALTH INSURANCE

Medicare was originally intended to provide health insurance for the elderly. While coverage was expanded to include qualifying disabled workers in 1972 and end-stage renal disease patients in 1973, Medicare fundamentally remains an elderly health insurance program. The aged Medicare population is 33.8 million, or 87% of the 38.8 million total Medicare beneficiaries.[1] Elderly individuals qualify for the Medicare program if they are eligible for Social Security benefits. This minimal eligibility requirement has resulted in nearly universal coverage among the aged population. All eligible enrollees draw identical Medicare benefits whenever they fall ill and experience expenditures above the deductibles. Because benefits are institutionally unrelated to the magnitude of past tax payments, the benefits received net of contributions vary across groups due to work history and longevity. Two extremes in net benefits are illustrated by a single worker who dies just before reaching retirement and by a qualifying nonworking spouse. The single worker receives nothing from the program after a lifetime of contributions, while the nonworking spouse receives benefits during retirement despite having invested nothing into the system.

McClellan and Skinner (1997) decomposed the redistribution inherent in the Medicare program into its between-generation and within-generation components. Within a generation, the direction of redistribution is not clear. While lower-income individuals pay less in lifetime taxes because of lower life expectancies, they also receive lower benefits than their higher-income counterparts. McClellan and Skinner found that the bulk of the redistribution in the Medicare system is between-generations, but of the total transfers that occur within generations, they found that Medicare redistributes from low- to high-income groups. Moreover, they suggested that the direction of the redistribution will persist for the next 20 years.

With prefunding, individual rates of return will continue to vary by usage, but any redistribution occurs within-generation. The projected experience of the average individual is used in this section to determine the contribution rates for prepaid retirement insurance. The contribution rates are equal to the ratio of the present value of expected benefits to expected lifetime earnings (see Appendix B, Equation B.1). At retirement, all survivors in a generation (a specific age cohort) will have equal funds in their PRIME accounts. Thus, for lower-income workers to have the same amounts in their retirement accounts as high-income workers, they would have to contribute at a higher rate throughout their lives.

An alternative to differential contribution rates is to establish a tax rate based on the projected experience of the average member of a cohort. In making the contribution rate cohort-specific, we assume that redistribution takes place between income groups as the cohort ages. One way to do this is to have all workers in a given cohort make mandatory contributions to their PRIME accounts up to a specified dollar maximum, which is equal to the dollar value of the taxes for the average individual. Contributions up to the maximum offset taxes dollar for dollar. The excess tax revenues from the higher-income workers within a cohort are then used to subsidize the contributions of the lower-income workers. The current subsidy to nonworking spouses can be eliminated by requiring single-earner couples to prepay both of their PRIME accounts. In this way, each individual will own a PRIME account, so that changes in marital status or spousal death will have no detrimental effects on the availability of retirement years health care.

The contribution rates for average new labor force entrants are presented in Table 6.1. In addition to the earnings estimates from Chapter 4 and the benefit estimates from Chapter 5, the remaining components of the contribution rate calculation are cohort-specific mortality rates, growth rates in per capita Medicare costs, and rates of return earned on the PRIME account assets. The earnings estimates used here and in the simulations that follow are based on one of the projections outlined in Chapter 4. The specific estimates are based on the combination of the geometrically weighted growth rates and the first decision rule for dealing with cases where women's projected wages exceed men's. Finally, mortality rates are drawn from the U.S. Bureau of the Census's 1995, 2005, and 2050 middle series, and cohort-specific mortality is imputed from the cross-sectional mortality tables.

To identify a range of possible contribution rates, we use three growth rates in real per capita Medicare reimbursements and three real

Table 6.1 Required Annual Contributions Beginning at Age 22 as a Percentage of Life-Cycle Earnings

Rate of return/growth rate[a]	Medicare replacement	$2500 Deductible policy
Rate of return = 3.5%		
1%	4.09	3.45
2%	7.13	6.01
HCFA[b]	5.34	4.51
Rate of return = 5.4%		
1%	2.05	1.74
2%	3.52	2.98
HCFA	2.67	2.27
Rate of return = 8.5%		
1%	0.66	0.57
2%	1.12	0.95
HCFA	0.87	0.74

[a] In per-capita medical expenditures.

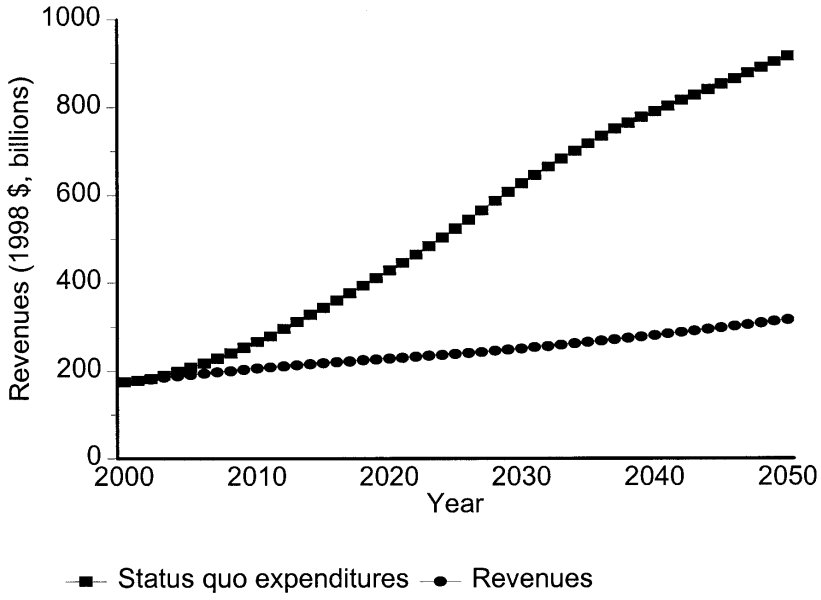
[b] The HCFA growth rate in per-capita medical expenditures is based on the approximated growth rates assumed in the 1998 Trustees reports. For years 1998 to 2002, the growth rate is 1%; from 2003 to 2010, it is 3.5%; and for the years 2011 to 2022, it declines at a constant rate to 0.9%, and remains at 0.9% in all subsequent years.

rates of return. The real per capita reimbursement growth rates are 1%, 2%, and the rates that mimic those used by the Trustees in the 1998 Trustees reports (Board of Trustees 1998a,b). The three real rates of return are 3.5%, 5.4%, and 8.5%. The lowest rate of return is approximately the real return on inflation-indexed government bonds. The highest rate, 8.5%, is the pre-tax rate of return on nonfinancial corporate capital in the United States between 1959 and 1996 (Poterba 1999). The intermediate rate is equal to the realized real rate of return after federal, state, and local corporate taxes are paid.

As indicated in the table, replacing current Medicare net of Part B premium payments requires contribution rates that range from 0.66% to 7.13% of lifetime earnings. The $2,500 deductible policy can be prefunded with contribution rates between 0.57% and 6.01% of lifetime earnings. Current Medicare is funded on a pay-as-you-go basis by a 2.9% payroll tax dedicated to Hospitalization Insurance expenditures and general revenue funds for expenditures incurred under the Supplementary Medical Insurance program. Expressing total Medicare expenditures incurred by retirees, net of their premium payments, as a percentage of taxable payroll implies that a tax rate that would pay for current total Medicare benefits would be 4.17%. Significantly, all of the contribution rates using the 5.4% and 8.5% rates of return fall below the 4.17% current Medicare implied tax rate, and all of the contribution rates at the 8.5% growth rate fall well below the current Hospitalization Insurance 2.9% payroll tax.

We introduce the 4.17% current Medicare implied tax rate as an accounting benchmark because it allows us to identify the degree to which projected expenditures are underfunded at current tax rates. Figure 6.1 illustrates projected Medicare expenditures and revenues in 1998 dollars. The expenditure projection uses the same per capita growth rates as the 1998 Trustees Report. Total Part A (Hospitalization Insurance) and Part B (Supplementary Medical Insurance) expenditures are expressed net of premium payments, which we assume will remain at the 1998 share, approximately 25% of average Part B costs. We project future Medicare revenue by holding constant both the 2.9% payroll tax and the 1.27% payroll tax equivalent of the general revenue contribution to Part B. Projected Medicare revenue is then calculated as 4.17% of projected aggregate labor earnings.

Figure 6.1 Projected Medicare Revenues and Expenditures



The population projections underlying both the revenue and expenditure estimates are from the U.S. Bureau of the Census middle series. The difference between projected expenditures and revenues identifies the degree to which current Medicare is underfunded at current full tax rates. Using a 2.8% government borrowing rate, the present value of the difference between projected expenditures and revenues out to 2080 is $9.3 trillion. This gap between expenditures and revenues represents a problem that must be addressed by any reform. If benefits are not cut and pay-as-you-go financing remains, the gap must be filled by higher taxes equal in present value to $9.3 trillion.

With prepayment, the expenditures in Figure 6.1 represent future annual draws from PRIME accounts. The question is, how do we make the transition from current pay-as-you-go financed Medicare to a system of PRIME accounts? During a transition to prepaid Medicare, workers must fund their PRIME accounts and pay for the expenditures of current Medicare recipients. We will defer the issue of who bears

the burden of such a transition until the end of this chapter and analyze a transition scenario in which all baby boomers achieve fully paid-up PRIME accounts by the time of their retirement. Thus, anyone born in 1945 or earlier, before the baby boomers, remains in the current Medicare program and their expenditures are paid by contemporaneous tax payments. All those born in 1946 and later are placed in the new PRIME account system.

Table 6.2 presents the results of a simulated transition in which individuals receive the 5.4% after-tax marginal productivity of capital as the return on their PRIME accounts. For purposes of comparison with current Medicare and with payroll tax implications of future pay-as-you-go Medicare costs, revenues and expenditures are presented as a percentage of taxable payroll. For now, we ignore the effects of a larger capital stock on the marginal productivity of capital and on the wage rate. Those considerations will be taken up in the discussion of the subsequent simulation. Projected Medicare expenditures, net of premium payments, as a percentage of taxable payroll are presented in the first column of the table. This column shows the tax rates required to fund Medicare on a pay-as-you-basis in the future. Over the next 20 years, if we retain the current pay-as-you-go financing of Medicare, the tax rate will rise to 7.81% and by 2070 will be 14.33% of payroll. The second column presents the prepaid accounts contribution to projected Medicare expenditures as a percentage of taxable payroll, and thus highlights the extent that the total tax burden is relieved by prepaid accounts. Because the oldest of the baby boomers will reach the age of 65 in 2011, the benefits paid from PRIME accounts are zero until then. The share of total benefits paid from PRIME accounts steadily rises, and by 2045, as the last of the individuals in the old system dies, all retirement medical care is prepaid.[2]

The third column shows the Medicare taxes that must be paid from contemporaneous tax payments (this column equals the difference between the first and second columns). Column four presents total PRIME account contributions as a percentage of taxable payroll. Recall from Table 6.1 that new entrants must set aside 2.67% of their lifetime earnings to prepay their Medicare coverage. However, during the transition, the aggregate PRIME accounts contributions are higher than 2.67% because the contributions to PRIME accounts sufficient to

Table 6.2 Medicare Simulation Results[a] (% of taxable payroll)

Year	Status quo Medicare tax rate	Benefits paid from prepaid accounts	Benefits paid by tax revenues	Aggregate PRIME account contributions	PRIME contributions + benefits paid by taxes	Corporate tax contribution	PRIME contributions + net taxes	Transition tax
2000	4.17	0.00	4.17	5.43	9.61	0.35	9.26	5.09
2010	5.38	0.00	5.38	4.70	10.08	1.77	8.31	4.14
2020	7.81	3.69	4.12	3.45	7.56	3.31	4.26	0.09
2030	10.44	8.54	1.90	2.82	4.72	4.31	2.67	0.00
2040	11.71	11.30	0.41	2.69	3.10	4.61	2.67	0.00
2050	12.07	12.07	0.00	2.67	2.67	4.66	2.67	0.00
2060	13.16	13.16	0.00	2.67	2.67	4.79	2.67	0.00
2070	14.33	14.33	0.00	2.67	2.67	4.73	2.67	0.00

[a] Assumptions: constant 5.4% after-tax marginal productivity of capital; $43.80 monthly premium in 1998; HCFA Medicare growth rates; and 4.17% implied Medicare tax rate.

prepay their retirement health insurance of cohorts between age 22 and age 54 in 2000 exceed 2.67%. With PRIME account contributions earning a realized 5.4% marginal productivity of capital, individuals up to 35 years of age can prepay their Medicare at less than the current Medicare 4.17% implied tax rate. However, transition tax revenues are required to supplement the contributions of individuals 36 to 54 years of age whose required contribution rate is higher than 4.17%. In 2000, aggregate PRIME account contributions equal 5.43%. Aggregate PRIME account contributions gradually decline to the long-run 2.67% level in future years as an increasing share of the labor force is under the prepaid system for their entire work-life.

The sum of aggregate PRIME account contributions and the benefits that must be paid by tax revenues is shown in column five. Between now and 2020, this amount exceeds the pay-as-you-go tax rate from the first column, but in every year that follows, the cost of prefunding is less than the status quo tax rate. However, the true cost of prefunding is actually less than is indicated by comparing the fifth and first columns. Recall that, in this simulation, individuals are assumed to earn the after-corporate-tax marginal productivity of capital on their PRIME accounts. Since any additions to the capital stock earn the precorporate tax rate of return, the difference between the before and after tax rate of return represents additional corporate tax revenues on the incremental capital. The incremental corporate taxes increase federal, state, and local tax revenues.

Because the prepaid accounts replace anticipated Medicare payments, aggregate PRIME accounts net of draws represent incremental capital. If the additional federal corporate taxes are used to facilitate the transition to prepaid Medicare, the length of the transition period can be shortened. The sixth column presents the contribution of these additional corporate taxes to the transition cost, where we assume that 67% of total corporate taxes that arise from earning on the incremental capital stock is available to assist in the transition to prepaid Medicare, allowing state and local governments to keep their share of the additional tax revenue. Subtracting the additional corporate taxes from column five yields net taxes and PRIME account contributions. Comparing the values in column five to those in column one reveals that, by 2015, total transition costs are less than the costs of maintaining pay-as-you-go financing. The final column in the table is obtained

by subtracting the implied tax from total transition costs. It shows the costs of the transition that are over and above the current implied tax rate.

The previous simulation used corporate taxes arising from earnings on the incremental capital as a funding source. Implicitly, most of the corporate taxes were used to help fund private accounts. A more transparent way to capture the full earnings from the additional capital stock is to assume that all taxes are deferred on PRIME accounts. The results of a simulation in which we allow PRIME accounts to earn the before-tax marginal productivity of capital but drop the assumption of a constant marginal productivity of capital are presented in Table 6.3. We assume that PRIME accounts begin earning the full 8.5% marginal productivity of capital, but as the capital stock rises, the marginal product of capital is allowed to fall. Also, since the increased capital stock increases the capital-labor ratio, wages rise. This wage rate effect is also included in this simulation.

To establish a baseline capital stock, we follow Feldstein and Samwick (1997) in assuming Cobb-Douglas production technology and a 25% capital share. We also follow their assumption that Gross Domestic Product (GDP) is equal to a constant 37% of the capital stock. GDP is forecast using our projections of aggregate earnings combined with the Social Security Administration's (Yang and Goss 1992) estimate that taxable payroll will represent between 44% and 46% of GDP in the future.

Using this baseline estimate of the capital stock, we identify the effects of the incremental capital stock resulting from the net accumulated PRIME accounts on the time path of the rate of return on capital and the wage rate. With these estimates in hand, the contribution rates and aggregate taxable earnings are recalculated. The first column in Table 6.3 is identical to the first column in Table 6.2. It is presented for comparison to the second column, which identifies the Medicare costs as a percentage of the higher tax base resulting from the higher earnings associated with a larger capital stock. By 2020, Medicare as a percentage of the taxable payroll falls from 7.81% to 7.51%. This decline is the result of a 4% increase in aggregate wages. By 2050, wages will be 5.76% higher, and as a result, Medicare as a percentage of payroll falls from 12.07% to 11.41%.

Table 6.3 Medicare Simulation Results[a] (% of taxable payroll)

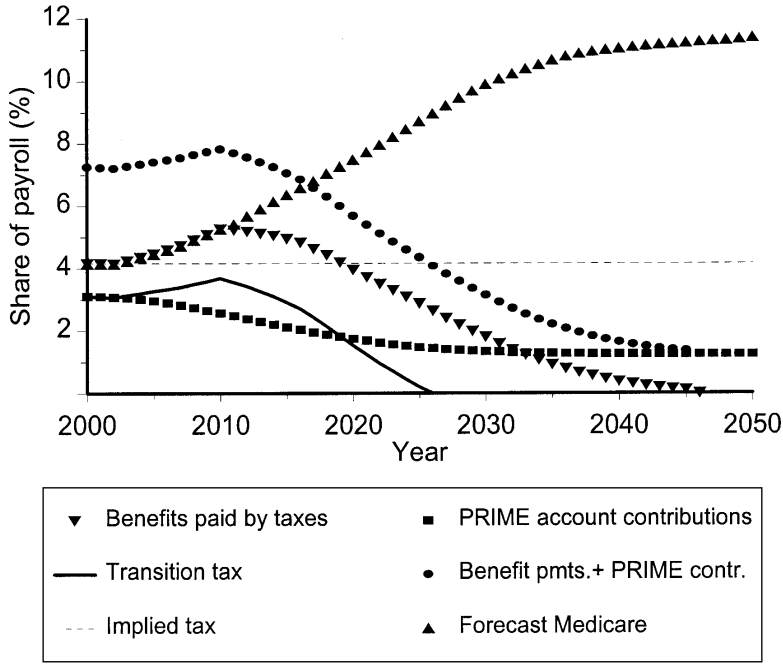
Year	Status quo Medicare tax rate	Forecast Medicare costs	Benefits paid from prepaid accounts	Benefits paid by tax revenues	Aggregate PRIME account contributions	Transition tax	Medicare tax + transition tax
2000	4.17	4.17	0.00	4.17	3.13	3.13	7.30
2010	5.38	5.27	0.00	5.27	2.57	3.68	7.85
2020	7.81	7.51	3.55	3.96	1.75	1.54	5.71
2030	10.44	9.91	8.11	1.80	1.35	0.00	3.16
2040	11.71	11.07	10.68	0.39	1.27	0.00	1.66
2050	12.07	11.41	11.41	0.00	1.26	0.00	1.26
2060	13.16	12.45	12.45	0.00	1.26	0.00	1.26
2070	14.33	13.65	13.65	0.00	1.26	0.00	1.26

[a] Assumptions: 8.5% marginal productivity of capital; $43.80 monthly premium in 1998; HCFA Medicare growth rates; 4.17% implied tax rate; and individuals born in 1946 and later are in the new system.

The next two columns in Table 6.3 are the same as those in Table 6.2 with the same titles, but they use the higher taxable wage base as the denominator. The aggregate PRIME account contributions are lower than in the previous table, given the higher starting marginal productivity of capital retained by the accounts. However, the ultimate contribution rate of 1.26% is higher than 0.87% rate presented in Table 6.1, which was based on a constant 8.5% marginal productivity of capital. The decline in the marginal productivity of capital outweighs the increased wages to produce the higher contribution rate. Next we present the transition tax, which again measures the total of the Medicare benefits that must be paid by tax receipts and PRIME account contributions less the implied 4.17% tax rate. The final column in Table 6.3 identifies the total costs of the transition, the sum of the PRIME account contributions and transition taxes, as a percentage of payroll.

Figure 6.2 depicts series from Table 6.3. As seen from the graph, the future costs of financing retirement medical care are significantly

Figure 6.2 Benefit Payments and Prepaid Account Contributions



reduced at the expense of higher current costs. The most telling comparison is between the forecast Medicare series and the benefit payments plus PRIME account contribution series. This comparison shows that, by 2016, total transition costs fall below pay-as-you-go costs and continuing falling thereafter. Thus, for the next 16 years, the transition to prepaid Medicare can be accomplished beginning with an initial transition tax of 3.13%. The solid line in Figure 6.2 depicting the transition tax shows that by 2026 total transition costs will fall below the current implied tax rate of 4.17%. However, this transition tax overstates the relative burden of moving to a prepaid system, in that it reflects the tax burden over and above a static tax rate of 4.17% rather than the pay-as-you-go tax rate that would be required if status quo Medicare financing is retained. Relative to the pay-as-you-go tax rate, the additional burden of the transition tax falls continuously and reaches zero within 16 years.

The percentage increase in the capital stock due to the transition to prepaid Medicare is presented in Table 6.4. Ultimately, prepaying Medicare will increase the capital stock 25% over projected baseline estimates. The associated reductions in the marginal productivity of

Table 6.4 Effects of the Larger Capital Stock on the Rate of Return and on the Wage Rate (%)

Year	Increase in the capital stock	New rate of return on capital	Increase in the wage rate
2000	1.39	8.41	0.35
2005	4.31	8.24	1.06
2010	8.17	8.01	1.98
2015	12.62	7.78	3.02
2020	16.94	7.56	3.99
2025	20.61	7.39	4.80
2030	23.16	7.27	5.35
2035	24.54	7.21	5.64
2040	25.09	7.19	5.76
2045	25.24	7.18	5.79
2050	25.09	7.19	5.76

capital and increases in wage rates are also presented. In the long run, the marginal product of capital falls from 8.5% to 7.2% and wage rates rise 5.8% relative to the baseline.

PREPAYING NO-FIRST-DOLLAR-COVERAGE INSURANCE

In the previous simulations, the benefit package was identical to current Medicare net of premium payments, and future expenditures were projected by allowing per capita expenditures to grow at the rates used in the 1998 Trustees report. Replacing the current two-part benefit package with a single, higher-deductible policy lowers the transition cost, brings about demand-side reductions in the level of expenditures, and may induce significant supply-side responses lowering the cost of medical care provision.

In a final simulation, we investigate prepaying higher deductible policies for the baby-boom and subsequent generations using cost estimates from Chapter 5, assuming an initial marginal product of capital of 8.5%, and assuming that per capita health care expenditures rise at the rates assumed in the previous simulations. Thus, we make a conservative assumption that switching to higher deductible insurance does not lower the growth rate in expenditures. Taking into account the capital stock effects on wages and the marginal product of capital, the contribution rate for new entrants is 1.02% of lifetime earnings. This leaves 3.15% of the implied tax to fund the contributions of older baby boomers and the expenditures of current beneficiaries. As a result, the initial transition tax falls from 3.13% to 2.58% of payroll. Again, by 2016, the total costs of prepaying PRIME accounts and paying for the expenditures of patients who remain in the old system fall below the tax rate required to maintain the status quo pay-as-you-go Medicare financing system.

Should the baby boomers prepay higher deductible retirement insurance, their benefits will be lower than those of the preceding retirees who remain in the current system, producing a “notch generation” who retire with a lesser level of retirement insurance coverage. However, policy changes within the current system, such as increases in the retirement age or higher Part B premiums, will also result in lower life-

time benefits for future retirees. Thus, the relevant comparison is between the higher deductible policy and what the benefit package must become by 2010, the year preceding the retirement of the oldest baby boomers. It may well be the case that lifetime benefits will be reduced in some way to reduce the pay-as-you-go tax burden. We have estimated that the higher deductible policies are 16% less expensive than Medicare, taking into account Part B premiums. Any reforms between now and 2011 that reduce per-capita Medicare payments by 16% will eliminate any concerns of a notch generation.

GENERATIONAL CONSIDERATIONS

The previous section raised the issue of how a transition to prepaid Medicare affects different generations. Importantly, how the burden of the transition affects various generations determines its immediate attractiveness. With a transition structured in the way we have discussed, all workers pay an equal transition tax rate in each year. In the second simulation, the transition costs exceed pay-as-you-go taxes for 16 years. As a result, the burden is greatest on the birth cohorts whose labor earnings for the next 16 years represent large shares of their lifetime earnings. Indeed, we find that the leading edge of the baby boom has the greatest reduction in the sum of remaining lifetime after-tax labor income plus Medicare benefits. Relative to a continuation of pay-as-you-go financing, those born in 1946 experience a 2.4% reduction in lifetime after-tax income and Medicare benefits, but all those born in 1962 and later experience higher lifetime after-tax income and benefits.

These generational burdens should be interpreted in light of the fact that baby boomers have been paying below the steady-state tax rate in the current pay-as-you-go regime because they have been supporting a small retired population. By being members of a large generation, their tax rates have been lower than would be necessary to support equal benefits in a constant population growth world. A transition to private accounts simply recognizes the implicit debt resulting from these tax under-payments. Further, our use of taxable payroll as an accounting metric leads to some problems that can be overcome

with the use of a tax that distributes the transition burden across generations more equally. The transitions we have outlined place the burden squarely on the shoulders of workers. By financing the transition with a business cash flow tax, for example, would increase generational equity and be less distortionary than a payroll tax (Kotlikoff and Sachs 1996).

CONCLUSION

In this chapter, we have outlined several possible transition scenarios. By the 16th year in the simulation in which the full pretax marginal product is credited to individual accounts, workers pay less in taxes and contributions to their PRIME accounts than the tax rate that would be required if the current pay-as-you-go Medicare financing system is retained. Furthermore, in all future years, workers pay lower taxes than would be needed to finance Medicare on a pay-as-you-go basis. Parts A and B of Medicare are replaced with fully funded real investment. Such investment will increase the nation's capital stock and provide the resources necessary to fund the retirement medical care of the baby boomers, while at the same time protecting the rights of older generations to retirement medical care.

The problem of the retirement population surge that will occur as the baby boomers leave the labor force is compounded by the fact that real per capita Medicare expenditures have been rising faster than the growth rate of the system's current financing base. The country's ability to cope with the unfunded Medicare liability depends on our willingness to harness these out-of-control health care expenditures. The approach we have suggested is the conversion of the current Parts A and B of Medicare into health insurance consisting of a high deductible and then 100% coverage. This type of health coverage makes consumers care what health care costs and will play a major role in restoring competition to the industry, but (as discussed above) the attractiveness of our transition path does not rest on the assumption of this less expensive insurance.

The transition we have investigated is designed such that all individuals born in 1946 and later are switched to prepaid insurance. We

consider the second simulation, which takes into account the effects of a larger capital stock on the marginal productivity of capital and wage rates, to be a reasonable projection of the consequences of prefunding Medicare. In that simulation, workers up to 43 years of age can prepay at rates that are less than the implied Medicare tax of 4.17%. Their excess contributions can go towards funding the older cohorts—those born before 1946—who remain in the to-be-amended Medicare system. The younger cohorts' contributions will also be used to subsidizing the prefunding of the baby boomers retirement health care. We estimate that the transition will save the country money when compared with the maintaining the status quo. A transitional tax is instituted to cover the transition cost. Once the last of individuals born before 1946 has left the system, all future generations are self-funded. At this point, we will have achieved a retirement health care system that will be free of uncertainty due to future generation size.

The estimates we have presented above assume a particular form for the transition to a private system of providing for the health care expenditures of the elderly. Our approach is only one of several financing methods, all of which can accomplish the end goal of moving us from generation-transfer-based Medicare to prepaid Medicare. Fundamentally, however, the financing issues we address in our transition must be faced whether or not any change is made in the form of Medicare financing. The elderly are going to consume real resources, and as the elderly population grows, younger generations are going to have to give up consumption in favor of the elderly no matter how Medicare is financed. The only real question is how these younger generations will be induced to give up the resources necessary to provide the elderly with the health care they demand.

There are only two ways for the elderly—especially those not working—to get resources from younger generations: government-enforced reductions in the younger generations' consumption through taxation, and voluntary reductions in consumption by the younger generations achieved through the sale of assets to the younger generations. In the projections of the transition, we assume that any shortfall in revenues are financed by a transitional tax. The transition costs exceed the cost of maintaining the current system for 16 years, but in every year thereafter they are less.

Importantly, the additional borrowing or taxation will be required whether or not we move the financing of Medicare from a pay-as-you-go generational transfer to a prepaid system. The elderly will still consume health care, and we are still committed to pay for it. The only way to pay for the health care of the increased population of elderly is to take resources from the working population. If we leave the current generation-transfer-based Medicare in place, tax rates will double over the next 25 years. On the other hand, if we embark on a transition to a prepaid system, financing the gap in revenues and expenditures with a combination of contributions to private accounts and transition taxes, the total resource commitment will be reduced. No matter what we do, if we honor the commitments we have made to the elderly population, some sacrifice must be made by younger generations. We can reduce the pain, but we cannot make it go away.

The current generation-transfer system of financing Medicare is inefficient. It results in a reduction in the nation's capital stock and in national income. The great benefit of making the transition to a prepaid system now is that the earnings of the baby boom generation can, at least for the next decade, be used to help finance the transition. Without prefunding, the baby boomers' retirement medical care consumption will have to be financed wholly through contemporaneous taxation. Given a commitment of meeting the demand of providing health care for the elderly, the fact that some of these resource demands can be satisfied by increased production resulting from a move to prepaid financing of elderly health care expenditures is a strong argument for proceeding at all possible haste to a such a system. In addition, we can enhance the efficiency of the health care delivery system and reduce the cost of the transition by introducing no-first-dollar-coverage health insurance.

Notes

1. We have chosen to analyze Medicare as a retirement health insurance program. We consider disability insurance to be a general welfare issue and for this reason omit it from the remaining analysis.
2. The U.S. Census Bureau data has population counts from ages 0 to 100. The youngest birth cohort remaining in the old (tax-supported) system was born in 1945, so the last population count for members of this cohort is in 2045, when they are 100 years of age.

7
Conclusions and Other Issues in the Medicare Reform Debate

The Medicare reform issues presented in the previous chapters have dealt with the three aspects of the Medicare program that have worked together to get us to the current situation: a payment scheme that ensures the users of the system will not care what it costs; a financing system that involves generation transfers as its principal source of revenue; and the penchant of Congress to fund "worthy" causes with any funds that appear available. By moving from generation-transfer financing to prepaid Medicare, we remove the inefficiencies induced by the adverse effects of the previous system on the incentive to invest in the nation's capital stock. Changing the form of insurance to catastrophic coverage with no first-dollar coverage makes consumers of health care evaluate what it costs. When consumers care what health care costs, suppliers will have to compete for consumer dollars and this competition will reduce the cost of care. The best thing about our solution is that it removes an inefficient institution and replaces it with an efficient institution, producing an increase in national earnings.

THE ISSUE IS THE STOCK OF CAPITAL, NOT THE RATE OF RETURN

Much of the discussion of the transition cost to a prefunded Medicare system in Chapter 6 was based on rates of return on private accounts that exceed the rate of return on government bonds. Casual observation of this fact may lead one to conclude that our proposal is based on this higher rate of return, and that if the existing Medicare Trust Fund were invested in higher-yielding securities, no change in the system would be necessary. Such a conclusion misses the point. Indeed, rate of return is not the issue for two reasons. First, the current Medicare Trust Fund contains no assets and never has. Granted, it does

have accounting entries that are entered as assets, but the fact of the matter is that these are accounting entries only. The Medicare Trust Fund—and the Social Security Trust Fund, for that matter—is pure fiction; there are no assets in either fund. One can see the vacuous nature of the contents of the trust funds by answering the following question: How would the future tax payments by any citizen be affected if the trust fund were twice its current size, or if it did not exist at all? The answer is that future tax payments by the working population are independent of the level of assets in the trust funds!

In both the Medicare and Social Security trust funds, the revenues in any year enter the fund and are then treated by the federal government as general revenues and spent. True, the Treasury gives the Medicare Trust Fund a government security that has a stated yield, but because the tax proceeds are spent on general expenditures and not invested, the trust fund does not contain title to any real assets. All future expenditures that are scheduled to come from the trust fund must actually come out of the general federal government budget. It is as if you establish a trust fund for your children's education and then use your entire contribution to that trust fund for an annual trip to Paris, while placing an IOU in the trust fund. No matter what interest rate you place on the IOUs, your children's education depends entirely on your willingness to constrain your own consumption when your children start college. Thus, the rate of return on the Medicare Trust Fund is irrelevant because there are no assets in the fund. When current revenues into the Medicare Trust Fund fail to cover current Medicare expenditures, the total amount of the shortfall must come from taxpayers, which is exactly what would happen if there were no trust fund!

The benefits of prefunding Medicare come from the removal of the inefficiency inherent in generational transfers. The fact that working generations expect that their retirement Medicare will be provided by future generations creates incentives for increased present consumption and early retirement. Both of these effects result in a level of investment that is below the level of investment if each generation is expected to provide for its own retirement health care. Thus, part of our reform plan for Medicare takes advantage of the increase in the nation's capital stock that will occur when we move to prepaid financing of retirement health care.

TRANSITION ISSUES

Any transition to market institutions, whether instantaneous or gradual, must answer the question of how to deal with the debts of the old regime. In our case the debts are the health care benefits promised to the currently retired and soon-to-be retired population.[1] To put this problem in perspective, in the United States for example, the present value of the unfunded liabilities of the two retirement programs, Social Security and Medicare, are more than $12 trillion, a sum that is approximately four times the acknowledged federal debt. This retirement system debt is the result of a larger-than-normal working generation paying taxes at a rate only sufficient to fund the retirement of a small retired generation. This same tax rate, when applied to the coming small working generation, will be insufficient to fund the retirement of a large retired generation.

A key element in reforms of elderly entitlement programs around the world is the potential for the rate of return on private investment to be much higher than the rate of return implicit in pay-as-you-go generation transfer systems of funding retirement benefits. Even if a significant disparity exists between these rates of return, however, this does not mean that every generation would be better off with a transition from an existing public pay-as-you-go retirement benefits system to a prefunded system. The key to understanding the generational distribution of the cost and benefits of a transition from pay-as-you-go financing to prefunded financing of Medicare is the "transition cost" that must be incurred to deal with the huge implicit debts in the form of accrued Medicare benefits.[2]

One way to deal with the implicit debts of an inherited elderly entitlement system is to recognize the debt by making it explicit, while at the same time making current and future working generations pay for servicing the newly recognized debt. It has been shown in several contexts that, when the additional taxes raised to service the additional debt are taken into account and when the debt management taxes are scheduled in such a way that the total debt (explicit and implicit) schedule remains unchanged after prefunding, the true rate of return that each generation can get from a prefunded system would be the same low rate of return implicit in any previously existing generation-

transfer system. Moreover, it has been found in these contexts that prefunding of an existing pay-as-you-go system with transition costs financed through the issuance of additional external debt cannot make any difference in the nation's capital stock.[3] Thus, a nation cannot borrow its way out of the debt implicit in a generation-transfer-financed elderly entitlement system.

If a nation cannot borrow its way out of the accrued debt, is there any alternative to simply sticking with the status quo? One way to deal with the accrued Medicare debt is to bite the bullet and raise taxes immediately by an amount sufficient to amortize the entirety of future promised benefits. Most Social Security privatization proposals in the United States have adopted this way of financing the transition cost. As admitted in these proposals, however, it is often the case that the long-run (and overall) benefits of a transition financed by immediate tax increases come only at a cost to the initial working generations. Although some studies have claimed an efficiency gain from following this type of transition path, using a criterion of discounted present value (Feldstein 1995, for example), a comparison between gains to one generation and costs to another generation must resort to an across-generation welfare function. Moreover, as pointed out by Mariger (1997), any alleged efficiency gain from a privatization, followed by the non-neutral debt management taxes intended to deal with the newly created debt, can be accomplished by bringing forward the debt retirement schedule with respect to the existing explicit debt and leaving the pay-as-you-go system intact.

The assessment of the efficiency gain from prefunding Medicare that is based solely on rate-of-return comparisons is open to criticism. The criticism applies to the argument that the private option should be more attractive because the rate of return from private investments is larger than the growth rate, as well as to the more sophisticated version that, with the transition cost taken into account, the rate of return one can get by investing one's Medicare contributions in the private sector would be the same rate one would get from the pay-as-you-go system. As pointed out by Murphy and Welch (1998), incentives do matter. Factors that may change incentives and have efficiency consequences include alternative tax bases, higher national saving, and a lower marginal tax rate on labor income from privatization.

In our discussion of the transition in Chapter 6, we simulated the effect on the capital stock under different assumptions concerning the financing of the transition. The transition we suggest requires initial tax payments in excess of currently existing tax but future taxes that are much lower than those that would exist if Medicare benefits are paid with contemporaneous taxes. Thus, it is not a Pareto-improving transition. While future generations will be better off as a result of the larger capital stock they will inherit, the current generation must give up current consumption to generate this larger capital stock.[4]

SOCIAL SECURITY AND MEDICARE PREFUNDING

While the issues surrounding the movement to prepaid financing are the same for Social Security and Medicare, certain very important differences should be noted in how the resulting accounts must be managed. Our approach to Medicare is to have recipients purchase, at the time of retirement, a long-term health policy that has certain minimum characteristics. Thus, in contrast to Social Security, all retirees must have sufficient funds in their Medicare accounts for the purchase of the required minimum health care coverage. To ensure that the accounts have this base capital value, the freedom of individuals to manage their Medicare accounts must be limited. We must accept the fact that, as a society, we will allow individuals to have very different levels of general retirement consumption but a much smaller difference in the level of retirement health care.

POLITICAL CONSIDERATIONS

The Medicare reform we suggest is in a very real sense, apolitical. We can move to prepaid financing of Medicare and achieve all the benefits of the increased capital stock without affecting the level of redistribution. Our suggested reform is not about redistribution, but about putting something aside for the future. This does not mean that our reform is not without political implications. To the extent that mem-

bers of Congress are aided by the complexity of Medicare and their ability to micromanage the current system, they lose power by allowing individuals to be in control of their own Medicare accounts. Additionally, the health care industry has a strong interest in the status quo, under which consumers do not care what health care costs. We must not lose sight of our ultimate goal while fine-tuning the details of moving to a private-account-based system of financing.

CONCLUSION

In our analysis, we have shown that using reasonable assumptions concerning male and female earnings distributions and just average rates of return on investments in our nation's capital stock, the younger generations can guarantee their retirement medical expenditures for a fraction of their current Medicare taxes. Moreover, the transition from the current system to our system has a much smaller unfunded liability than maintaining the existing Medicare system. Essentially we achieve this benefit with real capital. By removing the disincentive to invest that is inherent in the current generation-transfer system of financing Medicare, the nation will experience an increase in capital and income. We rely on this increase in capital to provide some of the additional resources required to deal with the current system's unfunded liability. Moving to prepaid retirement health insurance is just good business.

The pending retirement of the baby boomers looms like a dark cloud over the present Medicare system. However, by harnessing their earning power today we can move to a system of prefunded retirement medical insurance. If we act quickly, we can move all the baby boomers into the new system. This allows us to begin paying for the transition while the boomers, who currently account for more than 60% of all federal tax revenues, are still productive members of the population.

Notes

1. For an expanded discussion of the issues of the transition from a pay-as-you-go elderly entitlement system to a prefunded system, see Liu, Rettenmaier, and Saving (2000).
2. The term *transition cost* has been widely used in policy debates concerning Social Security reform. In fact, privatization does not generate any additional cost—at least not the kind of cost captured by this term, but serves only to bring the implicit government debts in terms of accrued benefits in the pay-as-you-go system to the surface.
3. See Murphy and Welch (1998), Geanakoplos, Mitchell, and Zeldes (1998), and Mariger (1997) for discussions of this point.

APPENDIX A: Appendix to Chapter 3

We write the common preference function for individual born in period t as

Eq. A.1 $U = U(c_t^t, c_t^{t+1}),$

where c_t^t and c_t^{t+} are, respectively, consumption in period t and consumption in period $t + 1$. Assume that each individual has one unit of labor to supply in the first period of life and then retires in the second period. On the production side, assume common individual production functions that, given the one unit of labor available in period t and using capital purchased from the retired generation, permit the production of output that can be designated on a once-and-for-all basis as either capital or consumption. Denote this production function as

Eq. A.2 $y_t = f(k_t),$

where y_t and k_t are, respectively, the output and the capital stock purchased by the representative individual in period t.[1] Because output can be capital or consumption, at any point in time individuals can add to their stock of purchased capital by consuming less, so that behavior is constrained by

Eq. A.3 $y_t = c_t^t + P_t k_t + \Delta k_t + f(k_t).$

where P_t is the period-t price of capital in terms of consumption units and Δk_t is the contemporaneous production of capital. Assuming a constant rate of capital depreciation δ, consumption in period $t + 1$ for generation-t individuals is

Eq. A.4 $c_t^{t+1} = P_{t+1}\left[k_t + (\Delta k_t - \delta k_t)\right].$

To maximize lifetime utility, the representative consumer of generation t decides at the beginning of time t how much productive capital to purchase (k_t) and how much additional capital to produce (Δk_t), which then determines consumption at $t + 1$ given the capital prices in both periods. Note that in choosing k_t and Δk_t, current and future consumption c_t^t and c_t^{t+1} are simultaneously determined through the budget constraints in Eq. A.3 and Eq. A.4. The first-order conditions governing the choice of Δk_t and k_t are derived as follows.

First, the choice of the pair k_t, Δk_t must be such that

Eq. A.5 $$\frac{U_{c_t^{t+1}}}{U_{c_t^t}} = \frac{1}{P_{t+1}}.$$

Although the choice of k_t can be determined as another first-order condition of the individual's maximization problem, we find the following alternative (but equivalent) approach to be more intuitive. Since the supply of k_t is fixed and determined exogenously by the aggregate capital stock left over from generation $t-1$ and the population of generation t, the price of capital is determined by the marginal willingness to pay by members of generation t.

The marginal value of capital to members of generation t is in two parts: the marginal productivity of capital in producing current consumption and the consumption value of capital carried over to the second period. One unit of purchased capital after depreciation purchases $(1-\delta)P_{t+1}$ units of future consumption, and when used to produce output yields the net marginal productivity of capital in units of present consumption. Thus, the price of capital at any time t must be

Eq. A.6 $$P_t = f'(k_t) + (1-\delta)P_{t+1}V_{c_t^{t+1}},$$

where $V_{c_t^{t+1}}$ is the value of future consumption in terms of present consumption, which must be equal to $\left(U_{c_t^{t+1}} / U_{c_t^t}\right)$. By applying Eq. A.5 and solving for the price of capital, Eq. A.6 becomes

Eq. A.7 $$P_t = f'(k_t) + 1 - \delta.$$

For a constant-population-growth economy, the steady-state solution for this model requires that the per capita capital stock and the price of capital be constant. Denoting the constant growth rate of population as n, the per capita capital stock at t is related to that at $t+1$ as

Eq. A.8 $$k_{t+1} = \frac{k_t + \Delta k_t - \delta k_t}{1+n}.$$

The steady state requires that $\Delta k_t - \delta k_t = nk_t$ and that $P_{t+1} = P_t$. Because we are interested in considering generation size shock and because the fertility rate in the developed world is less than the population-sustaining rate, we will concentrate most of our discussion below on a zero population growth rate.[2]

Given that the economy is in the steady state, the following three equations characterize the prepaid retirement equilibrium,

Eq. A.9a $$c_t^t + c_t^{t+1} = f\left(\frac{c_t^{t+1}}{P}\right) - \delta\frac{c_t^{t+1}}{P}$$

Eq. A.9b $$\frac{U_{c_t^{t+1}}}{U_{c_t^t}} = \frac{1}{P}$$

Eq. A.9c $$P = f'\left(\frac{c_t^{t+1}}{P}\right) + 1 - \delta\,.$$

Equations A.9 fully characterize the steady-state competitive equilibrium level of c_t^t, c_t^{t+1} and P, with $k_t = c_t^{t+1}/P$ being the equilibrium per capita capital stock.[3]

LUMP-SUM INTERGENERATIONAL TRANSFERS

Consider a per-capita lump-sum tax, T, imposed on generation t, (the working generation) and distributed to generation $t-1$ (the retired generation). This lump-sum-tax-financed intergenerational transfer requires changing budget constraints (Eq. A.3) and (Eq. A.4) respectively to

Eq. A.3´ $$c_t^t + P_t k_t + \Delta k_t = f(k_t) - T$$

and

Eq. A.4´ $$c_t^{t+1} = P_{t+1}\left[k_t + (\Delta k_t - \delta k_t)\right] + T\,.$$

Accordingly, the steady-state equilibrium characterizing conditions become

Eq. A.10a $$c_t^t + c_t^{t+1} = f\left(\frac{c_t^{t+1} - T}{P_T}\right) - \delta\left(\frac{c_t^{t+1} - T}{P_T}\right)$$

Eq. A10.b $$\frac{U_{c_t^{t+1}}}{U_{c_t^t}} = \frac{1}{P_T}$$

Eq. A10.c $$P_T - f'\left(\frac{c_t^{t+1} - T}{P_T}\right) + 1 - \delta\ ,$$

where P_T denotes the equilibrium price of capital under a lump-sum-tax-financed transfer.

The economic effects and welfare implications of a lump-sum intergenerational transfer amounts to a comparison of Eqs. A.10 with Eqs. A.9. By comparing Eq. A.9c and Eq. A.10c, it is easily shown that, under fairly normal assumptions on preferences and technology, an intergenerational transfer from the young to the old always reduces the equilibrium capital stock; hence, $P_T > P$.[4] This finding is consistent with empirical and theoretical work done by Feldstein (1974, 1985) and Kotlikoff (1979).

INCOME-TAX-BASED INTERGENERATIONAL TRANSFERS

When an intergenerational transfer of size T per person is financed through a proportional income tax τ, the steady-state equilibrium characterizing conditions become

Eq. A.11a $$c_t^t + c_t^{t+1} = f\left(\frac{c_t^{t+1} - T}{P_\tau}\right) - \delta\left(\frac{c_t^{t+1} - T}{c_t^{t+1}}\right)$$

Eq. A.11b $$\frac{U_{c_t^{t+1}}}{U_{c_t^t}} = \frac{1}{P_\tau}$$

Eq. A.11c $$P_\tau = 1 + (1-\tau)\left[f'\left(\frac{c_t^{t+1} - T}{P_\tau}\right) - \delta\right]$$

Eq. A.11d $$\tau\left[f\left(\frac{c_t^{t+1} - T}{P_\tau}\right) - \delta\frac{c_t^{t+1} - T}{P_\tau}\right] = T\,,$$

where P_τ is the steady-state equilibrium price of capital when the intergenerational transfer is financed by an income tax.

The relative performance of the income-tax-financed intergenerational transfer against the laissez-faire and lump-sum-tax-financed transfer is, of course, determined by the solution to Eqs. A.11 as compared with Eqs. A.9 and Eqs. A.10, respectively. What is of most importance is to establish that an intergenerational transfer, regardless of its financing method, is always welfare-reducing. It can be rigorously proved that $P_\tau > P$, so that in the income tax world, the equilibrium price of capital is greater than the laissez-faire world price of capital.

LABOR SUPPLY EFFECTS

Denote the level of leisure demanded during an individual's working period as ℓ_t and rewrite the individual's preferences as

Eq. A.12 $U = U(c_t^t, c_t^{t+1}, \ell_t)$.

The per capita output is now

Eq. A.13 $(1-\ell_t) f\left(\frac{k_t}{1-\ell_t}\right)$,

where k_t is the per capita capital stock.[5]

In a world without any transfer, the budget constraints facing a representative generation-*t* individual are

Eq. A.14 $c_t^t + P_t k_t + \Delta k_t = (1-\ell_t) f\left(\frac{k_t}{1-\ell_t}\right)$

and

$$c_t^{t+1} = P_{t+1}\left[k_t + \left(\Delta k_t - \delta k_t\right)\right].$$

Proceeding to the steady state, the following equations characterize the equilibrium values of the relevant variables:

Eq. A.15a $c_t^t + c_t^{t+1} = (1-\ell) f\left(\frac{k}{1-\ell}\right) - \delta k$

Eq. A.15b $\frac{U_{c_t^{t+1}}}{U_{c_t^t}} = \frac{1}{P}$

Eq. A.15c $\frac{U_{1_t}}{U_{c_t^t}} = f\left(\frac{k}{1-\ell}\right) - \left(\frac{k}{1-\ell}\right) f'\left(\frac{k}{1-\ell}\right)$

Eq. A.15d $P = f'\left(\frac{k}{1-\ell}\right) + (1-\delta)$

Eq. A.15e $c_t^{t+1} = Pk$.

We should note here that, without loss of generality, we can define the labor supplied in equilibrium as 1. Thus, the equilibrium conditions for this problem are identical to those for the problem considered above once the optimal labor

supply is determined. We shall use this characteristic of the equilibrium in the discussion below.

The two critical characterizing equations for the steady state with an intergenerational transfer of size T that is financed by lump-sum tax are

Eq. A.16a $$\frac{U_\ell}{U_{c_t^t}} = f\left(\frac{c_t^{t+1}-T}{P_T(1-\ell)}\right)-\left(\frac{c_t^{t+1}-T}{P_T(1-\ell)}\right)f'\left(\frac{c_t^{t+1}-T}{P_T(1-\ell)}\right)$$

Eq. A.16b $$P_T = 1+\left[f'\left(\frac{c_t^{t+1}-T}{P_T(1-\ell)}\right)-\delta\right],$$

and the corresponding equations for that financed by an income tax are

Eq. A.16c $$\frac{U_t}{U_{c_t^t}} = (1-\tau)\left[f\left(\frac{c_t^{t+1}-T}{P_T(1-\ell)}\right)-\left(\frac{c_t^{t+1}-T}{P_T(1-\ell)}\right)f'\left(\frac{c_t^{t+1}-T}{P_T(1-\ell)}\right)\right]$$

Eq. A.16d $$P_\tau = (1-\tau)f'\left(\frac{c_t^{t+1}-T}{P_\tau(1-\ell)}\right)-\tau\delta+(1-\delta).$$

Given the level of labor supplied in the prepaid world, $\hat{L}$, it follows that $P_{T\hat{L}} > P_{T\hat{L}} > P$ and that $k_{T\hat{L}} < k_{T\hat{L}} < k$. Consider Eqs. A.16a and A.16b. The transfer-induced reduction in the capital stock reduces the marginal product of labor, the right-hand side of Eq. A.16a, and therefore reduces labor supplied. As a result, there is a further reduction in the capital stock that increases the welfare cost of the transfer.

Given that the production function is homogeneous, the payments to labor (the payroll) can be expressed as

Eq. A.17 $$Y_L \equiv (1-\ell)f\left(\frac{k}{1-\ell}\right)-\left(\frac{k}{1-\ell}\right)f'\left(\frac{k}{1-\ell}\right),$$

so that the tax rate on payroll, τ_L, must be such that

Eq. A.18 $$T = \tau_L\left[(1-\ell)f\left(\frac{k}{1-\ell}\right)-\left(\frac{k}{1-\ell}\right)f'\left(\frac{k}{1-\ell}\right)\right].$$

From Eqs. A.17 and A.18, the relevant subset of equilibrium conditions are

Eq. A.19a $$\frac{U_\ell}{U_{c_t^t}} = (1-\tau_L)\left[f\left(\frac{c_t^{t+1}-T}{P_T(1-\ell)}\right)-\left(\frac{c_t^{t+1}-T}{P_T(1-\ell)}\right)f'\left(\frac{c_t^{t+1}-T}{P_T(1-\ell)}\right)\right]$$
$$-\tau_L\left(\frac{c_t^{t+1}-T}{P_T(1-\ell)}\right)^2 f''\left(\frac{c_t^{t+1}-T}{P_T(1-\ell)}\right)$$

Eq. A.19b $$P_L = \left[f'\left(\frac{c_t^{t+1} - T}{P_\tau(1-\ell)} \right) + \tau_L \left(\frac{c_t^{t+1} - T}{P_T(1-\ell)} \right) f''\left(\frac{c_t^{t+1} - T}{P_T(1-\ell)} \right) \right] + (1-\delta).$$

Unfortunately, a closed-form solution for the price of capital and the equilibrium stock of capital is beyond this chapter. However, a comparison of the income tax equilibrium characterizing equations from Eq. 3.16 with Eq. 3.19 yields some insight to the solution. First, payroll is less than total income, $\tau_L > \tau$. Second, the derivative of payroll with respect to the capital stock is $-kf''$, which is positive. Therefore, if the equilibrium price of capital remained the same with the income tax and the payroll tax, the payroll-tax capital stock would have to exceed the income-tax capital stock.

Notes

1. Consistent with the current literature, the production function is assumed to be derived from a linear homogeneous function in capital and labor, which can be written as $y_t = L_t F(k_t,1) = f(k_t)$, because $L_t \equiv 1$.
2. We are treating both population size and fertility as exogenous. Below, we discuss population size shocks but not fertility shocks. An interesting paper that treats fertility as endogenous is Barro and Becker (1989). The literature also contains discussions of optimal population growth rates (Samuelson 1975, 1976; Deardorff 1976; Gigliotti 1983; Eckstein and Woplin 1985; Nerlove, Razin, and Sadka 1987; Lopez-Garcia 1991).
3. While the social planner's problem would result in maximizing $c_t^t + c_t^{t+1}$, which requires that $f' = \delta$, there is no guarantee that the competitive solution will attain this result. As we shall show below, however, any implementation of transfers by a social planner result in a reduction in the per capita capital stock and community welfare.
4. In particular, the assumption of the absence of perverse time preference, defined as a preference for the future when consumption in both periods is equal, is sufficient but not necessary for this result.
5. Production specification Eq. A.13 captures the dependence of output on the labor supplied and the capital/labor ratio, and it is derived from a linearly homogeneous aggregate production function.
6. We should note here that this expression for labor income internalizes the effect of the choice of capital and the marginal product of capital. An alternative would have to impose the market price of capital in the expression for the payments to capital. In this form, $T = \tau_L \left\{ (1-\ell) f\left(\frac{k}{1-\ell} \right) - [(P-1)+\delta]k \right\}$, and in the case of fixed labor supply, the payroll tax has the same effect on the capital stock as a lump-sum tax. However, when labor is endogenous, this form of payroll tax is superior to the lump-sum tax.

APPENDIX B: Appendix to Chapter 4

THE MATHEMATICS OF THE PREPAID MEDICARE CONTRIBUTION RATE

The contribution rate required to provide for the retired health care needs of a cohort of age a_0 can be written as

Eq. B.1
$$C_{a_0} = \frac{\sum_{t=65-a_0}^{119-a_0} \frac{P_{a_0,t} b_{a_0,t}}{(1+r)^t}}{\sum_{t-0}^{64-a_0} \frac{P_{a_0,t} b_{a_0,t}}{(1+r)^t}}$$

where

a_0 = the cohort's age at the beginning of the transition to a prefunded Medicare program

C_{a_0} = the percentage of remaining lifetime earnings that must be saved to purchase retirement medical insurance given age a_0;

$P_{a_0,t}$ = the probability of surviving to year t for an individual of age a_0;

$b_{a_0,t}$ = the mean real retirement medical care insurance premium for cohort a_0 in year t;

r = real interest rate;

$y_{a_0,t}$ = the mean real income for cohort a_0 in year t.

Given this interpretation, $P_{a_0,t} = \prod_{t=a_0}^{a_0+t} S_i$, where s_i is the probability of surviving from age$_i$ to age$_{i+1}$. In effect, C_{a_0} is the tax rate that must be applied to mean cohort member's income in order to fund the retirement medical benefits of the cohort a_0.

The numerator of Eq. B.1 is the expected present value of the average retirement medical insurance benefits for members of a cohort, and the denominator is the expected present value of the average cohort member's income. The ratio of these two yields the appropriate tax rate for funding all members of a cohort of age a_0. The older the cohort at the time transition begins, the greater the contribution rate that is required to fund a given level of retirement Medicare benefits, for three reasons. First, the number of years of potential benefits is fixed because the calculation is for individuals who are less than 65 years of age. Thus, as a_0 rises, each future benefit is discounted by a smaller discount factor. Second, as a_0 rises, the number of years with earnings falls because the

cohort approaches retirement. Finally, as a_0 rises, the survival probabilities for retirement benefits rise.

FORECASTING THE TOTAL TAX BASE

To forecast the total tax base and, ultimately, the cohort profiles required for the contribution rate estimates, we rely on the following accounting. We begin with the aggregate annual earnings components for either men or women identified as

Eq. B.2 $Y_{ijt} = N_{ijt} P_{ijt} H_{ijt} W_{ijt}$,

in which

i = one of 12 age groups: 16–19, 20–24, 25–29, 30–34, 35–39, 40–44, 45–49, 50–54, 55–59, 60–64, 65–69, or 70–75;
j = categories for years of education, 0–11, 12, 13–15, 16, and 17+;
t = the year;
Y_{ijt} = annual earnings;
N_{ijt} = the number of individuals;
P_{ijt} = the proportion participating;
H_{ijt} = the average annual hours (conditional on participation), and
W_{ijt} = the average hourly wage (conditional on participation) for age group i and education cell j in period t.

With 12 age groups and 5 education cells for each sex, we have 120 age × education × sex cells. Omitting the cells for age group 16–19 in the education categories of college graduates and graduate school results in 116 age × education × sex cells.

THE THEORY UNDERLYING OUR GROWTH RATE CALCULATIONS

Time-Period Proportional Weights

Time-period proportional weights are formed by the ratio of the specific time period over the total time period of the data. For example, for a sample of T periods, the most recent period gets a weight of $\frac{T}{\sum_{t=1}^{T} t}$ and the first period gets a weight of $\frac{1}{\sum_{t=1}^{T} t}$. By construction, the sum of the time-period proportional weights is 1. Because the CPS data spans 33 years, we will have 32

growth rates, the first receiving a weight of 0.00189 and the last, for the 1994–1995 change, weighted by 0.06061 (32 times the size of the first period's weight). The proportional weights compare with the equal weight of 0.03125 that is implied in a simple average of the growth rates. Equation B.3 below calculates the weighted average hourly wages expressed in logarithms using weights that are proportional to the time period.

Eq. B.3 $$\bar{g}_{w_p} = \sum_{t=1}^{T} \omega_t g_{w_t}, \omega_t = \frac{t}{\sum_{t=1}^{T} t}, g_{w_t} = W_t - W_{t-1},$$

where $\bar{g}_{w_p}$ is the proportionally weighted average wage growth rate, ω_t is the weighting factor in time period *t*, and *W* is the wage. For simplicity, in this equation, the age and education subscripts are dropped. However, in our work we calculate a different growth rate for each age by education category.

Geometric Weighted Growth Rates

Geometric weights, an alternative to proportional weights, also weight recent annual growth rates more heavily. In Eq. B.4, $\beta = (1 + d)$, where *d* is the "discount" factor applied to the growth rates.

Eq. B.4 $$\bar{g}_{w_{G1}} = \sum_{t=1}^{T} \omega_t g_{w_t}, \omega_t = \frac{(\beta - 1)\beta^t}{\beta(\beta^T - 1)}, g_{w_t} = W_t - W_{t-1}\ .$$

The growth between the first and second period when ($d = 0.05$) is assigned a weight of 0.0133, and the most recent growth rate is assigned a weight of 0.0603. As with the proportional weights, the geometric weights sum to 1.

Geometric Weights Levels

We consider a final geometric weighted growth rate, introduced by Murphy and Welch (1992), which is applied to annual levels rather than annual changes. In Eqs. B.3 and B.4, the annual changes in the earnings component are differentially weighted by the degree to which we believe more-recent experience matters. This is an important characteristic of these weights if one considers the relatively flat real earnings for men since 1974 or the path of women's real earnings to be persistent trends. The growth rate presented in Eq. B.5 again relies on geometric weights, but rather than weighting annual changes like $\bar{g}_{w_p}$ and $\bar{g}_{w_{G1}}$ do, the most recent earnings component is compared with a geometrically weighted average of lagged values, with the earnings component expressed again in natural logs. This growth rate is one of two components of the

overall growth rate; the other is $\bar{g}_{w_T} = (W_T - W_0)/T$, which is the average growth rate based on the first and the last points in the data. In the in-sample forecasts in Table B.1, the growth rate calculated using Eq. B.5 with $\beta = 1.05$ produces the best overall projections,

Eq. B.5 $$\bar{g}_{w_{G2}} = \left(\frac{W_T - \overline{W}_L}{\bar{L}} \right)$$

where $\bar{L} = \dfrac{1 - \omega_0 T}{\omega_T - \omega_0}$ is the average lag, which is equal to 12.5 when $T = 32$ and $\beta = 1.05$, and $\overline{W}_L$ is a weighted average of the lagged values of the hourly wage as defined below, where k is the lag length:

$$\overline{W}_L = \frac{1}{(\omega_T - \omega_0)} \sum_{k=1}^{T} (\omega_{T+1-k} - \omega_{T-k}) W_{T-k}.$$

The relationship between $\bar{g}_{G1}$, $\bar{g}_T$, $\bar{g}_{G2}$ can be written as

$$\bar{g}_{G1} = (1 - \omega_0 T)\bar{g}_{G2} + \omega_0 T \bar{g}_T.$$

Thus, if growth over the entire time period exceeds growth over the recent past, then $\bar{g}_{G2}$ will produce the more conservative estimates.

MEASURES OF FORECAST ACCURACY

Table B.1 quantifies the accuracy of each forecast using the root-mean-squared error (RMSE) defined for wages (not expressed in logs) for the 1986–1995 forecast,

$$RMSE = \sqrt{\frac{\sum_{t=1986}^{1995} (W_t - \hat{W}_t)^2}{10}}.$$

The top section of Table B.1 presents the RMSE values for the 1986–1995 participation, annual hours, hourly wage, and annual earnings forecasts for men and women. The bottom section presents the RMSE values for the forecasts over the last five years of data. As expected from the series depicted in Figure 4.2, across all growth rates and for both in-sample forecast periods, the women's estimates are more accurate than the men's when the annual earnings are compared. For the first set of in-sample estimates, those using $\bar{g}_{G2}$ with $\beta = 1.05$ produce the most accurate participation, wage, and annual earnings projections. The next most accurate forecasts are those based on the $\bar{g}_{G2}$, $\beta = 1.02$

Table B.1 Root Mean Squared Errors for Forecast Earnings Components Using Alternative Growth Rate Estimates

	Men				Women			
Growth rates[a]	Participation	Hours	Wage	Annual earnings	Participation	Hours	Wage	Annual earnings
1986 to 1995 Forecast[b]								
ξ_T	0.0169	**32.70**[c]	1.52	2903.99	0.0530	**13.54**	0.52	1809.73
ξ_P	0.0083	33.17	0.82	1505.86	0.0396	15.58	0.26	1283.58
ξ_{GA} , $\beta = 1.02$	0.0143	34.47	1.34	2499.76	0.0499	14.15	0.45	1677.17
ξ_{GA} , $\beta = 1.05$	0.0113	33.77	1.10	2016.29	0.0457	15.42	0.36	1520.14
ξ_{GO} , $\beta = 1.02$	0.0079	36.38	0.71	1257.92	0.0385	17.04	0.21	1209.86
ξ_{GO} , $\beta = 1.05$	**0.0079**	35.02	**0.66**	**1211.19**	**0.0374**	18.29	**0.20**	**1198.63**
1991 to 1995 Forecast[d]								
ξ_P	0.0227	27.36	0.76	1822.18	0.0383	19.23	0.32	1206.65
ξ_P	**0.0154**	31.38	**0.50**	**1302.90**	**0.0277**	**19.10**	0.16	**826.61**
ξ_{GA} , $\beta = 1.02$	0.0215	27.40	0.68	1666.36	0.0361	19.70	0.28	1120.20
ξ_{GA} , $\beta = 1.05$	0.0202	27.27	0.59	1502.57	0.0332	20.43	0.23	1009.54
ξ_{GO} , $\beta = 1.02$	0.0178	27.53	0.52	1346.99	0.0297	21.13	0.17	868.89
ξ_{GO} , $\beta = 1.05$	0.0179	**27.19**	0.51	1322.98	0.0287	21.52	**0.16**	839.51

[a] ξ_E is the growth rate based on the endpoints in each series, ξ_P is based on proportional weights applied to annual changes, ξ_{GA} is based on geometric weights applied to annual changes, and ξ_{GO} is based on geometric weights applied to annual levels.

[b] Using growth rates estimated from 1963 to 1985.

[c] Bolded values are minimum root mean squared errors in each column for each forecast.

[d] Using growth rates estimated from 1963 to 1990.

pair, followed by the forecasts which rely on the proportionally weighted growth rates, $\bar{g}_p$. In the second set of forecasts, the proportional weights were most accurate. Based on these results, we will limit our projections in the following sections to include only those based on growth rates, $\bar{g}_p$ and $\bar{g}_{G2}$ with a β of 1.05.

DECISION RULES FOR ADJUSTING FORECAST MALE/FEMALE WAGE DIFFERENTIALS

Let $W_{w,ijt}$ ($F_{w,ijt}$, $H_{w,ijt}$) and $W_{m,ijt}$ ($F_{m,ijt}$, $H_{m,ijt}$) be the real wages (labor force participation rate, hours worked) associated with age/education category ij, at time t, for women and men, respectively, and let $\overline{gw}_{m,ij}(\overline{gf}_{m,ij}, \overline{gh}_{m,ij})$ be the growth rate of wages (labor force participation rate, hours worked) for males in age/education category ij. Then Decision Rules 1 and 2 can be written as

Decision Rule 1. If $W_{w,ijt}$ ($F_{w,ijt}$, $H_{w,ijt}$) first exceeds $W_{m,ijt}$ ($F_{m,ijt}$, $H_{m,ijt}$) in period t^*, and if $\overline{gw}_{m,ij}(\overline{gf}_{m,ij}, \overline{gh}_{m,ij}) > 0$, then $W_{w,ijt}$ ($F_{w,ijt}$, $H_{w,ijt}$) is set equal to $W_{m,ijt}$ ($F_{m,ijt}$, $H_{m,ijt}$) for all $t \geq t^*$. If $W_{w,ijt}$ ($F_{w,ijt}$, $H_{w,ijt}$) first exceeds $W_{m,ijt}$ ($F_{m,ijt}$, $H_{m,ijt}$) in period t^*, and if $\overline{gw}_{m,ij}(\overline{gf}_{m,ij}, \overline{gh}_{m,ij}) > 0$, then $W_{w,ijt}$ ($F_{w,ijt}$, $H_{w,ijt}$) and $W_{m,ijt}$ ($F_{m,ijt}$, $H_{m,ijt}$) are set equal to W_{m,ijt^*} (F_{m,ijt^*}, H_{m,ijt^*}) for all $t \geq t^*$.

Decision Rule 2. If $W_{w,ijt}$ ($F_{w,ijt}$, $H_{w,ijt}$) $> 0.95 \times W_{m,ijt}$ ($F_{m,ijt}$, $H_{m,ijt}$), in any period t, then $W_{w,ijt}$ ($F_{w,ijt}$, $H_{w,ijt}$) is set equal to $0.95 \times W_{m,ijt}$ ($F_{m,ijt}$, $H_{m,ijt}$) for that period t.

The same decision rule applies to real wages, labor force participation rates, and hours worked.

Given these two decision rules, whenever Decision Rule 1 applies, Decision Rule 2 would also apply, so that a value of $W_{w,ijt}$ ($F_{w,ijt}$, $H_{w,ijt}$) that invokes Decision Rule 1 is a sufficient but not necessary condition for Decision Rule 2 being invoked. However, applying Decision Rule 2 is necessary but not a sufficient condition for Decision Rule 1 to apply. As a result, the level of the forecast for $W_{w,ijt}$ ($F_{w,ijt}$, $H_{w,ijt}$) using Decision Rule 2 is less than or equal to the forecast obtained using Decision Rule 1 and strictly less than the Decision Rule 1 forecast when Decision Rule 2 is invoked.

FORECAST CROSS-SECTIONAL AND LONGITUDINAL AGE/EARNINGS PROFILES

Table B.2 gives in detail for each age and sex the actual forecast for average annual earnings. The left side of the table contains cross-sectional age/earnings profiles that we forecast for the years 2010 and 2020. For each of these years, each age is associated with a specific birth cohort. For example, the 22-year-old in 2010 is a member of the 1988 birth cohort and the 64-year-old in 2010 is a member of the 1946 birth cohort. The right side of the table contains longitudinal age earnings forecasts for the 1965 and 1975 birth cohorts. For each year of age for a member of the 1965 birth cohort, we show our forecast of average annual earnings by sex. The entries for the 1965 birth cohort before age 31 are all blank because the average annual earnings for the ages younger than 31 are observations from our CPS data set rather than forecasts of the future, because in 1995 (the last year for which we have data), a member of the 1965 birth cohort was 30 years of age. There are entries for all ages for the 1975 birth cohort because a member of the 1975 birth cohort would be 22 years of age until 1997, two years after our last data observation. By comparing the forecast average annual earnings contained in the longitudinal age earnings profile to those in the cross sections, the convergence of female average annual earnings toward the male average annual earnings is quite apparent.

Table B.2 Forecast Cross-Sectional and Longitudinal Cohort Age/Earnings Profiles[a] ($)

	Cross sections				Longitudinal by birth cohorts			
	2010		2020		1965		1975	
Age	Men	Women	Men	Women	Men	Women	Men	Women
22	10,176	6,348	10,083	5,995			10,657	6,886
23	11,952	7,955	11,647	7,716			12,576	8,217
24	13,666	9,442	13,138	9,293			14,409	9,491
25	15,398	10,901	14,707	10,893			16,201	10,764
26	17,180	12,438	16,413	12,688			17,987	12,099
27	18,991	14,023	18,215	14,625			19,762	13,486
28	20,798	15,582	20,051	16,572			21,512	14,882
29	22,604	17,065	21,932	18,458			23,239	16,267
30	24,470	18,472	23,970	20,282			24,997	17,649
31	26,425	19,821	26,214	22,067	27,564	15,783	26,829	19,043
32	28,434	21,113	28,597	23,798	29,097	16,686	28,737	20,438
33	30,449	22,300	31,032	25,392	30,702	17,608	30,697	21,798
34	32,424	23,309	33,437	26,728	32,324	18,532	32,679	23,058
35	34,325	24,062	35,762	27,690	33,933	19,435	34,658	24,130
36	36,134	24,569	37,995	28,298	35,509	20,276	36,618	24,992
37	37,832	24,911	40,118	28,686	37,031	21,037	38,530	25,689
38	39,368	25,134	42,053	28,922	38,456	21,721	40,335	26,260
39	40,673	25,252	43,683	29,023	39,737	22,336	41,949	26,721

40	41,680	25,267	44,888	28,990	40,831	22,886	43,263	27,072
41	42,384	25,194	45,653	28,839	41,689	23,361	44,239	27,319
42	42,835	25,077	46,065	28,633	42,301	23,769	44,919	27,508
43	43,078	24,962	46,197	28,434	42,698	24,143	45,351	27,688
44	43,151	24,888	46,106	28,300	42,928	24,514	45,583	27,911
45	43,090	24,879	45,839	28,266	43,032	24,895	45,646	28,212
46	42,923	24,911	45,439	28,303	43,034	25,273	45,570	28,566
47	42,685	24,925	44,962	28,330	42,968	25,637	45,398	28,898
48	42,404	24,896	44,466	28,313	42,869	25,977	45,181	29,172
49	42,109	24,813	44,007	28,243	42,760	26,277	44,983	29,382
50	41,825	24,668	43,641	28,114	42,653	26,514	44,877	29,546
51	41,533	24,444	43,342	27,908	42,556	26,665	44,853	29,656
52	41,175	24,112	43,014	27,584	42,457	26,700	44,817	29,666
53	40,693	23,644	42,580	27,104	42,299	26,574	44,684	29,522
54	40,034	22,997	41,943	26,406	42,002	26,248	44,334	29,121
55	39,144	22,105	40,952	25,382	41,430	25,636	43,561	28,276
56	37,994	20,950	39,532	24,004	40,349	24,578	42,264	26,924
57	36,557	19,572	37,693	22,330	38,676	23,042	40,450	25,134
58	34,831	18,021	35,482	20,444	36,463	21,132	38,180	23,024
59	32,846	16,353	32,969	18,429	33,808	18,988	35,555	20,700
60	30,653	14,612	30,261	16,343	30,869	16,722	32,747	18,242

(continued)

Table B.2 (continued)

	Cross sections				Longitudinal by birth cohorts			
	2010		2020		1965		1975	
Age	Men	Women	Men	Women	Men	Women	Men	Women
61	28,302	12,831	27,461	14,233	27,896	14,412	29,894	15,717
62	25,877	11,069	24,694	12,173	25,082	12,174	27,136	13,247
63	23,445	9,398	22,075	10,258	22,568	10,158	24,581	10,978
64	21,056	7,884	19,690	8,572	20,440	8,487	22,287	9,037

[a] The table series are the smoothed versions of the forecasted series that appear in Figures 4.7 and 4.8. The cross-sectional series are smoothed within the cross section, and the birth cohort series are smoothed within the birth cohort.

References

American Medical Association. 1998. *Rethinking Medicare: Solutions for Medicare's Short-Term and Long-Term Problems*. Chicago: American Medical Association, p. 14.

Baldwin, Spencer F. 1913. "Old Age Insurance." *American Labor Legislation Review* 3(2): 202–212.

Barro, Robert, and Gary Becker. 1989. "Fertility Choice Model of Economic Growth." *Econometrica* 57: 481–501.

Berkowitz, Edward D. 1995. *Mr. Social Security: The Life of Wilbur J. Cohen*. Lawrence, Kansas: University of Kansas Press.

_____. 1996. "Social Security and the Financing of the American State." In *Funding the Modern State, 1941–1995: The Rise and Fall of the Era of Easy Finance*, W.E. Brownlee, ed. New York: Woodrow Wilson Center Press and Cambridge University Press.

Board of Trustees. 1998a. *1998 Annual Report of the Board of Trustees of the Federal Hospital Insurance Trust Fund*. Washington, D.C., April.

_____. 1998b. *1998 Annual Report of the Board of Trustees of the Federal Supplementary Medical Insurance Trust Fund*. Washington, D.C., April.

Brandts, J., and C.A.M. de Bartolome. 1992. "Population Uncertainty, Social Insurance, and Actuarial Bias." *Journal of Public Economics* 15: 1–22.

Brownlee, W.E. 1996. *Funding the Modern American State, 1941–1995: The Rise and Fall of the Era of Easy Finance*. New York: Woodrow Wilson Center Press and Cambridge University Press.

Christensen, Sandra, and Judy Shinogle. 1997. "Effects of Supplemental Coverage on Use of Services by Medicare Enrollees." *Health Care Financing Review* 19(1): 5–17.

Cochrane, John H. 1995. "Time-Consistent Health Insurance." *Journal of Political Economy* 103(3): 445–473.

Committee on the Costs of Medical Care. 1932. *Medical Care for the American People: The Final Report of the Committee on the Costs of Medical Care*. Chicago: The University of Chicago Press.

Committee on Economic Security. 1935. *Report to the President*. Washington, D.C.: U.S. Government Printing Office.

Council of Economic Advisers. 1966. *Economic Report of the President*. Washington, D.C.: U.S. Government Printing Office.

Crawford, Vincent P., and David M. Lilien. 1981. "Social Security and the Retirement Decision." *Quarterly Journal of Economics* 95: 505–529.

Deardorff, Alan V. 1976. "The Optimum Growth Rate for Population: Comment." *International Economic Review* 17: 510–514.

Derthick, Martha. 1979. *Policy Making for Social Security.* Washington: The Brookings Institution.

Diamond, Peter A. 1965. "National Debt in a Neo-Classical Growth Model." *American Economic Review* 55: 1126–1150.

———. 1977. "A Framework for Social Security Analysis." *Journal of Public Economics* 8: 275–98.

Diamond, Peter A., and James A. Mirrlees. 1986. "Payroll-Tax Financed Social Insurance with Variable Retirement." *Scandinavian Journal of Economics* 88: 25–50.

Eckstein, Zvi, and K. Woplin. 1985. "Endogenous Fertility and Optimal Population Size." *Journal of Public Economics* 27: 93–106.

Eichner, Matthew J., Mark B. McClellan, and David A. Wise. 1996. *Insurance or Self-Insurance? Variation, Persistence, and Individual Health Accounts.* NBER working paper no. 5640, National Bureau of Economic Research, Cambridge, Massachusetts (April).

Eppig, Franklin J., and George S. Chulis. 1997. "Trends in Medicare Supplementary Insurance: 1992–96." *Health Care Financing Review* 19(1): 201–206.

Falk, I.S. 1973. "Medical Care in the USA 1932–1972. Problems, Proposals and Programs from the Committee on the Costs of Medical Care to the Committee for National Health Insurance." *The Milbank Memorial Fund Quarterly / Health and Society*: 1–32.

Feldstein, Martin S. 1974. "Social Security, Induced Retirement and Aggregate Capital Accumulation." *Journal of Political Economy* 82: 905–926.

_____. 1985. "The Optimal Level of Social Security Benefit." *Quarterly Journal of Economics* 100: 303–320.

———. 1995. *Would Privatizing Social Security Raise Economic Welfare?* NBER working paper no. 5281, National Bureau of Economic Research, Cambridge, Massachusetts.

———. 1996. "The Missing Piece in Policy Analysis: Social Security Reform." *American Economic Review, Papers and Proceedings* 86(2): 1–14.

Feldstein, Martin S., and Andrew A. Samwick. 1997. *The Economics of Prefunding Social Security and Medicare Benefits*. NBER working paper no. 6055, National Bureau of Economic Research, Cambridge, Massachusetts.

Feldstein, Martin S., Elena Ranguelova, and Andrew A. Samwick. 1999. *The Transition to Investment Based Social Security When Portfolio Returns and Capital Profitability are Uncertain.* NBER working paper no. 7016, National Bureau of Economic Research, Cambridge, Massachusetts.

Fiengold, Eugene. 1966. *Medicare: Policy and Politics*. California: Chandler Publishing Company.

Flemming, John S. 1977. "Optimal Payroll Taxes and Social Security Funding." *Journal of Public Economics* 7: 329–349.

Geanakoplos, John O., O.S. Mitchell, and S.P. Zeldes. 1998. "Would a Privatized Social Security System Really Pay a Higher Rate of Return?" *Pension Research Council* working paper no. 98-6, University of Pennsylvania, Philadelphia, Pennsylvania.

Gigliotti, Gary A. 1983. "Total Utility, Overlapping Generations, and Optimal Population." *Review of Economic Studies* 50: 71–86.

Green, Jerry R. 1988. "Demographics, Market Failure and Social Security," in S.M. Wachter, *Social Security and Private Pensions*, Lexington, Massachusetts: Lexington Books.

Health Care Financing Administration. 1998. *CY 1995 Cost and Use, Public Use File Documentation*. Medicare Current Beneficiary Survey, March.

_____. 1999. *Proposed Method of Incorporating Health Status Risk Adjusters into Medicare + Choice Payments*. Office of Strategic Planning, Research, and Evaluation, Division of Payment Research, March.

Johnsen, J.E. 1922. *Selected Articles on Social Insurance*. New York: The H.W. Wilson Company.

Joint Economic Committee. 1965. *Joint Economic Report, Congress of the United States*. Washington, D.C.: U.S. Government Printing Office.

Karni, Edi, and Itzhak Zilcha. 1986. "Welfare and Comparative Statics Implications of Fair Social Security." *Journal of Public Economics* 30: 341–357.

Keeler, Emmett B., Joan L. Buchanan, John E. Rolph, Janet M. Hanley, and David M. Reboussin. 1988. *The Demand for Episodes of Medical Treatment in the Health Insurance Experiment*. RAND Health Insurance Experiment Series.

Kingson, E.R., and E.D. Berkowitz. 1993. *Social Security and Medicare: A Policy Primer.* Westport, Connecticut: Auburn House.

Kotlikoff, Laurence J. 1979. "Social Security and Equilibrium Capital Intensity." *Quarterly Journal of Economics* 93: 233–253.

Kotlikoff, Laurence J., and Jeffrey Sachs. 1998. "The Personal Security System: A Framework for Reforming Social Security." *Federal Reserve Bank of St. Louis Review* 80(2): 11–13.

Liu, Liqun, Andrew J. Rettenmaier, and Thomas R. Saving. 2000. "Constrains on Big Bank Solutions: The Case of Intergenerational Transfers." *Journal of Institutional and Theoretical Economics* 156: 270–291.

Lopez-Garcia, M.-A. 1991. "Population Growth and Pay-As-You-Go Social Security in an Overlapping Generations Model." *Public Finance* 46: 93–110.

Lubitz, James, James Beebe, and Colin Baker. 1995. "Longevity and Medicare Expenditures. *New England Journal of Medicine* 332(15): 999–1003.

MaCurdy, Thomas, and Thomas Mroz. 1995. *Measuring Macroeconomic Shifts in Wages from Cohort Specifications*. Hoover Institution working paper, Stanford University, Stanford, California.

Mariger, Randall P. 1997. "Social Security Privatization: What It Can and Cannot Accomplish." Manuscript, Board of Governors of the Federal Reserve, June.

Marmor, Theodore R. 1973. *The Politics of Medicare*. Chicago: Aldine Publishing Co.

McClellan, Mark, and Jonathan Skinner. 1997. *The Incidence of Medicare*. NBER working paper no. 6013, National Bureau of Economic Research, Cambridge, Massachusetts, April.

Murphy, Kevin, and Finis Welch. 1992. *Real Wages 1963–1990*. Unicon Research Corporation working paper, Santa Monica, California.

———. 1996. *Real Wage Growth and OASDI Trust Fund Solvency.* Working paper.

———. 1998. "Perspectives on the Social Security Crisis and Proposed Solutions." *American Economic Review* 88(2): 142–150.

Musgrave, R.A. 1959. *The Theory of Public Finance: A Study in Public Economy.* New York: McGraw-Hill Book Company, Inc.

Myles, Gareth D. 1995. *Public Economics.* Cambridge University Press, Cambridge.

Nerlove, Marc, Assaf Razin, and Efraim Sadka. 1987. *Household and Economy Welfare Economics of Endogenous Fertility.* Boston: Academic Press.

Ordover, Janusz A., and Edmund S. Phelps. 1979. "The Concept of Optimal Taxation in the Overlapping-Generations Model of Capital and Wealth." *Journal of Public Economics* 12: 1–26.

Park, N.-H. 1991. "Steady-State Solutions of Optimal Tax Mixes in an Overlapping-Generations Model." *Journal of Public Economics* 46: 227–246.

Philipson, Tomas J., and Gary S. Becker. 1998. "Old-Age Longevity and Mortality-Contingent Claims." *Journal of Political Economy* 106(3): 551–573.

Poterba, James M. 1999. *The Rate of Return to Corporate Capital and Factor Shares: New Estimates Using Revised National Income Accounts and Capital Stock Data*. NBER working paper no. 6263, National Bureau of Economic Research, Cambridge, Massachusetts.

Rettenmaier, Andrew J., and Thomas R. Saving. 1997. *Medicare Reform: A Cohort-Based Solution*. Working paper 9804, Private Enterprise Research Center, College Station, Texas, December.

Roosevelt, Franklin D. 1934a. June 8th message to Congress. At http://www.ssa.gov/history/fdrstmts.html, accessed November 1999.

———. 1934b. Executive Order no. 6757, June 29th. At http://www.ssa.gov/history/fdrstmts.html, accessed November 1999.

———. 1935. Message to Congress on Social Security, January 17th. At http://www.ssa.gov/history/fdrstmts.html, accessed November 1999.

———. 1938. Radio address on the third anniversary of the Social Security Act, August 15th. At http://www.ssa.gov/history/fdrstmts.html, accessed November 1999.

Samuelson, Paul A. 1958. "An Exact Consumption-Loan Model of Interest with or without the Social Contrivance of Money." *Journal of Political Economy* 66: 467–482.

———. 1975. "The Optimum Growth Rate for Population." *International Economic Review* 16: 531–538.

———. 1976. "The Optimum Growth Rate for Population: Agreement and Evaluations." *International Economic Review* 17: 516–525.

Schlesinger, Arthur M., Jr. 1958. *The Coming of the New Deal*. Boston: Houghton Mifflin Company.

Seager, H.R. 1910. *Social Insurance: A Program of Social Reform*. New York: The Macmillan Company.

Sheshinski, Eytan. 1978. "A Model of Social Security and Retirement Decisions." *Journal of Public Economics* 10: 337–360.

Smith, A. 1982. "Intergenerational Transfers as Social Insurance." *Journal of Public Economics* 19: 97–106.

Social Security Administration. 1992. *Economic Projects for OASDHI Cost and Income Estimates: 1992*. Actuarial Study no. 108, December.

_____. 1996. *Annual Statistical Supplement, 1996* to the *Social Security Bulletin*. Office of Research Evaluation and Statistics, Washington, D.C.: U.S. Government Printing Office.

_____. 1997. *Annual Statistical Supplement, 1997* to the *Social Security Bulletin*. Office of Research Evaluation and Statistics, Washington, D.C.: U.S. Government Printing Office.

_____. 1998. *Pre-Social Security Period.* At http://www.ssa.gov/history/early.html, accessed November 1999.

Standard Federal Tax Service. 1943. Commerce Clearing House, Inc., New York.

Stata Corp. 1999. *Stata Statistical Software, Release 6.0*. College Station, Texas.

Thompson, Lawrence H. 1993. "The Social Security Reform Debate." *Journal of Economic Literature* 21(4): 1425–1467.

U.S. Public Law 271. 1935. 74th Cong., August 14th, Preamble. At http://www.ssa.gov/history/35actpre.html, accessed November 1999.

Willcox, A.W. 1937. "The Old-Age Reserve Account: A Problem in Government Finance." *The Quarterly Journal of Economics* 51(3): 444–448.

Yang, Eugene B., and Stephen C. Goss. 1992. *Economic Projections for OASDHI Cost and Income Estimates: 1992.* Social Security Administration, Office of the Actuary, Actuarial Study no. 108, SSA Pub. no. 11-11551, December.

Zelizer, Julian E. 1996. "Learning the Ways and Means: Wilbur Mills and a Fiscal Community 1954–1964." In *Funding the Modern American State, 1941–1995: The Rise and Fall of the Era of Easy Finance*, W.E. Brownlee, ed. New York: Woodrow Wilson Center Press and Cambridge University Press.

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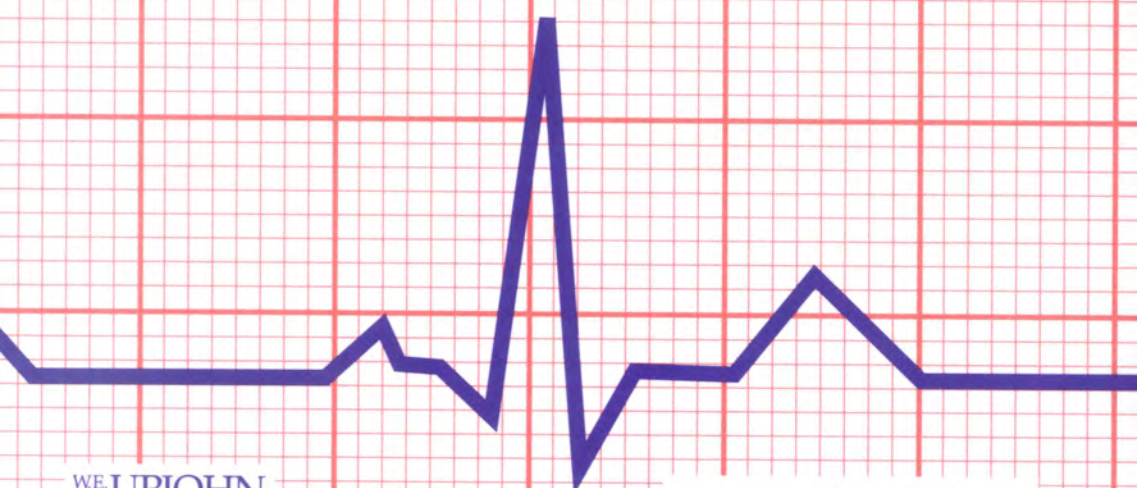

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ISBN 0-88099-211-5