Health Care Demand, Supply, and Funding in the Long Run

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Health Care Demand, Supply, and Funding in the Long Run

November 2021

Ronald Horst[1] and Douglas Meade[1]

Abstract

What will be the economic needs, challenges, and capacities for the American society in the long run, particularly with respect to health care, and how will they differ from those of today? Is projected spending on health care sustainable for government and household sectors? Is production feasible to satisfy such levels of demand? To address these questions, we employ an economic model of the U.S. economy, complete with representation of demand and supply components for health and non-health sectors, to develop a comprehensive and consistent portrayal of developments over the coming 75 years. A baseline scenario illustrates the potential size and composition of the future economy, together with health needs, supplies, and funding. Projections are consistent with official assumptions concerning health care spending and federal funding levels. The baseline is calibrated to reflect the assumed scale of the labor force and the economy, and the model completes the scenario by providing details for households, industry, and government sectors. Several variations on this baseline indicate how results depend on the scale of the economy, including variations in the size of the labor force and variations in the overall population, and in particular we consider the effects on federal finances potentially imposed by variations in economic growth. Other variations consider the effects of interest rates on federal financing, including feedback effects that federal borrowing might impose on the overall economy. We construct these scenarios to promote greater understanding of potential economic developments in the distant future, to indicate the sustainability of health funding, and to evaluate likely capacities to satisfy expected demand for health care goods and services.
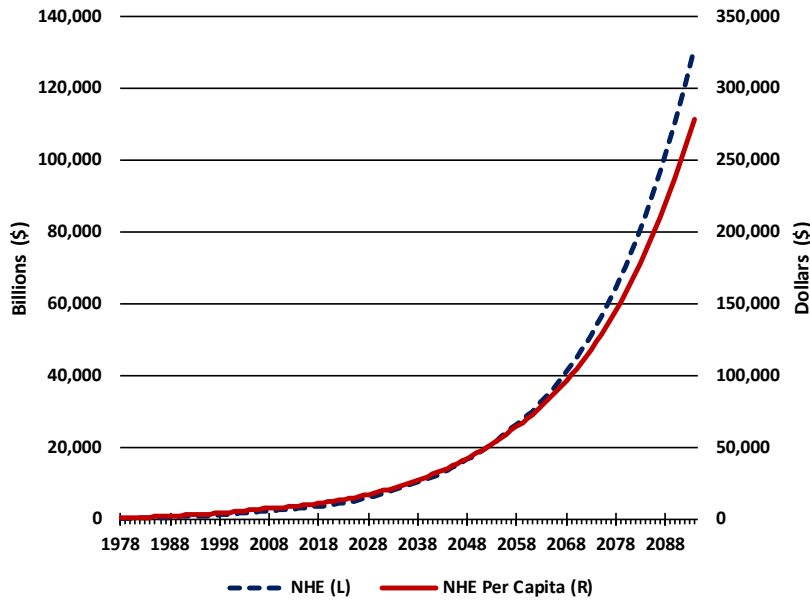
Introduction

For many decades, spending on health care sustained rapid growth, easily outpacing expansion of the economy. Although spending growth generally declined since the onset of the Great Recession, National Health Expenditures (NHE) continue to climb. This rise of total spending is due both to rising quantities and rising price levels. In part, a growing population supported need for greater quantities, but it mainly was fast-rising prices, with average growth well beyond general inflation rates, that drove NHE per person upward by a factor of 12 between 1978 and 2018. As we look into the future, how much health care will be needed in the long run? Current NHE projections[2] indicate that nominal spending per person may rise by a factor of 25 between 2018 and 2094.

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[1] Inforum. Website: www.InforumEcon.com. Contact author: Horst@InforumEcon.com. An earlier draft of this study was presented at the May 2021 ASHEcon conference. As indicated, this report initially was completed in November 2021 and reflects information available at that time; this revised edition was completed on August 30, 2022.

[2] NHE projections are provided by Centers for Medicare and Medicaid Services (CMS), 2020. Population projections developed for this study are described below.

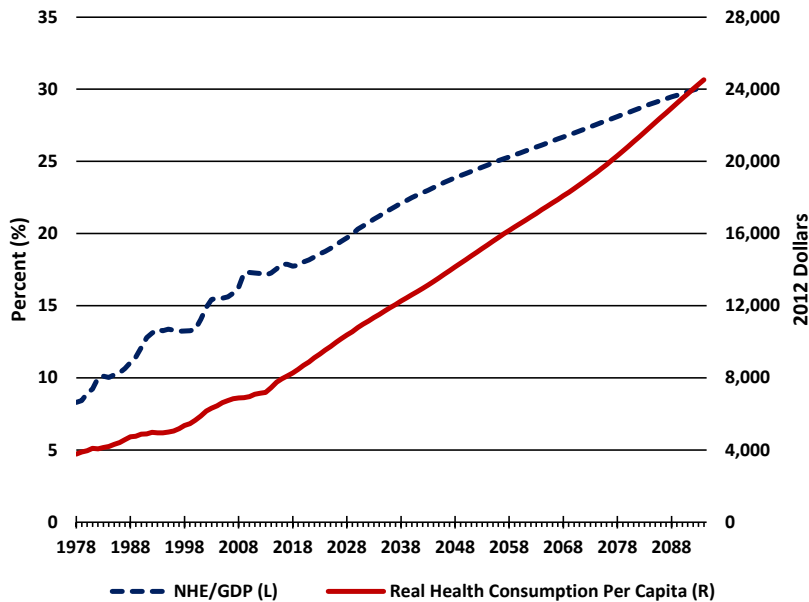## Figure 1. National Health Expenditures (NHE)

Source: Inforum, based on macro-economic and health spending assumptions adapted from the Medicare Trustees (2020).

Is production of such amounts feasible, and will enough workers be available to provide such amounts of health care? Spending on health long has expanded faster than the economy. In proportion to nominal GDP, NHE rose from 8% in 1978 to 18% in 2018; it may reach 30% by 2094. Part of this increase is due to health care prices that rise faster than general inflation, but quantities are rising too. The greatest part of NHE is personal consumption of health care goods and services.[3] After adjusting for inflation, personal consumption of health care rose from about $3,800 per person in 1978 to $8,300 per person in 2018 (measured in 2012 dollars), more than doubling over forty years. Real consumer spending on health care may triple again over the coming 75 years, reaching $24,500 per person by 2094.[4] Is production of these large amounts likely to prove feasible in the long run?

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[3] Personal Consumption Expenditure (PCE) for health care is attributed to consumers (households) regardless of the source of funding. Principal funding sources include households (out-of-pocket spending), private insurance companies, and government (e.g. through Medicare and Medicaid programs).

[4] These long-run proportions are indicated by the baseline projections described in greater detail later in this report.
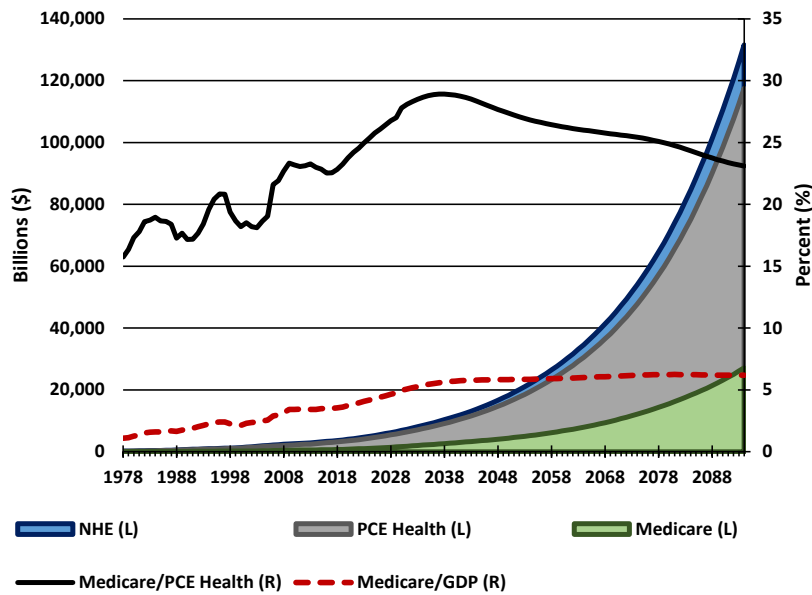
Figure 2. Consumption per Person

Source: Inforum, based on macro-economic and health spending assumptions adapted from the Medicare Trustees (2020).

Health care is costly for all payers, including the federal government and households. Is projected funding for health care sustainable, or will government and household balances be stretched too far to sustain other necessities and priorities? Medicare is a key source of funding for older Americans. In proportion to personal consumption of health care, Medicare funding rose from 15.7% in 1978 to 22.8% in 2018. Medicare funding may sustain at least 23% of health care consumption through 2094, implying its continued importance to household budgets. In proportion to the overall economy, the Medicare program also has expanded, rising from 1.1% of GDP in 1978 to 3.5% of GDP in 2018; it may reach 6.2% by 2094.[5] At the same time, the federal government faces substantial commitments to fund Social Security and other programs, and federal debt already is larger than GDP. Is public funding for health care sustainable in the long run?

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[5] These long-run proportions are implied by projections and study assumptions provided by CMS.

Figure 3. Medicare Financing per Person

Source: Inforum, based on macro-economic and health spending assumptions adapted from the Medicare Trustees (2020).

Study Objectives and Methods

This study evaluates the economic feasibility of anticipated health care spending and production. It evaluates the financial sustainability of public and other funding, and it provides information to improve understanding of potential long-run developments in economics and health care. This is the third joint research effort conducted by the Centers for Medicare and Medicaid Services (CMS) Office of the Actuary (OACT) and Inforum to formulate and analyze long-run scenarios based on 75-year Medicare and NHE projections. In each study, a baseline scenario was constructed as a means to improve understanding of the economy and the health sector over the long run and to create a coherent framework for policymakers to use when addressing the long-term outlook. This framework was used to construct alternative scenarios as well, with each differing from the baseline scenario in key details related to health care expenditure, finance, demographics, or economic development. A comparison of alternative and baseline scenario results indicates the implications of alternative assumptions.

The baseline scenario relies heavily on assumptions compiled and established by CMS. Projected levels of NHE and Medicare funding are established by CMS. Key demographic and economic parameters also are established by CMS directly or are adapted from work by other federal agencies; examples include projections of GDP growth, unemployment rates, population growth, and labor force growth.

While these assumptions largely establish the scale of the economy, health spending, and federal funding, the composition of the economy and the health sector remain undetermined. To complete the baseline scenario, an economic model is employed to formulate an outlook that is consistent with the study assumptions over a 75-year horizon. The model provides extensive representation of industry, household, government, and international sectors, where each contains pertinent health care details. Extensive accounting for federal budgets, household budgets, and production of health services allow careful evaluation of the implications for production and financing.

Assumptions for this project were formulated in 2019, and economic modeling work began soon after. Despite subsequent development of pandemic in 2020, the long-run focus of the study justifies the maintenance of the original assumptions, rather than to begin again with short-run pandemic details that remained uncertain.[6] For this reason, few pandemic effects were incorporated in the present work, either in the health care or other economic components. A key exception is the level of federal debt, which was adjusted to reflect actual 2020 levels; federal debt projections thus remain elevated through the forecast horizon.

Additional scenarios developed in this study show the implications of alternative assumptions concerning the general economy and the health care sector. The project includes five alternative scenarios in addition to the baseline scenario. The baseline scenario is consistent with the 2020 CMS Trustees Report projections of economic growth, population and labor force growth, labor productivity growth, national health expenditures, and Medicare funding.[7]

Assumptions for the alternative scenarios include:

1. A smaller labor force, where fewer people choose to seek and hold jobs. In this case, the scale of the economy is reduced, and the specified level of health care consumption becomes more difficult to satisfy and to fund.

2. Higher population growth and a downward shift in the age distribution, and

3. lower population growth and an upward shift in the age distribution. In these two scenarios, health care demand varies with the size of the population. A larger number of older people has particularly strong effects on health care demand (the second alternative). On the other hand, federal budgets prove more manageable when the number of workers increase (the third alternative).

4. Higher interest rates paid on federal debt, and

5. lower interest rates paid on federal debt. For both interest rate scenarios, assumptions concern the cost of financing federal debt, but these also affect private economic activity and thus federal tax revenue. Over 75 years, the effects of interest rates on federal debt can be substantial.

Together, these five alternative scenarios illustrate the economic implications of willingness to work, population and age distribution, and debt financing costs. In each case, even small deviations from baseline assumptions are shown to imply substantial changes when sustained over a long time horizon.

Models and Long-Run Modeling
In principle, modeling of the long run is similar to modeling of the short and medium run, and in principle the same models can be employed regardless of the horizon. However, many issues need

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[6] In a study by CMS following completion of this project, it was assumed that the public health emergency ends in 2022 and additional public health funding ends in 2023 (Poisal, 2022).

[7] Note again that the NHE projections and the basic economic framework employed in this study were established before the pandemic of 2020-2021. The short-run economic environment thus does not reflect the severe recession of 2020 and subsequent recovery. It does, however, take into account the large increase in federal debt amassed in 2020 and 2021. When the longer-run implications of the pandemic become evident, the assumptions of these scenarios can be revised accordingly.

to be addressed in a long-term forecast or scenario that are not as important when horizons are shorter, such as substantial changes to demographics, changing structural relationships among industries, and the long-term viability of government tax and expenditures policy. Earlier studies[8] indicated how changing demographics, productivity, consumption patterns, and international trade affect the viability of assumptions used for the trust fund projections. Development of long-term scenarios can require more effort than development of shorter-term scenarios, as many details that safely might be assumed stable, or even constant, over the short or medium run must be handled more carefully at longer horizons. This particularly is true for the construction of a forecast that depends on actual historical time-series data, with modeling capability to provide detailed forecasts in keeping with extensive historical detail. An alternative approach for long-run analysis employs abstract models that have useful theoretical properties but represent historical economic data less fully than does the modeling approach employed in this study. However, a firm empirical rooting in data, despite additional accompanying burdens, establishes vital connection of the modeling results to the real world that sometimes is left nebulous when using abstract modeling techniques.

Indeed, it is precisely because of such challenges that earlier long-run studies have been appreciated. It is easy to overlook inconsistencies and conflicts in the high-level assumptions that might be envisioned, such as projections of GDP, inflation, NHE, Medicare financing, and unemployment, with these affecting feasibility of desirable conditions like manageable federal debt levels. Such potential inconsistencies still can be overlooked easily if the assumptions are incorporated in simple empirical models that lack substantial detail or used to calibrate elaborate but abstract models that are not firmly connected to data. On the other hand, use of a suitably elaborate model with foundations on historical economic time-series data readily exposes such inconsistencies and their causes, and it provides the means to examine the effects of alternative assumptions and policies. The interindustry-macroeconomic modeling techniques developed by Inforum researchers are the leading example of the latter sort of model, and such a model is employed in this study.[9]

Development of long-run scenarios can be difficult, particularly if key assumptions are not easily reconciled with each other or with the structure of the economy. For example, substantial growth of NHE might not be problematic over 25 years as it might become large but still manageable, but continued high growth over the following 50 years could displace vastly more non-health consumer spending and employment. Because health services industries typically have relatively low rates of labor productivity growth, an increasing share of employment for the health sector implies slowing economy-wide labor productivity; for a given labor force trajectory, slower labor productivity growth can cause difficulty with satisfying an assumed rate of GDP growth. If the GDP growth assumptions cannot be satisfied, then health care financing becomes even more difficult, and assumed spending and financing paths would need additional scrutiny. Thus, while it might be relatively easy to make projections of basic economic concepts like GDP and its components, either with a simple model or without a model, crafting a plausible and useful scenario with extensive detail requires careful effort, using a suitable model, to establish plausible assumptions related to health and other economic concepts, followed by extensive review and

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[8] See Related Work below and Appendix 2 for summary details of earlier studies.

[9] The Long-term Interindustry Forecasting Tool (LIFT) Model used in this project and in earlier studies is described in Appendix 1.

polishing of results. The model used here makes this work feasible, and it ensures consistency among the various components of the economy.

Establishment of a long-run baseline thus suggests the joint plausibility of assumptions concerning health care spending and financing; industry assumptions including health services productivity growth; and assumed trajectories of economic aggregates like GDP, unemployment, and inflation. Development of the scenario requires a balance of objectives as, for example, it often is difficult to maintain both 1) manageable levels of federal debt without 2) straying too far from current law concerning tax policies. The model employed here features an extensive accounting of household income, together with other forms of income, and these support efforts to model federal and state and local (S&L) tax revenue. Such features, including personal and government accounts, support a variety of analyses relevant to health care spending and financing. These particular accounts indeed are tightly linked in the model, as households pay income and other taxes to government and government makes large interest payments on debt and provides health and other social benefits, with these payments contributing significantly to household income. Many features of fiscal policy, both those related to revenue and expenditure, can be specified in the modeling effort to guide the baseline and to construct alternative scenarios.

The Inforum LIFT model has been used for the 75-year projections for several reasons:

1. In addition to an extensive representation of the macro economy, it represents supply and demand components for 121 commodities and 71 industries, furnishing the necessary detail to study health care consumption, production, investment, and employment for such categories as pharmaceuticals and other goods, health insurance, physicians, dentists, hospitals, outpatient care, home health care, diagnostic labs, and nursing homes.
2. It performs fully-consistent calculations of production and prices. Consistency among sectors is ensured by using input-output data and accounting methods, together with national accounting methods used for construction of macroeconomic aggregates.
3. It includes a full consumer demand system with 83 categories, including eleven health care categories, that takes into account demographic changes such as the age structure of the population.
4. It includes extensive detail for federal and state and local government revenue and expenditure. These government accounts are integrated with industry and consumer sectors of the model. These details include accounting for Medicare, Medicaid, Social Security, and other transfer programs.
5. It has been used extensively to perform long-term analyses concerning energy, environment, and health care. The extensive detail of the model makes it suitable for analyses of a wide range of topics, and the flexibility of the modeling tools makes it possible to identify effects of an array of alternative assumptions and specifications.

Many of the equations in the LIFT model rely on econometric estimation using historical time-series data. Analyses using the LIFT model often incorporate year-by-year information provided by outside parties. Although most components of the model are endogenous, projections also may be constrained to satisfy external assumptions. Examples of third-party forecasts commonly used for guidance include energy projections provided by the Energy Information Administration; federal budget details provided by the Congressional Budget Office; NHE and Medicare assumptions provided by CMS; and Social Security transfer spending projections by the Social Security Administration (SSA).

The LIFT model combines the strengths of dynamic macroeconomic modeling techniques and input-output industry modeling techniques. The model is highly detailed, dynamic, internally consistent, and capable of addressing a broad range of questions. For example, the model can tolerate varying levels of unemployment and other types of disequilibrium. Prices in the model are related to output growth, labor productivity, and sometimes exogenous commodity price assumptions. Many demand side equations in the model (e.g. consumption, investment, imports, and exports) respond to price change at the sectoral level.

Alternative models that are used for long-run analyses often are more abstract and depend heavily on theoretical equations, but these typically are less faithful to historic time-series data and the economic relationships revealed in the data. Forecasts constructed with such models might be extended arbitrarily far into the future without much difficulty. These models often possess features that make them useful for certain types of analyses. However, they often are less useful for assembling and reflecting the year-by-year assumptions that CMS specifies. Such models typically are built without extensive dynamic capabilities, and because they tend to be less faithful to the historical data, they miss certain complexities of the economy that are made evident by time-series data.

Related Work

This study extends a series of long-run health care analyses conducted by Inforum on behalf of CMS, including efforts in 2017 and in 2010. [10] Results of the 2010 study were presented at the 19th International Input-Output Conference in 2011. Periodic construction of these 75-year scenarios augments annual development of 10-year projections. The annual efforts focus attention on personal income and its implications for health care financing, while the long-run analyses typically consider matters of sustainability.

Past long-run analyses considered implications of a variety of health and non-health economic factors. Factors directly related to health include NHE levels, Medicare funding levels, consequences of tax rate adjustments to fund the Medicare program, and health industry developments such as labor productivity growth. Non-health factors included overall economic growth and non-health industry labor productivity growth. The current study extends the scope of these scenarios to consider implications of 1) labor force participation, 2) interest rate effects on federal debt financing, and 3) population size and age distribution.

CMS and Inforum (2014, 2019) also explored the far-reaching dependencies of the health-care producing sector, as nearly every industry makes essential contributions to the provision of health care products and services. While spending on health amounted to 18% of GDP in 2014, much smaller shares of production and employment easily can be identified as supplying health care. The work, as reported in the Survey of Current Business (2014), identified production and employment in other industries that indirectly contribute to the supply of health care. Although the present study does not focus attention on the supporting roles of other industries, the model employed here represents the full range of health-care dependencies on health and non-health industries.

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[10] Earlier Inforum reports were completed in 2008, 2010, 2013, and 2017. Appendix 2 summarizes the 2010 and 2017 studies.

Baseline Assumptions and Implications

This section describes assumptions established for the baseline scenario, together with key implications of these assumptions. In following sections, details of alternative scenarios are presented in contrast to this baseline. Fundamental assumptions and their implications are presented first, and then results of the economic modeling efforts establish implications that are consistent with the assumptions.

Fundamental to economic scale is the size of its population, together with the magnitude of its labor force. Historical levels are extended through 2094.[11] Growth rates of both total population and the labor force decline before stabilizing; in later decades of the forecast horizon, both grow at similar rates. The population is projected to reach nearly 475 million people in 2094, up from 222 million in 1978 and 328 million in 2018. About 235 million participate in the labor force in 2094, in contrast to 162 million in 2018; these individuals either hold jobs or actively seek work.

Figure 4. Population and Labor Force
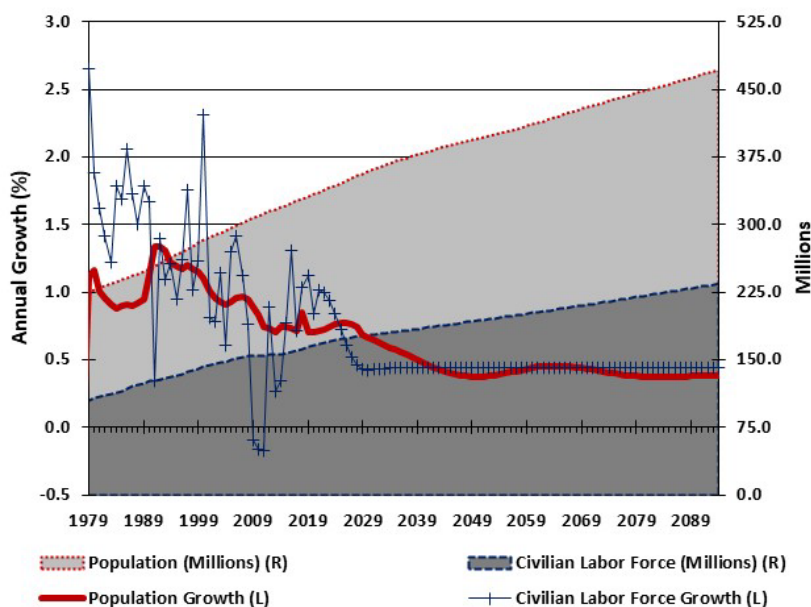
Source: Inforum, based on macro-economic and health spending assumptions adapted from the Medicare Trustees (2020).

Together, the total population and labor force largely imply the labor force participation rate. The participation rate is the share of the civilian population not in institutions, ages 16 and above, who are employed or who actively are looking for work. The age distribution of the population also affects these rates;[12] the baseline age distribution is guided by SSA population projections. Implied participation rates rise slightly over several years, to about 63%, before subsiding to approximately 62% for most of the forecast horizon.[13]

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[11] Projected population growth rates are similar to those of the Intermediate Cost scenario published by the Social Security Administration (SSA). The age distribution and other demographic details also are guided by the SSA projections.

[12] Labor force participation rates typically are higher for ages 25 to 64 years, with educational activities and retirement leading to lower participation rates for younger and older people.

[13] Most other forecasters also project declining participation rates over the next two decades, though they differ in the magnitudes of decline.

Figure 5. Labor Force Participation and Levels
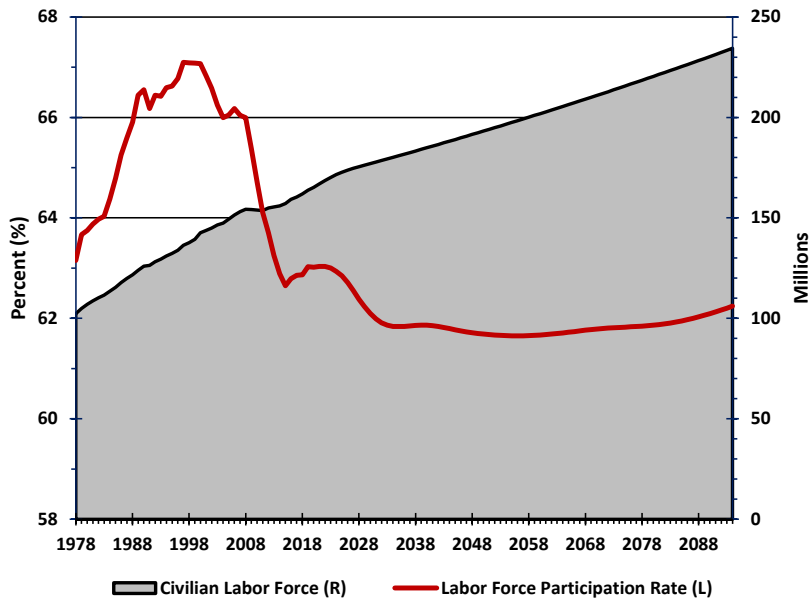
Source: Inforum, based on macro-economic and health spending assumptions adapted from the Medicare Trustees (2020).

Given an assumed trajectory of unemployment rates, these labor force projections imply corresponding employment and unemployment levels. The number of workers holding jobs reaches nearly 225 million by 2094, while about 12 million people are unemployed; unemployment rates remain stable at 5%.[14]

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[14] Long-run natural (NAIRU) and actual rates of unemployment are assumed to be 5%, in keeping with SSA and CMS unemployment rate assumptions, though others (e.g. CBO) project lower rates over the next several decades. Given the labor productivity projections of the current study, a decline in NAIRU and actual unemployment rates would imply higher employment levels and a larger economy without introducing inflation pressures. An enlarged economy would make specified NHE and Medicare levels more affordable. In this respect, results of the current study might be conservative concerning feasibility and sustainability.

Figure 6. Unemployment Rates and Labor Force Composition

Source: Inforum, based on macro-economic and health spending assumptions adapted from the Medicare Trustees (2020).

The scale of the baseline economy is specified by assumption, where assumed growth rates extend historical levels of real GDP. This assumption establishes a trajectory to which baseline model projections ultimately must adhere.[15] Together with the population projection, the historical data and assumptions imply per-capita real GDP rising from about $30,000 in 1978 (in 2012 dollars) to nearly $57,000 in 2018; it is projected to exceed $175,000 by 2094, more than triple the 2018 level. This indicates per capita averages of both the quantities produced as well as incomes earned by all parts of the economy.[16]

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[15] By definition, the projection of GDP specifies the necessary sum of personal consumption, private investment, government consumption and investment, and net exports. The trajectory for GDP is not imposed directly, but rather the components of GDP are specified so that their aggregation satisfies the assumed level.

[16] Real GDP is assumed to grow at approximately 2.0% in the long-run, with small deviations, while population growth rates oscillate with generational cycles. This implies slight oscillation in projected per-capita economic growth rates.
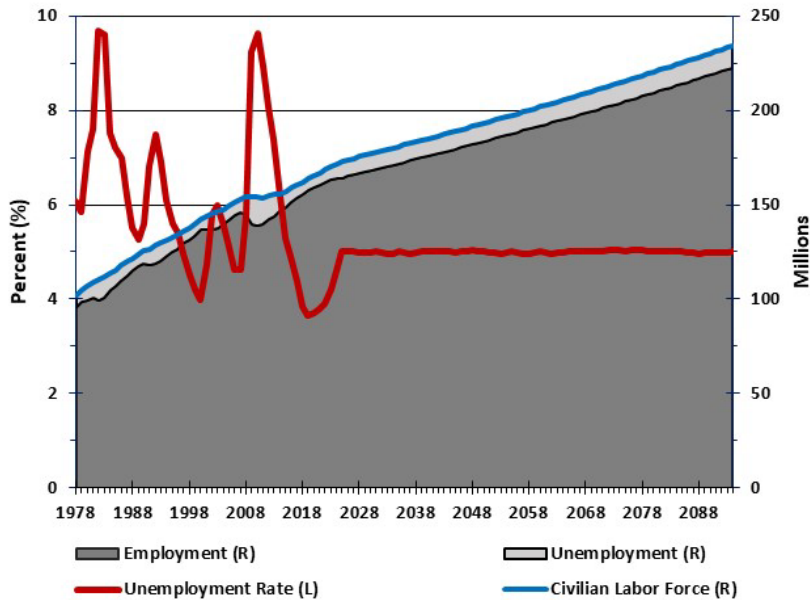
Figure 7. Real Gross Domestic Product

Source: Inforum, based on macro-economic and health spending assumptions adapted from the Medicare Trustees (2020).

Although definitions of nominal GDP and household income substantially differ, they do overlap significantly. In particular, labor income represents the greatest portion of both, and capital income contributes large additional amounts. In contrast to earlier graphs, which mostly reported study assumptions, household income is a modeling result that is consistent with study assumptions. Labor income, as a share of total household income, declined from about 60% in the late 1970s to about 50% in 2018. In the baseline scenario, the downward trend is projected to continue for about 20 years before the share stabilizes at about 47%. Capital income shares of household income largely remain stable throughout, as do household contributions to social insurance. Displacement of labor income shares mainly comes from rising transfer income. The rise of Medicare transfer income is particularly large, though Social Security and other transfers together continue to provide a greater share of income. Note that national accounting standards treat all Medicare benefits as household income, and all health care spending likewise is attributed to households, even if the Medicare program or private insurers pay health care providers directly. Medicare transfers, in proportion to total household income, rose from 1.4% in 1978 to 4.1% in 2018; by 2094, 7.0% of household income may come through Medicare benefits.

The continuing rise of Medicare funding, as is assumed in this study, makes more difficult the sustaining of federal budget balances. At the same time, federal funding of health care consumption significantly helps household budgets.
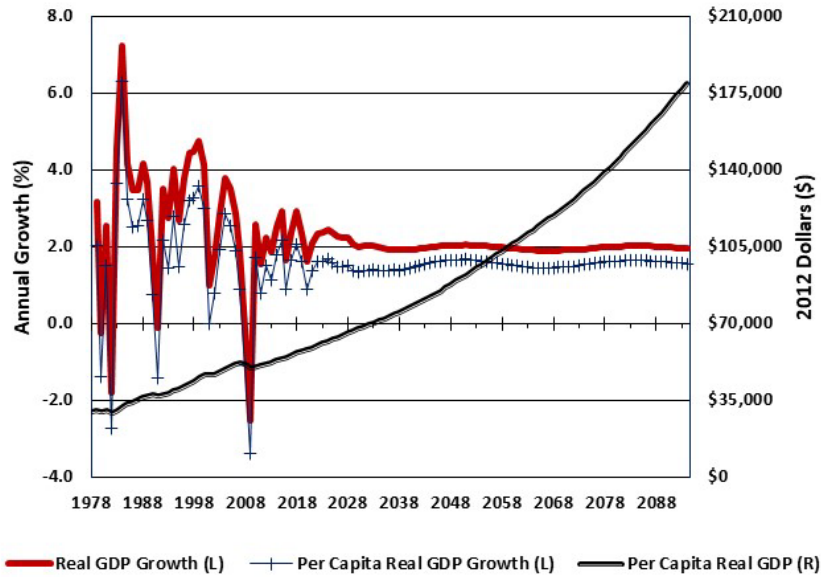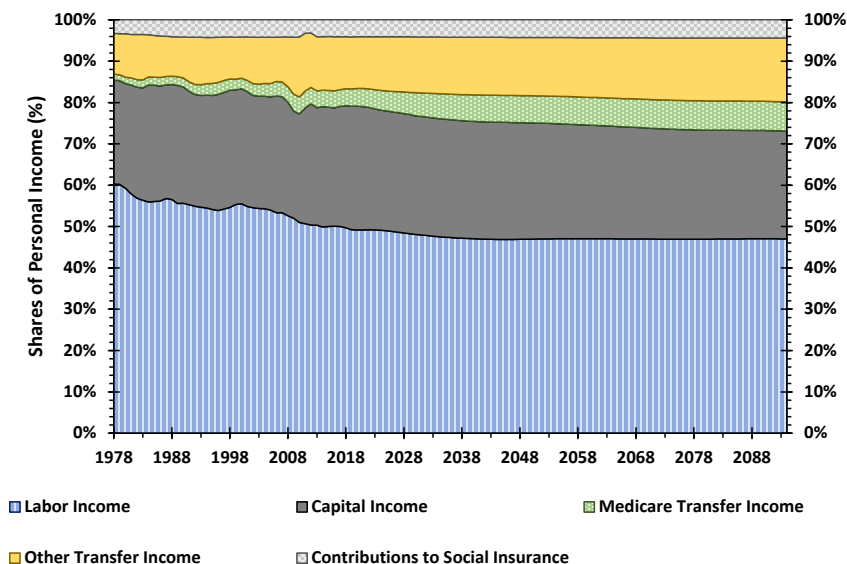
Figure 8. Household Budgets: Composition of Income

Source: Inforum, based on macro-economic and health spending assumptions adapted from the Medicare Trustees (2020).

The greatest portion of household income is devoted to Personal Consumption Expenditure (PCE), which includes the full value of health care received by individuals. Another substantial portion of income goes to federal, state, and local governments as tax and non-tax payments; these payments are associated with income, and they do not include other payments to government such as sales taxes, property taxes, or motor vehicle registration fees that generally are associated with spending or wealth. Income taxes represent only a portion of total government revenue, but they amount to a particularly large share of federal revenue. Assumed federal tax rates for households approximately follow current-law projections over the first decade, and effective rates then are assumed to rise slightly higher before stabilizing.[17] Such payments by households to government, including federal, state, and local levels, are projected to rise from about 12% of household budgets in 1978 and in 2018 to about 15% in 2094. Significant rise takes place in the first 10 years, with payments reaching 13.5% by 2028. In the longer run, the assumed increase is significant but moderate, and it is important for stabilizing federal government debt at marginally-sustainable levels. Without an increase in federal revenue, whether through income taxes or other channels, federal debt quickly would become unsustainable, as is indicated by CBO[18] and others. While these high-debt projections are valuable in showing implications of current law, the difficulties of managing extreme debt levels quickly dominate in long-run projections and analysis, and so we

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[17] These effective tax rates are derived from 10-year projections of federal budgets published by the Congressional Budget Office. While statutory tax rates are fixed or otherwise follow a course established by policy, effective tax rates tend to drift over time due to bracket creep and other factors (CBO, August 2019, p. 24). Whether projected effective tax rates also rise because of changes to statutory tax rates or because of legislated or other changes to the tax base is not specified. Personal tax payments are calculated as the assumed effective rate multiplied by household income, where household income is a proxy for the actual tax base.

[18] "Growing deficits are projected to drive federal debt held by the public to unprecedented levels over the next 30 years" (CBO, June 2019, p. 7.). Additional debt incurred during the pandemic (2020 and 2021) add to these projected levels. These CBO projections end in 2049, but by that time debt levels already are large and growing rapidly. Extension of these projections by another 45 years likely would indicate that debt levels under current law ultimately will prove unsustainable.

assume that the rise of debt levels will be restrained in order to focus attention usefully on health care funding.[19] In contrast to the limited extent to which federal personal tax rates are assumed to change, state and local tax rates are assumed more flexible in order to keep debt stable; these governments typically face balanced budget requirements that limit excessive debt. In addition to consumption spending and tax payments, remaining components of household budgets include other miscellaneous payments (e.g. net non-mortgage interest and business transfer payments) and savings; in the baseline scenario, shares for both categories are projected to be stable throughout the forecast horizon.

Figure 9. Household Budgets: Allocation of Income

Source: Inforum, based on macro-economic and health spending assumptions adapted from the Medicare Trustees (2020).
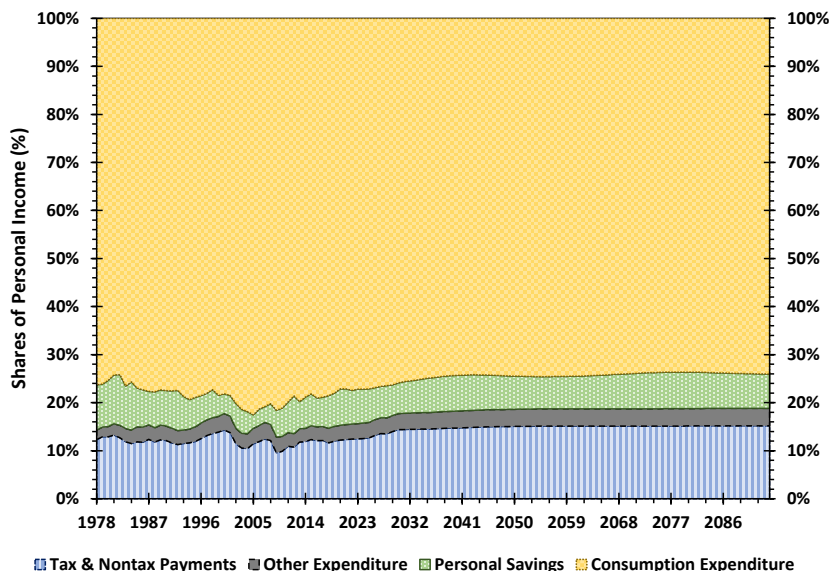
As noted above, the greatest portion of household budgets is devoted to consumption spending. Because national accounting practices indicate that virtually all spending on health care is done by households, where third-party funds[20] reimburse households, health care spending forms a large component of PCE. Although health spending is expected to increase substantially, baseline shares of other spending components decline only moderately after 2018. Spending shares for goods, both durable and nondurable, continue decades-long decline before eventually stabilizing somewhat. The decline is greater for nondurable goods, which include items such as food, clothing, gasoline, and household supplies. However, health care accounts for a rising portion of spending on goods, including equipment, medical supplies, and pharmaceuticals; this implies that shares for non-health goods diminish at a moderately rapid pace. Spending on non-health services forms a large share—nearly 50% in 2018—that remains stable throughout the forecast period. The share of spending devoted to health services rises somewhat over the forecast horizon, though the

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[19] We thus appeal to Stein's Law: "I recently came to a remarkable conclusion which I commend to you and that is that *if something cannot go on forever it will stop*. So, what we have learned about all these things is that the Federal debt cannot rise forever relative to the GNP." Herbert Stein (January 16, 1986). "A Symposium on the 40th Anniversary of the Joint Economic Committee, Hearings Before the Joint Economic Committee, Congress of the United States, Ninety-Ninth Congress, First Session; Panel Discussion: The Macroeconomics of Growth, Full Employment, and Price Stability". p. 262.

[20] Key third parties include government (e.g. Medicare and Medicaid programs) and private insurance companies.

expansion comes at a slower pace than was seen over the previous four decades. Together, the goods and services components of health care spending rise from 10% of PCE in 1978 to nearly 23% in 2018 and to a projected 41% in 2094.[21] Note that declining shares for non-health spending do not imply declining levels. Total PCE is projected to rise sufficiently so that most components will rise too, even if some grow at slower rates. Spending levels for certain components of PCE indeed may fall, but these mainly will be due to changes in technology, consumer preferences, and other factors.

The relatively balanced growth of household income and spending suggests that the baseline scenario may prove feasible from the perspective of households. Despite declining spending proportions for particular non-health goods and services, total expenditure rises by enough to sustain levels of each item that likely will prove sufficient.

Figure 10. Composition of Personal Consumption Spending
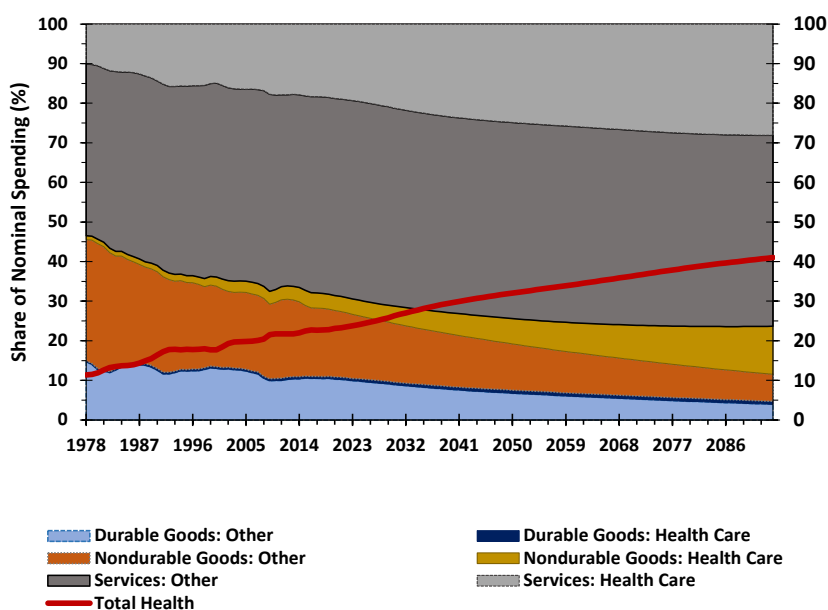
Source: Inforum, based on macro-economic and health spending assumptions adapted from the Medicare Trustees (2020).

However, for health care to occupy such a large portion of household budgets and of the economy, health industries will require large numbers of workers to provide the desired quantities of health care goods and services. Still more workers will be needed in supporting roles, namely to produce goods and services required by the health sector.[22] Whether the economy plausibly can remain viable given such a dramatic expansion of the health sector is a key question addressed in the present study.

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[21] NHE projections guide total health care spending in this work, both in real and nominal terms, but NHE provides detail for the components of health care spending only for the first decade of the forecast horizon. Growth of these components was extended through the forecast horizon in keeping with those 10-year growth projections, with necessary adjustments to satisfy the assumed totals. Future work will investigate the implications of the resulting spending distribution, including the balance of direct spending on health care goods versus services.

[22] For more information on the role of supporting industries, see Werling, et al. (2014) and Keehan, et al. (2019).

We thus turn now from the demand side of the economy to matters of supply, both for health and non-health sectors. While a variety of factors are necessary for the production of health care and other commodities, labor is a key ingredient of all production processes. Labor particularly is important for the provision of services, including health care services. Labor productivity rates indicate the average amount produced during each labor hour. For this study, labor productivity growth rates are assumed for each of the three health care services industries,[23] along with an economy-wide growth rate trajectory. Assumed real GDP and NHE trajectories largely establish baseline production levels for the overall economy and its health care component. Together with the labor productivity assumptions, necessary labor hours are implied.[24] These are joined with projections of the labor force and the number of workers, as was described earlier, to develop a portrayal of the economy-wide supply of labor.

Labor productivity growth for health care services typically lags the economy-wide average, implying that labor productivity for non-health industries generally grows more quickly. Productivity for non-health services industries also tends to grow more slowly than average, while productivity for goods-producing sectors (both health and non-health) typically grows more rapidly than average. For both health and non-health sectors, projected growth rates approximately are consistent with average rates seen in recent history.

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[23] These health services industries include Ambulatory Health Care, Hospitals, and Nursing and Residential Care.

[24] Hours are a fundamental measure of labor supply. [Not all hours produce the same value, as labor productivity varies according to skill levels, educational attainment, capital resources, industry, and other factors. Even so, hours are fundamental in that they correspond directly to production volumes, whereas the associated number of jobs and workers are related indirectly to production volumes.] Hours imply jobs, with the relationship depending mainly on the average hours worked per job each year. Jobs are related to workers, or employment, in that each worker fills one or more jobs; holding more than one job implies that a worker contributes more hours, given the average number of hours per job worked annually. Still another factor is the number of foreign workers employed in the U.S. In this project, assumptions about the labor force and unemployment rates imply the number of domestic workers, and assumptions about production volumes and labor productivity imply the number of hours. Degrees of freedom used to reconcile implied hours and workers are 1) average hours per year and 2) multiple-job holdings, where the third factor (foreign workers) is assumed to move in proportion to labor force levels. The established assumptions imply a relatively high labor force participation rate; this means that when faced with the choice of whether to hold a job, many opt to maintain employment. However, assumed production volumes are relatively low, given the implied employment levels. Reconciliation requires that each worker gradually contributes less time; individuals thus opt to sustain employment but reduce hours spent on each job, and a smaller proportion holds multiple jobs. Average hours worked historically have sustained a downward trend, and so the projections qualitatively are consistent with historical patterns, though the magnitude of future decline is uncertain.

Figure 11. Labor Productivity: Health Care Services and Other Industry
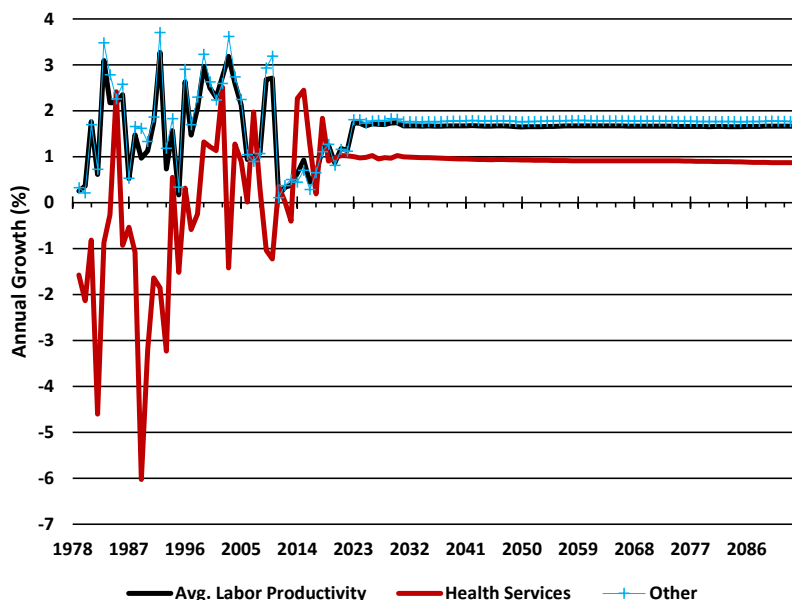
Source: Inforum, based on macro-economic and health spending assumptions adapted from the Medicare Trustees (2020).

Between the late 1970s and 2018, the share of employment (i.e. jobs) for production of goods (including agriculture, mining, utilities, construction, manufacturing, and similar sectors) fell by nearly half, from about 30% to about 16%. Relatively rapid gains in labor productivity was a key factor, as production volumes generally increased even as labor requirements broadly fell. This shift is expected to continue, but with much slower decline; by 2094, about 11% of employees will produce goods. On the other hand, the share of jobs in government (civilian jobs in general government and in government enterprises) has been more stable, slipping from about 16% in 1978 to about 14% in 2018; the projected share changes little. These imply a rising employment share for private services industries, including health care services. Employment in health services was about 5% in 1978 but reached 10% by 2018; given projected spending levels and productivity growth, employment may surpass 13% by 2094. While the anticipated increase is significant, the assumption of sustained and relatively high productivity growth (i.e. high but well within historical norms) means that the supply of labor required by the health services sector remains relatively modest. Finally, all other private services accounted for 49% of jobs in 1978 and about 60% of jobs in 2018; the projected share rises slightly, to nearly 62% in 2094.

Note that the labor requirements to satisfy NHE extend far beyond employment in the health services sector. For example, households purchase certain pharmaceuticals and medical supplies directly, and this expenditure does not contribute to health services output and employment.[25] Further, health services industries rely heavily on other industries, including not only

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[25] Consumption spending on goods supports jobs in manufacturing, retail and wholesale trade, and transportation industries. Direct consumer spending on certain goods, such as prescription drugs, might coincide with spending on health care services, but such complementary spending on goods and services are treated as distinct activities in the data employed in this project. See Figure 10 (Composition of Personal Consumption Spending) for indication of the substantial expenditure projected for medical equipment (durable goods) and pharmaceuticals and medical supplies (nondurable goods). The balance of health-related PCE is satisfied by health services industries.

pharmaceutical and medical supply manufacturers but also medical wholesalers, IT support, accounting services, electric utilities, legal counsel, and other goods and services providers. Industries that provide direct support to health services require, in turn, support from still other industries. Each of these industries, whether they contribute directly or indirectly to the provision of health care, also requires workers. Satisfaction of projected NHE levels thus requires a much larger commitment of labor than is indicated by the share of workers directly employed in health services. Many workers in other private industries provide essential contributions to NHE (Werling, et al, 2014 and Keehan, et al, 2019).[26] It thus is important to consider the broader labor requirements when assessing the feasibility of satisfying NHE projections.[27]

Figure 12. Employment by Industry, Shares of All Jobs

Source: Inforum, based on macro-economic and health spending assumptions adapted from the Medicare Trustees (2020).

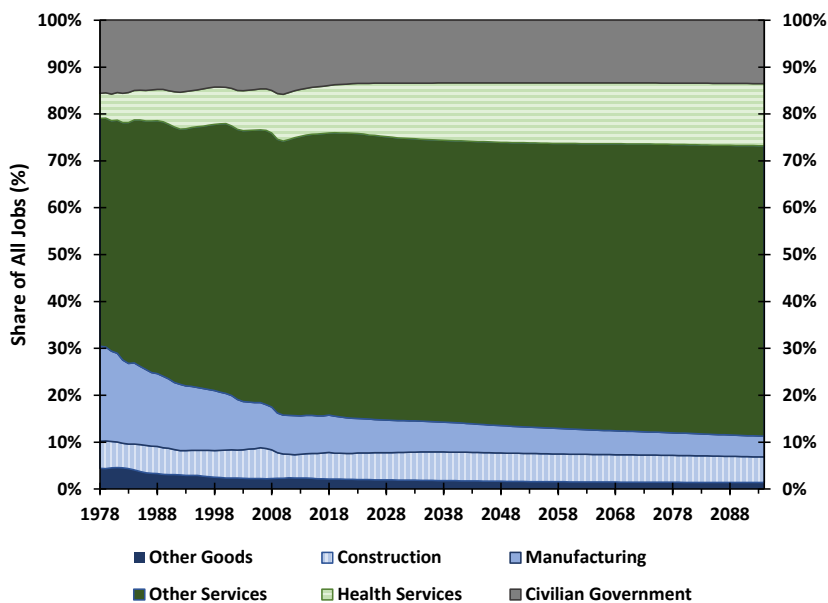Health services industries include Ambulatory Health Care (physician offices, dentist offices, home health care, and others), Hospitals, and Nursing and Residential Care. Although historic patterns of labor productivity have varied, average growth rates for the three recently have been similar; all are projected to rise at constant and identical rates. Employment requirements for each thus depends largely on production volumes, where production closely follows the consumer spending patterns shown earlier. Ambulatory health care currently employs the most, accounting for nearly 5% of all jobs in 2018. Hospitals jobs amounted to 3% and nursing and residential care employed about 2% in 2018. Together, health services jobs are projected to rise from about 10%

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[26] To some extent, the number of workers employed directly in health services is arbitrary. For example, a decision to hire outside support for accounting services would reduce labor requirements within health services industries, but substituting the industry's own employees for custodial work would raise employment requirements. Production of health care requires these efforts, regardless of the industry that employs the workers.

[27] While the present study does not specifically identify the total (direct plus indirect) number of jobs required to provide health care, it nonetheless does establish total requirements of the health care industry. The work illustrates that the economy plausibly could satisfy demand for both health and non-health goods and services, including necessary production of intermediate goods and services and without exceeding resource constraints (e.g. the total number of available workers in the economy).

of all jobs in 2018 to more than 13% in 2094, with about 7% in Ambulatory Health Care, 4% in Hospitals, and 2% in Nursing and Residential Care.[28]

While the implied number of health services workers is large, its proportion to total employment stabilizes. This might imply that provision of health care will prove feasible, but we emphasize that many additional resources will be needed. Large numbers of doctors, nurses, and others will be required, and in turn this implies the need for substantial provision of education, practical training, and licensing. Many more workers likewise will be needed in other supporting non-health industries to provide the materials, energy, and services required by health care industries. Together, the share of workers needed to produce the desired amounts of care will be far in excess of 13% in 2094.

Figure 13. Health Services Employment, Share of All Jobs
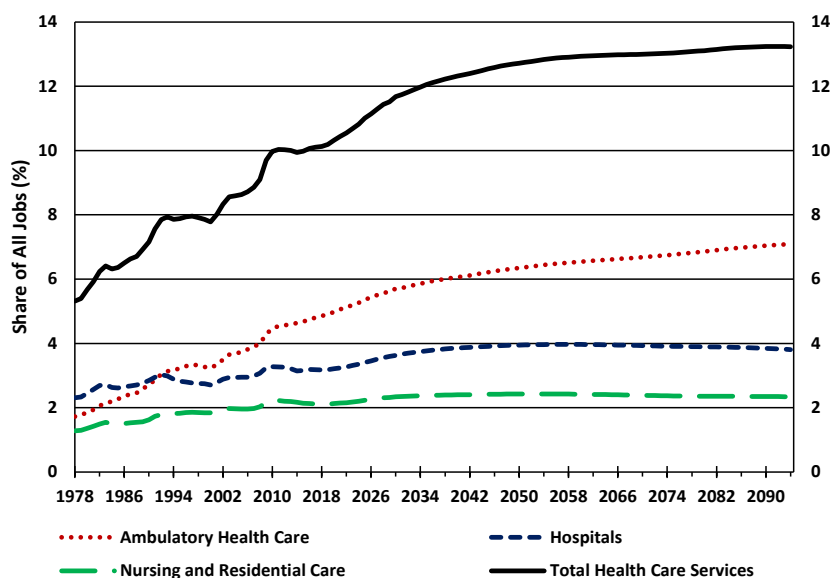
Source: Inforum, based on macro-economic and health spending assumptions adapted from the Medicare Trustees (2020).

Thus far, few obvious difficulties have appeared regarding the potential feasibility of satisfying significantly higher NHE, as labor supply and production capacity may prove sufficient to satisfy health and other needs. However, another key concern is the sustainability of health care financing. Major sponsors of health consumption include the federal government, principally via the Medicare program, and households themselves, with support from private insurers.

Entitlement programs account for the greatest portion of federal spending; Medicare and Social Security are the two largest programs. Public support for health care financing has been particularly challenging because of the rapid rise of health care prices. Together with needs implied by NHE, future Medicare financing levels are assumed in this study. Other details of

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[28] The fundamental assumptions in this study concern total spending on health and aggregate economic growth. The composition of health spending and production illustrated here is consistent with the fundamental assumptions, but the composition of health services could vary somewhat without violating the basic assumptions concerning NHE and, most likely, without overturning key implications and conclusions of the project. In particular, the mix of direct spending on health care goods and services can vary without violating study assumptions. A greater proportion of direct spending on health care services, with less spent on health care goods, would raise employment requirements for health services industries.

future federal spending are added, along with parameters for federal revenue collection.[29] As was described earlier, federal revenue collection is assumed to be enhanced in this work, particularly in the longer run. Federal tax policy over the first decade largely follows the "current law" in place when the study began, and effective personal tax rates rise accordingly; effective personal tax rates rise further but largely are stable in the final decades of the forecast horizon. While technical factors like bracket creep plausibly account for rising effective rates, particular values for the baseline long-run personal tax rates are specified to stabilize federal debt levels in proportion to GDP.

This project began before the pandemic of 2020, and so the economic history and outlook largely omit pandemic and recession effects in 2020 and beyond. However, federal debt levels for 2020 were raised in keeping with actual (fiscal year) 2020 debt levels, and debt for 2021 was raised to reflect anticipated levels. These adjustments are in excess of modeled deficit levels for those years, and so they introduce little change to federal finances or the overall economy in those years; the increase in debt does not lead to economic stimulus. However, the higher debt levels imply greater debt financing costs in following years, and so the challenge of sustaining high Medicare funding levels becomes still more difficult. In the baseline, we assume that lenders will continue to purchase federal bonds at moderate interest rates, and so the greater financing burden due to higher debt levels is not compounded by significantly higher interest rates. Note that interest payments by the federal government form a substantial portion of household income.[30] In turn, a portion of household interest income is returned to government as tax payments while the balance may facilitate saving or spending. While high federal interest costs certainly do pose formidable challenges, the full picture established by the baseline thus is not entirely bleak.

Given appropriate fiscal policy to stabilize federal debt, and assuming that such policy can be implemented in ways that do not unduly discourage labor supply[31] and private investment activity, then it seems that Medicare funding might be sustainable despite already-high debt levels. However, many strong assumptions were made in the construction of this baseline scenario, and adjustments to these assumptions could lead to substantially different results. In the case of federal balances, we assumed that interest rates will not rise substantially despite higher debt levels. If this assumption fails to hold, or if policies are not adjusted to stabilize debt, or if policy changes discourage workers and restrain economic growth, then debt levels could rise quickly and the health-care spending and funding assumptions of this scenario could prove unsustainable. Similarly, if labor force growth is reduced due to lower participation, then GDP likely will fall relative to this baseline trajectory; this would lead to lower federal revenue collection and greater strain on federal financial balances. We consider such potential alternative developments and assess the implications with a series of scenarios presented later in this report.

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[29] Projected federal policies are informed by the published work of CBO, the Social Security Administration, and other agencies, particularly in the first decade of the forecast horizon and in some cases beyond.

[30] The Federal Reserve, other private parties, and state and local governments also hold federal debt. Foreign parties also hold a large portion of U.S. Treasury debt; debt payments to these parties amount to significant financial leakages.

[31] Our work in 2017 (Scenario 3, summarized in Appendix 2) considered potential effects that an increase in tax rates could have on the supply of labor, the scale of the economy, and the implications for debt finance.

Given these assumptions, baseline federal debt levels stabilize at about 125% of GDP by the medium run. Deficits, including interest expenses, stabilize at about 5% of GDP. These levels are high but could prove sustainable.[32]

Figure 14. Federal Deficits and Debt in Proportion to GDP
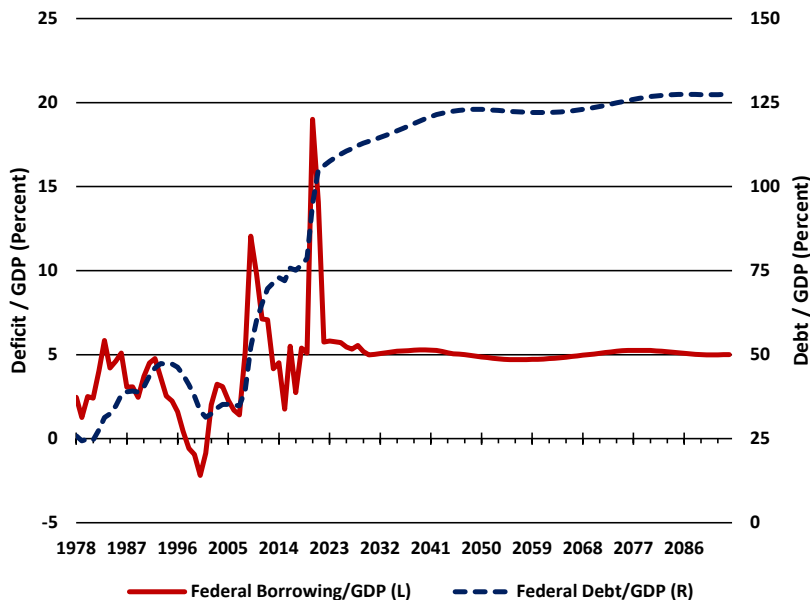
Source: Inforum, based on macro-economic and health spending assumptions adapted from the Medicare Trustees (2020).

Finally, household and international balances provide two additional indicators of financial sustainability. Personal savings rates are projected to vary but to remain well within historic norms, at about 8-9%. This, together with rising total expenditure levels and relatively stable consumption shares as reported earlier, suggests that household accounts might not be overwhelmed either by tax payments or by health care costs. International balances, as indicated by the Current Account balance in proportion to nominal GDP, also are stable and well within historic norms. The largest component of the current account is the trade balance (the value of total exports minus total imports). A potential consequence of limited labor supply and domestic production capacity is greater reliance on foreign producers; this would be reflected in a wider trade gap and greater current account deficit. As with federal debt levels, indebtedness to other countries cannot grow without bound,[33] and ultimately these measures could imply trouble with satisfying NHE projections. At this stage, however, little such trouble is evident, as the baseline current account deficit remains stable and well within the historic norm relative to GDP. Baseline

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[32] Some countries, including Japan, have seen relative debt levels substantially greater than those depicted here. Japan in particular has sustained high debt levels for decades. Although the Japanese economy perhaps suffers consequences and other indebted governments have collapsed under heavy debt loads, the Japanese example indicates that governments and economies can continue to function despite difficult circumstances.

Debt levels portrayed this scenario are lower than those reported elsewhere, such as the CBO (June 2019). Using a different set of assumptions, CBO projected debt levels reaching 149% of GDP by 2049; this was established before onset of pandemic and its consequent increase in federal debt. The key reason for higher debt levels in the CBO analysis is assumed strict maintenance of current law, with no deviations to mitigate large deficits and rising debt despite the economic consequences.

[33] This is another familiar application of Stein's Law. Whether, in practice, Stein's Law takes effect smoothly or whether crises develop varies widely.

household and international financial balances thus suggest that these sectors might navigate the coming decades without undue financial strain, despite the rising expenditure levels for health care.

Figure 15. Household and International Balances
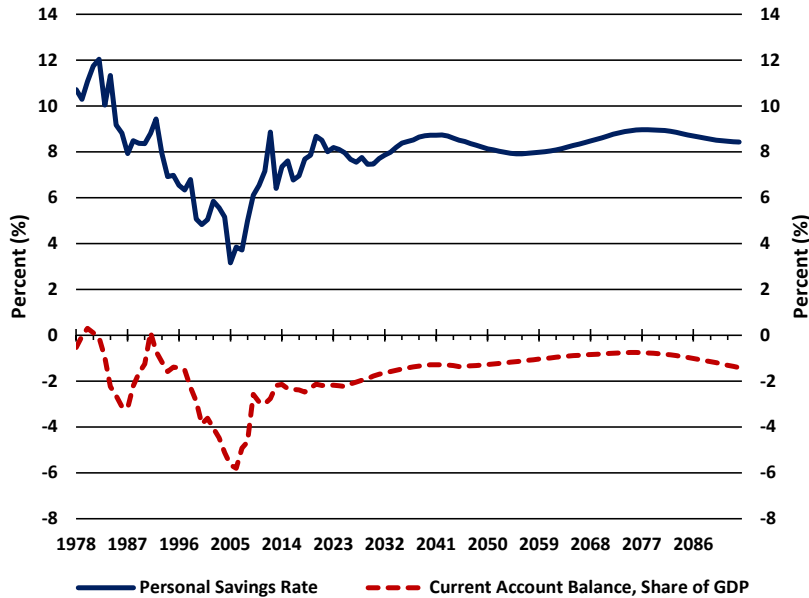
Source: Inforum, based on macro-economic and health spending assumptions adapted from the Medicare Trustees (2020).

In summary, baseline results seem to illustrate a plausible path to economically feasible and financially sustainable satisfaction of NHE over the coming 75 years. Projected consumption spending on health care does not overwhelm household budgets, nor do corresponding supply requirements overwhelm labor or other markets. Anticipated federal funding of health care through the Medicare program certainly will be costly, but given the full set of assumed fiscal policies, the program may prove sustainable. The portrayed overall economy remains reasonably well balanced, both internally and in international markets. Though various assumptions underlying the baseline scenario will prove imperfect as the future unfolds, and despite limited ability to establish long-run forecasts with convincing claims of accuracy, the baseline scenario still provides a useful illustration of the economy in the long run.[34] The baseline incorporates a variety of assumptions, and the modeling exercise helps to determine their joint implications, including implications concerning feasibility and sustainability. In addition, the baseline establishes a reference to which alternative scenarios may be compared. Following sections identify several variations to our modeling assumptions and report consequent changes to the baseline trajectories.

Alternative Assumptions and Implications
Indeed, many assumptions embodied in the baseline scenario are far from certain. We consider several alternative assumptions to examine the scale effects of population sizes together with the

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[34] Numerical details of the baseline for select years are presented in the tables of Appendix 3.

compositional effects of varying age distributions; the implications for economic scale and government financing of reduced willingness to work; and the implications for debt financing of alternative interest rates. In this section, we describe these three sets of specific alternative assumptions. In other ways, the assumptions and modeling framework remain consistent with those of the baseline scenario. For each, key results are presented; additional results are reported in the data appendix.[35]

Except where noted, government consumption and investment spending is not adjusted in the alternative scenarios. Although perhaps in some cases this practice is not ideal,[36] it helps to focus attention on effects of the primary alternative assumptions. To modify government consumption and investment spending as well would introduce additional powerful, exogenous effects on the economy; disentangling the results to establish the particular implications of primary changes would prove difficult.

Government expenditure for transfers, on the other hand, does vary according to total population or other relevant measures, and nominal spending varies with the price level. Social Security funding, for example, rises with the number of people of retirement ages and with increases in consumption prices. Given such developments, overall federal expenditure will tend to rise as well. Whether federal deficits rise too depends on the corresponding effects on federal revenue, which also will be affected by changes in economic activity and price levels.

Finally, state and local debt levels are stabilized by adjusting tax rates on personal income. Without such adjustments, the variation in S&L debt levels would be extreme over the 75-year horizon. As was noted earlier, existing laws typically govern the extent to which S&L government can realize deficits in their operating budgets, which include interest costs. This in turn implies limits on capital spending and debt levels. For simplicity, we assume that personal tax rates alone are adjusted to keep S&L deficit and debt levels stable in the baseline and alternative projections.[37]

Lower Labor Force Participation—A key determinant of economic scale is the labor supply. Labor supply depends on several factors, with the number of domestic workers the key determinant.[38] Supply of workers is determined partly by the overall population and its age distribution, particularly the number of people of prime working ages. However, the inclination of people to participate in the labor force, which means they either work or actively seek employment, varies over time. Even if total population and its composition are known, the size of the labor force remains uncertain. To examine the effects of changes to this key variable, we specify an alternative scenario with lower labor force participation. This change naturally leads to lower total employment levels, though we mitigate some of the decline by raising average annual

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[35] Summary details of the alternative scenarios for select years are presented in the tables of Appendix 4. An accompanying spreadsheet provides additional details for recent history and for all forecast years.

[36] For example, government spending on education typically depends on the school-aged population, but we do not vary such government spending levels in scenarios that consider effects of population size and age distribution. On the other hand, private spending on education does vary with the number of school-aged people in those scenarios.

[37] A reasonable alternative assumption is that the proportion of S&L debt to GDP should remain stable, rather than to assume stability of S&L debt levels. This alternative approach would allow larger S&L deficits in larger economies, and it would force tighter fiscal policy in smaller economies. Although this approach also has merit, we instead keep S&L debt levels stable and focus attention on the primary matters of interest.

[38] Other important factors include the number of foreign workers, the number of multiple-job holdings, and the average number of hours worked per year (per person, per job). Together, these imply the number of total hours supplied in the economy.

hours per worker.[39] The net effect is a moderate reduction in labor supply (i.e. total hours worked) and a moderate reduction in potential GDP. Corresponding reduction of actual GDP implies reduced federal revenue, given maintenance of the tax policies established in the baseline scenario. This causes debt levels to climb and makes Medicare financing more difficult. Greater federal borrowing puts upward pressure on interest rates. This compounds the difficulty of managing higher debt levels, and higher interest rates also discourage private activity such as residential construction. Reduced private activity in turn further reduces federal revenue, though it also relieves upward pressure on interest rates and on inflation. At the same time, greater federal interest payments boost interest income received by households and other parties, thus mitigating some of the private-sector declines due to higher interest rates; a portion of private interest and other income subsequently is paid to the federal government as taxes, thus reducing the net debt financing expenditure. This income side of federal debt financing often is overlooked, and the alternative scenarios described below provide useful illustrations of the matter. In particular, results for the alternative labor force participation scenario illustrate the implications of economic scale for health care production and financing.

Together, the total population, age distribution, and labor force assumptions largely imply the baseline labor force participation rate. Implied participation rates briefly rise in the baseline, to about 63%, before subsiding to approximately 62% for most of the forecast horizon. These rates may be plausible, as they easily are within the historic range and vary little from 2019 rates.[40] However, some anticipate lower rates coming in the next decade or two, perhaps falling below 60%.[41] We thus construct an alternative trajectory for labor force participation rates, where rates fall through 2045 before stabilizing below 60%. The long-run difference of 2-3 percentage points is significant. With other details unchanged, the lower participation rates imply a labor force with

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[39] That is, we slow the downward trend in average hours worked per year, and so the alternative average hours worked trajectory is increased relative to the baseline trajectory but not raised in absolute terms. By "lower employment levels," we mean a reduced number of workers; while this likely implies fewer jobs, potential variation in the number of multiple-job holdings makes this outcome uncertain. In results for this scenario, both the number of jobs and number of workers decline relative to the baseline.

[40] Recall that the short-run outlook omits effects of the 2020 pandemic and recession that reduced labor force participation in 2020 and 2021. Late in 2021, rates remain significantly lower than seen before the pandemic, and it is not clear whether and when rates might recover to earlier norms. Note that participation rates are based on the total (noninstitutional, civilian) population of ages 16 and greater; this means that retirement reduces participation rates. If the pandemic encouraged retirement, then participation rates could remain lower than expected earlier for years to come unless others enter the labor force who otherwise would not have done so.

[41] See, for example, projections by the Congressional Budget Office (CBO, June and August 2019) and the Bureau of Labor Statistics (BLS 2021). Social Security Administration (SSA 2019) projections have been somewhat higher and are similar to the baseline assumptions used here.

According to BLS (2021, p. 3), "The labor force participation rate is projected to decline, from 61.7 percent in 2020 to 60.4 percent in 2030. The decline in labor force participation is due to the aging of the baby-boom generation (see chart 3), a continuation of the declining trend in men's participation, and a slight decline in women's participation." According to CBO (June 2019), participation rates will fall from 62.8% in 2019 to 60.9% in 2030 and 59.8% in 2049. According to SSA (2019, p. 107), participation in the long run for men will rise from 70.7% in 2017 for men to 73.3% in 2093 (Intermediate-Cost Scenario), while the rate for women will rise from 58.5% in 2017 to 61.7% in 2093, due mainly to expected increases in life expectancies. "To model the effects of other factors related to increases in life expectancy, projected participation rates are adjusted upward for mid-career and older ages to reflect projected increases in life expectancy. For the intermediate projections, this adjustment increases the total labor force by 2.8 percent for 2093."

Social Security Advisory Board Technical Panels convened in 2017 and 2019 (www.ssab.gov/tags_taxonomy/technical-panel), and in 2017 it commissioned a panel of five labor economists to provide projections of labor force participation rates (Social Security Advisory Board Technical Panel, 2017).

nearly 11 million fewer workers by 2094, a 4.7% reduction. The size of the labor force is a key determinant of potential GDP; the reduction thus implies a smaller economy for this alternative scenario.

Figure 16. Labor Force Participation and Levels
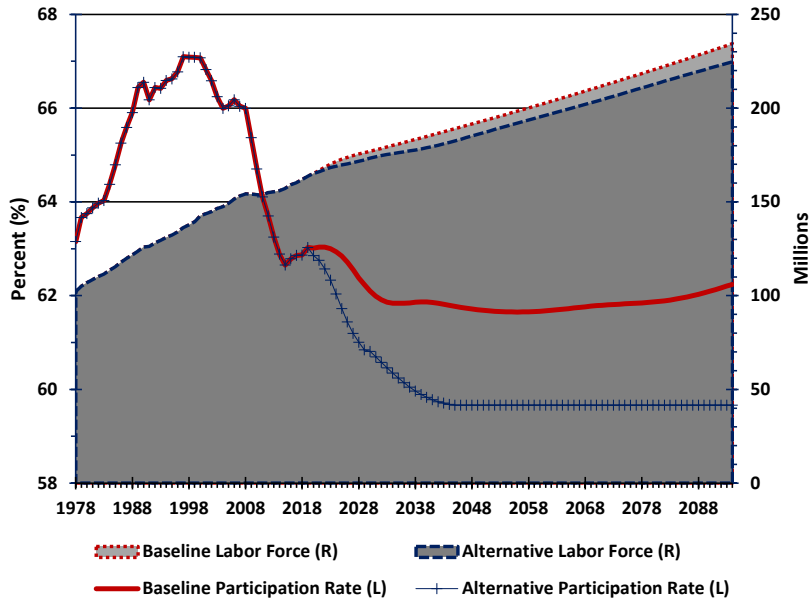
Source: Inforum, based on macro-economic and health spending assumptions adapted from the Medicare Trustees (2020).

If the baseline trajectory of unemployment rates is maintained (i.e. if full employment is sustained), these lower labor force projections imply correspondingly lower employment levels. Lower participation could reduce employment by 10.4 million (4.7%) by 2094. Other factors also could adjust to lessen the ultimate decline in labor supply, but the reduced scale of the labor force implies a reduction in potential GDP relative to the baseline. A smaller economy would make more unlikely the feasibility of supplying projected levels of health care, and budgets would realize further strain. For these reasons, this alternative scenario allows useful exploration of the implications of labor force assumptions, particularly as it pertains to feasibility and sustainability of health care projections. With fewer people working, even if each tends to work moderately more hours, actual GDP almost certainly will fall, [42] and with it falls the ability to produce health care and other goods and services; household and federal incomes decline as well.

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[42] The effects of a reduced labor force might be mitigated by greater private and public investment in labor-augmenting capital that could raise labor productivity, whether physical capital, intellectual property, or human capital. Tax and other policies also could encourage those who do work to contribute more hours each year. While we do assume a moderate increase in average hours worked (and this without any change to policy), we leave unexplored the possibility of actively countering the negative effects of reduced participation on potential GDP.

Figure 17. Employment Levels

Source: Inforum, based on macro-economic and health spending assumptions adapted from the Medicare Trustees (2020).

The scale of the baseline economy is specified by assumption, where assumed growth rates extend historical levels of real GDP. As the alternative scenario reflects diminished capacity to produce, this implies that fewer goods and services will be produced and that incomes will fall. The reduced labor force, which is 4.7% smaller than the baseline level in 2094, leads to a reduction in real GDP levels of about 1.5% in the same year. In both the baseline and this alternative scenario, workers' average contribution of hours per year trends downward. In the alternative, the decline is less substantial, and so workers contribute more hours relative to the baseline. This accounts for much of the difference between the percentage change in the labor force and the corresponding change in production volumes. The implication is that per capita production levels fall with the reduction in the labor force, but employees tend to work more hours to offset some of the reduction in production and the consequent decline in per capita income. This illustrative result is conservative in the sense that effects on GDP could be greater if workers do not respond by contributing additional hours. [43]

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[43] Average hours worked historically have sustained a downward trend, and baseline projections continue this pattern. The magnitude of future change is uncertain, though, and so this alternative scenario includes 1) lower labor force participation (and thus fewer workers) but 2) somewhat greater effort by each worker (more hours per year and more multiple-job holders). The net effect is a reduction in labor supply (hours worked) and thus lower potential GDP, but the decline in total hours and aggregate production volumes are less than proportional to the reduction in the labor force.

Figure 18. Real Gross Domestic Product, Percent Change From Baseline

Source: Inforum, based on macro-economic and health spending assumptions adapted from the Medicare Trustees (2020).

A smaller economy, as envisioned in this alternative scenario, produces less labor and capital income, though transfer income may remain similar.[44] This implies increasing share for transfer income in household budgets and declining shares for labor and capital income. At the same time, tax payments to the federal government diminish due to a decline in the tax base, while Medicare payments remain unchanged; both likely imply larger federal deficits and mounting debt levels.

In this alternative scenario, effective federal tax rates remain identical to those of the baseline; though tax payments are lower because of reduced incomes, the share of household income that is paid in federal taxes remains similar. Savings are more vulnerable, as households are forced to satisfy their various needs and preferences with fewer resources. State and local governments are forced to raise tax rates to sustain revenue levels and contain debt despite the diminished tax base; no cuts to S&L consumption and investment spending are considered here, and S&L debt levels are constrained by policy. These changes to S&L tax rates put additional strain on personal savings rates.

Although NHE and Medicare levels remain identical to those projected in the baseline, health care now occupies a greater share of consumer spending and domestic production. Reduced availability of labor means that production of non-health commodities and will be displaced, given that NHE does not change.[45] Productivity assumptions for the alternative scenarios remain unchanged.

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[44] To maintain baseline federal transfer spending levels despite the smaller economy might prove unsustainable without policy changes to raise revenue. We assume no changes to baseline federal tax policy, and thus we assume that debt financing will be available and sufficient to sustain federal transfer spending at baseline levels despite the reductions in the tax base and tax revenue. Results for this scenario suggest the plausibility and implications of these assumptions.

[45] Reduced production does not necessarily require reduced consumption, so long as inventory levels and net exports adjust to sustain domestic consumption and fixed investment spending. However, this implies continual reduction of domestic savings which could prove unsustainable in the long run.

Given that the alternative supply of labor is lower, identical labor productivity rates imply that real GDP almost certainly must be lower than in the baseline.

While proportions of health care spending to total consumer spending and health services industry employment to total employment both rise relative to baseline projections, the differences are small. The relatively small changes are in keeping with the moderate reduction in GDP, as shown earlier. This might imply that assumed health care consumption and production levels still will prove feasible. However, we emphasize again that many additional resources are needed to facilitate production than are indicated by employment and production levels for health services industries.[46] Relative to the overall economy, the increased size of the health sector, including its supporting industries, implies that health needs absorb an even larger portion of productive capacity than is established in the baseline scenario. While this still might prove feasible, it implies greater economic imbalance and that fewer resources are available to satisfy other (non-health) needs.

Baseline federal debt levels stabilize at about 125% of GDP. In this alternative scenario, the smaller economy provides less tax revenue. Because federal tax rates are not changed and Medicare and other spending continue at baseline levels, structural deficits rise. Greater federal borrowing pushes interest rates higher; both higher structural deficits and higher debt financing costs contribute to greater debt. Despite the relative increase in average hours worked per year, where this partially mitigates the decline in the labor supply due to lower participation, the long-run effects on federal debt are substantial. In proportion to GDP, debt levels in 2094 rise from just under 125% in the baseline to nearly 140% in the alternative scenario; this is caused both by increased debt and by reduced GDP. If workers instead chose not to contribute more hours each year, then the reduction in federal tax revenue and the increase in debt could be higher than is illustrated here.

Figure 19. Federal Debt in Proportion to GDP
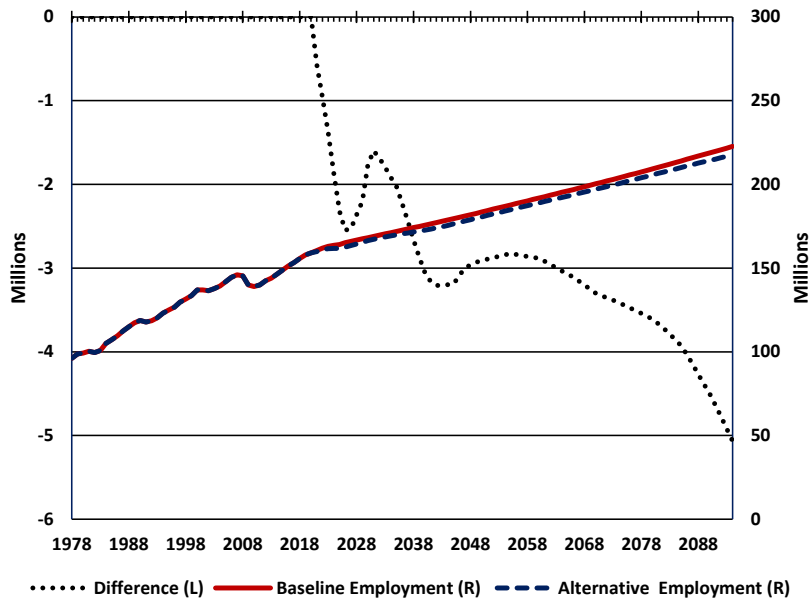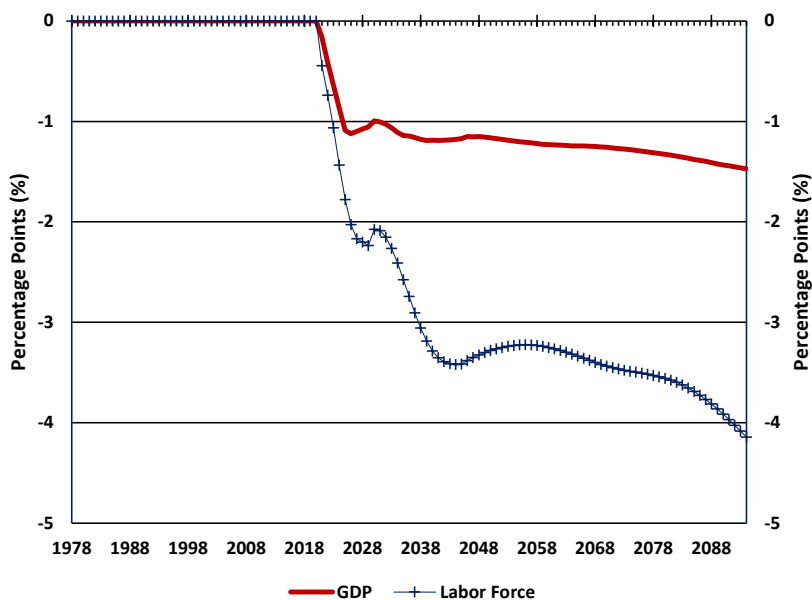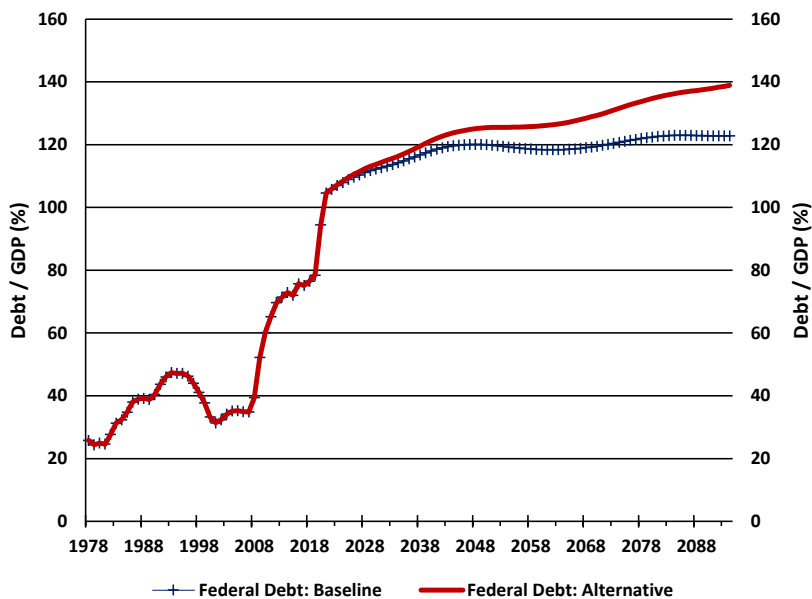

Source: Inforum, based on macro-economic and health spending assumptions adapted from the Medicare Trustees (2020).

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[46] Werling, et al. (2014) and Keehan, et al. (2019).

In summary, reduced participation rates imply greater economic strains in the satisfaction of NHE over the coming 75 years. While provision of projected health care levels still could prove economically feasible and financially sustainable, it would require a greater share of household budgets, a larger share of workers, and potentially higher federal debt levels.[47]

Higher and Lower Population and Shifted Age Distributions—Variations in labor force participation affect the productive capacity of the economy while, in principle, leaving health care spending and funding requirements unchanged. Maintaining the participation assumptions but varying the population can imply similar effects on production, as this too will affect the size of the labor force. However, population size and age distribution have strong implications for NHE. For example, a greater number of older people will mean greater expenditure for nursing homes. If the proportion of older people rises relative to those of prime working ages, then financial viability of the federal government and other parties could be strained. In two alternative scenarios, we consider the implications of 1) higher population growth with a smaller share of older people and 2) lower population growth with a greater share of older people.[48] In both, production volumes vary with labor supply and NHE varies with population size and age distribution.

Total population in the high-growth scenario exceeds baseline levels by about 17% in 2094, while population in the low-growth scenario is about 16% lower than baseline level. In addition to alternative growth rates for total population, the age distributions shift as well. In the high-growth case, the age distribution shifts down, leaving fewer older people. In the low-growth case, the age distribution shifts up such that there are additional older people and fewer children and working-age people.[49] Because of the shifting age distributions, spending on health care does not move in proportion to total population. Older people in particular spend disproportionate amounts on health care, and young children also may receive more care than average. In the high-growth case, total population rises proportionally more than does the number of older people, and so health spending rises by less than does total population. In the low-growth case, health spending falls by less than total population because of the (relative and absolute) increase in the number of older people. In the high population-growth case, total spending on health rises by about 8% in 2094, while spending falls by about 8% in the low-growth case. Because of changes in the age distribution, per-capita spending on health falls in the high population-growth growth scenario due to a reduction in the proportion of older people; per-capital health care spending rises in the low-growth alternative, driven mainly by the increased number of older people.

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[47] Note again that the higher federal debt levels reported here could be mitigated, to some extent, by changes in fiscal policies, though reduction of federal debt could come at the expense of household saving and expenditure levels.

[48] Population levels are guided by Social Security Administration (2020) Intermediate Cost, High Cost, and Low Cost projections. Annual population details are published as "Single-Year Tables Consistent With 2020 OASDI Trustees Report." These alternatives projections specify corresponding age distributions as well. Projected population levels by age, together with model parameters that relate age to health care demand, then were used to assess effects of shifting age distributions on health care expenditure.

[49] Variations in the alternative SSA scenarios, which guide the present baseline and alternative scenarios, are substantial. Not only do age distributions vary, but the largest total population coincides with the smallest number of people 65 years old and above, and the smallest total population coincides with the largest number of older people. These assumptions have strong implications for corresponding supply and demand for health care and other commodities.

Figure 20. Total Population and Health Care PCE, in Proportion to Baseline Levels
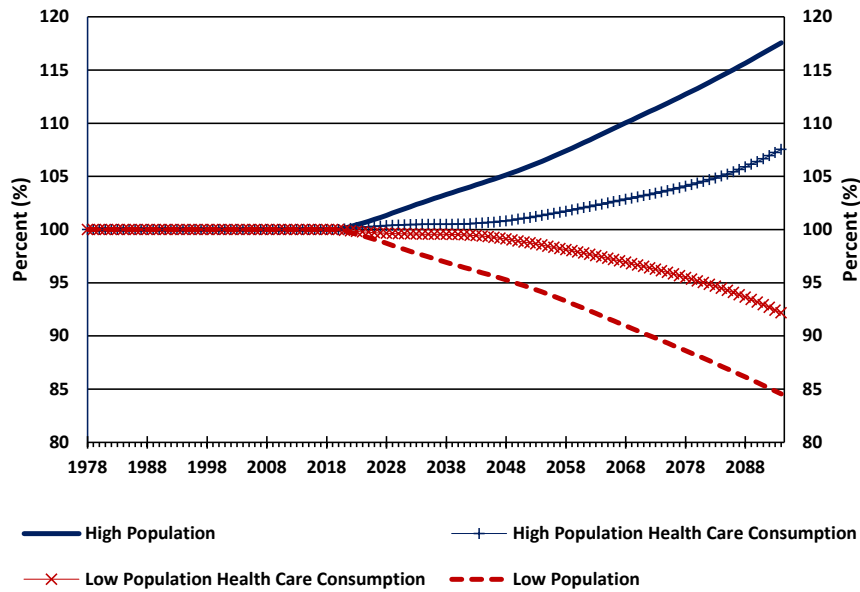
Source: Inforum, based on macro-economic and health spending assumptions adapted from the Medicare Trustees (2020).

As was noted earlier, a key determinant of economic scale is the labor supply, which is determined partly by participation rates and partly by the overall population and age distribution, particularly the number of people of prime working ages. For given participation rates, faster population growth naturally leads to a larger labor force, and the economy tends to expand accordingly. Economic growth especially will be stronger if the number of people of prime working ages grows more quickly, but economists typically assume that participation rates are positive for all ages of 16 years and above, and so economic growth also depends on changes in the number of young adults and people beyond typical retirement age.

As these alternative population scenarios reflect enhanced or diminished capacity to produce, supply of goods and services and income levels will vary as well. Changes to the labor force, which rises or falls about 13% relative to the baseline level in 2094, lead to slightly greater variation in real GDP. The small differences in magnitude, where GDP changes are slightly greater than labor force changes, might be explained by industry compositional effects due to changes in the relative size of the health care sector, variations in average hours worked per year, and other factors.

Figure 21. Labor Force and Real Gross Domestic Product, in Proportion to Baseline Levels
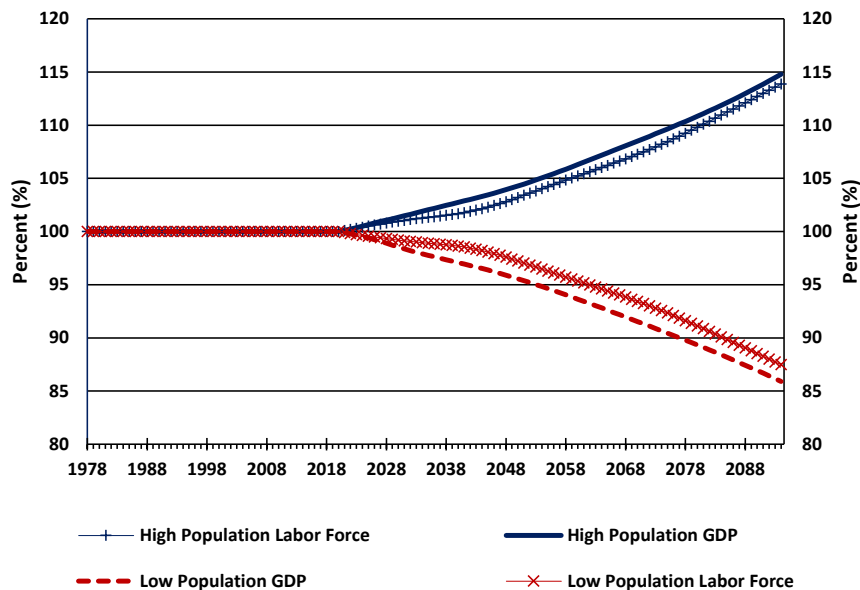
Source: Inforum, based on macro-economic and health spending assumptions adapted from the Medicare Trustees (2020).

Effects on federal deficits and debt are substantial. First, Medicare expenditure is assumed to vary with the size of the retirement-age population. Because the high population-growth scenario envisions a smaller number of older people, Medicare expenditure falls relative to baseline levels;[50] similar correspondence holds for the low-growth scenario. Other forms of transfers to households are modeled in similar fashion, where transfer spending varies with total population, retirement population, or the size of other relevant groups. Together, these effects on transfer spending account for wide variation in total federal expenditure levels.[51]

At the same time, tax revenue varies widely as GDP, personal income, industry production levels, and other measures vary with population and labor force size. Tax revenue changes without adjustment to tax rates because of changes to the tax base; for example, income taxes paid by households vary with income levels. In the low population-growth scenario, federal revenue sags relative to baseline, and structural deficits widen accordingly, even as a larger retirement-age cohort leads to greater Medicare, Social Security, and other federal expenditure. Both revenue and expenditure adjustments thus add to federal debt, and the consequently higher financing costs drive deficits and debt higher still. In addition, greater federal borrowing pushes up interest rates so that

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[50] In these alternative scenarios, real Medicare transfer dollars per recipient remain at baseline levels. Total Medicare expenditure thus rises (falls), relative to baseline levels, as the retirement-age population rises (falls).

[51] Note that variations in government consumption and investment levels are limited in these scenarios, and thus variations in government expenditure have limited direct effects on GDP. Variations in federal expenditure do have large indirect effects, most importantly by facilitating consumption of health care via programs such as Medicare. While consumption and investment spending plausibly could vary with population size, e.g. with education needs and spending adjusting with the school-aged population, maintenance of absolute consumption and investment spending levels allows focus on key health-related aspects of these scenarios. As explained later in this section, only government consumption spending on labor compensation varies, as government employment levels are assumed proportional to total population in the various scenarios.

federal debt compounds more quickly even as private activity slows due to higher borrowing costs, with tax revenue slowing further along with private activity.

Figure 22. Medicare Spending and Federal Debt, in Proportion to Baseline Levels[52]
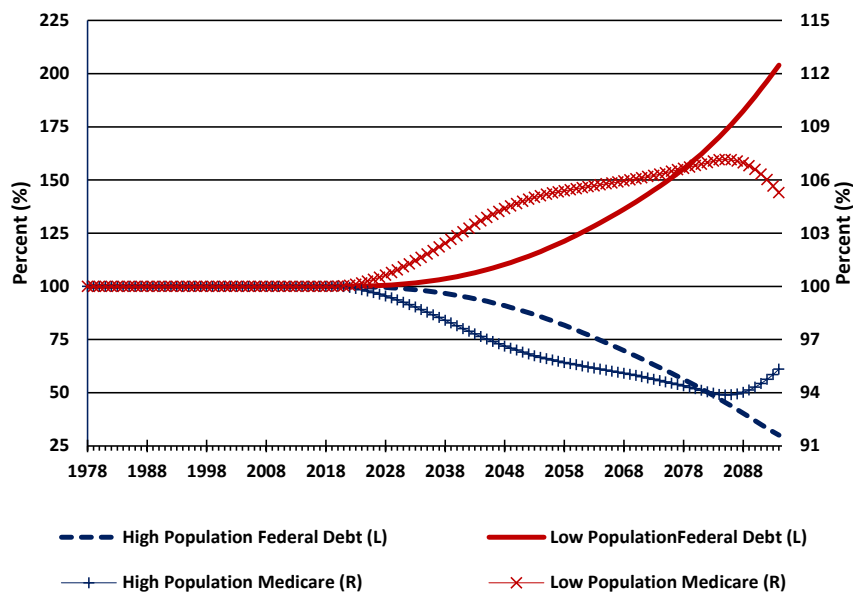
Source: Inforum, based on macro-economic and health spending assumptions adapted from the Medicare Trustees (2020).

Note, however, that the effects of adjusted population magnitudes and age distribution are restrained in these scenarios. Both federal and S&L transfer payments to households vary with the relevant population size. In addition, government civilian employment and labor compensation are adjusted in proportion to total population. However, government consumption other than compensation, investment, and other expenditure in general do not vary. By holding other spending constant relative to baseline projections, we focus attention on the effects of population growth rather than a combination of effects. Unfortunately, although in most cases such assumptions are suitable, certain improbable implications do become evident. For example, we implicitly assume that the number of employees at public schools and universities will vary with the population, but we assume no changes in spending on public school buildings, IT equipment and services, paper, or other items, despite changes in enrollment and employment.[53] If instead we assumed that these expenses would vary, then the overall effects on federal debt would change to some extent. In the low population growth scenario, reduced government consumption and investment spending would tend to reduce deficits, but reduced spending also could lead to reduced economic activity and lower tax revenue. In the high population case, greater government consumption and investment spending would raise spending but also could stimulate economic growth and tax revenue. In both cases, the implications of additional changes in spending for deficits and debt remain unclear, but most likely the qualitative results reported here would remain

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[52] The cause of the shifts in Medicare spending after 2085 likely is a shift toward baseline in the number of people of retirement age. As cohorts of varying sizes age over the forecast horizon, the effects can be seen not only in the demographic numbers but also in corresponding economic figures. An example is numbers of school-age children; this number varies over time, and the effects on private school construction levels and dynamics are substantial.

[53] This also implies changes for capital-labor ratios in the public sector, which could affect labor productivity.

intact. Federal entitlement spending and debt obligations are more difficult (easier) to manage in a smaller (larger) economy, and plausible changes to government consumption and investment expenditure are unlikely to fully offset effects on revenue and other changes. Results for these alternative scenarios again illustrate the implications of economic scale for health care production and financing. Smaller populations support smaller economies and reduced federal revenue, given maintenance of baseline tax and spending policies. This leads to higher debt levels and makes Medicare financing more difficult. Greater federal borrowing puts upward pressure on interest rates. This compounds the difficulty of managing higher debt levels, and higher interest rates also discourage private activity such as residential construction and auto purchases. Reduced private activity in turn further reduces federal revenue, though it also reduces upward pressure on interest rates and on inflation. At the same time, greater federal interest payments boost household and other income and thus mitigates some of the private-sector declines due to higher interest rates. Corresponding effects are seen in the high population growth scenario, where more workers support expanded production volumes leading to greater government revenue. Given the assumptions developed for these scenarios, deficits and debt subsequently fall, and maintenance of federal health care funding becomes easier to manage. Importantly, these scenarios model both changes in total population and changes in age distributions; clearly, increases (decreases) in the absolute and relative number of retirement-age people increases (decreases) the difficulty of maintaining government health care funding.

Higher and Lower Interest Rates—A final set of alternative scenarios explores the consequences of higher or lower interest rates. Such interest rate adjustments could be caused by changes in federal borrowing and debt levels, with more (less) borrowing leading to higher (lower) interest rates, though the baseline scenario illustrates conditions when adequate government financing is available at stable interest rates. Interest rates affect federal finances directly, in part by making debt finance more or less expensive. Rates affect interest payments and annual budget deficits, and cumulative effects help to determine debt levels. Interest rates also affect federal budgets through indirect channels. For example, an increase in interest rates would discourage private investment spending, and it would discourage automobile purchases and other personal consumption spending. Such reductions in private activity lead to lower tax revenue, including reductions in income taxes, sales taxes, tariffs, and other payments. Together, the smaller tax base widens the structural deficit and the higher debt financing costs causes existing debt to grow more quickly. These make federal financing significantly more difficult when interest rates are high, and conversely financing becomes far easier when interest rates are low.

To explore these matters with a focus on health care financing, short-term interest rates were raised or reduced by up to 0.5 percentage points in two alternative scenarios, where full adjustments were made in 2030 and later years.[54] These adjustments to 3-month Treasury Bill rates cause 10-year Treasury Bond rates, mortgage interest rates, and other rates to shift similarly. Of particular importance is the effect on federal borrowing costs. Effective rates paid on federal debt are linked

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[54] These exogenous adjustments were introduced to equations that include other economic factors, such as private and public borrowing levels. The resulting total effect on interest rates thus includes both the direct effect of the adjustment plus indirect effects that come through other channels. For example, a direct upward adjustment to raise interest rates could push up federal interest expenditure and borrowing levels, thus causing interest rates to rise further. While the direct adjustments were ±0.5 percentage points, the full effects on 3-month Treasury Bill rates were slightly greater. This approach requires a weaker assumption than setting alternative interest rates to ±0.5 percentage points from baseline rates. The approach instead illustrates, for example, effects of a shift in risk premia for federal borrowing amounting to ±0.5 percentage points, and the model accounts for consequent direct and indirect effects on interest rates.

tightly to Treasury rates, and so federal interest payments shift accordingly. Additional effects on interest payments follow with changes to structural deficits and cumulative effects on debt levels. Debt in 2094, in proportion to GDP, rises from about 125% in the baseline case to nearly 160% in the high-interest rate scenario, and it sinks below 100% in the low-interest rate scenario. This illustrates that even small changes to interest rates paid on federal debt can have substantial effects on debt levels and associated costs.

Figure 23. 10-Year Treasury Interest Rates and Federal Debt in Proportion to GDP
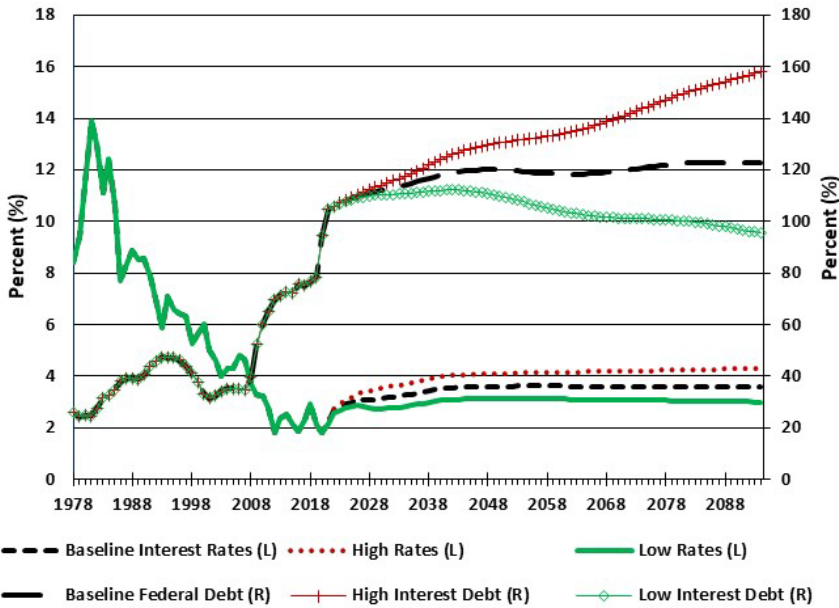
Source: Inforum, based on macro-economic and health spending assumptions adapted from the Medicare Trustees (2020).

To some extent, federal debt is not as onerous as it seems. As was described earlier, higher federal interest payments to households, businesses, and S&L governments allow greater spending and support increased economic activity. Households and businesses also pay federal taxes on income, and the Federal Reserve transfers surplus to the U.S. Treasury, and so a portion of federal interest payments are returned. At the same time, though, foreign parties own a significant portion of federal debt, and interest payments to these foreign entities constitute leakages in the U.S. economy. Such leakage may be exacerbated by high interest rates that raise debt financing costs, including higher payments to foreign parties.

Projected effects of small interest rate adjustments on the scale of the economy are relatively minor, but more-notable effects on the private economy are seen in fixed investment spending. Residential investment levels depend on mortgage interest rates and disposable income; both vary significantly in these scenarios, with net interest income a significant component of total household income. Nonresidential investment in structures, equipment, and intellectual property depends on borrowing costs and growth of production volumes. These direct and indirect effects of varying interest rates thus cause fixed investment to shift from baseline levels in greater proportion than shifts seen for the overall economy. The composition of personal consumption spending shifts as well, with less (more) spending on automobiles and other durable goods when borrowing costs rise (fall), though spending on other goods and services could see corresponding and offsetting

changes.[55] Nevertheless, because GDP shifts by relatively small amounts, the indirect effects of changing interest rates on federal revenue also are relatively small, though cumulative indirect effects on debt can be substantial. Still, this suggests that the dramatic effects of slightly higher (lower) interest rates on federal debt levels are due mainly to higher (lower) debt finance costs rather than to higher (lower) structural deficits caused by changes to the private economy and tax revenue.[56]

Figure 24. Real Fixed Investment and Gross Domestic Product, in Proportion to Baseline Levels
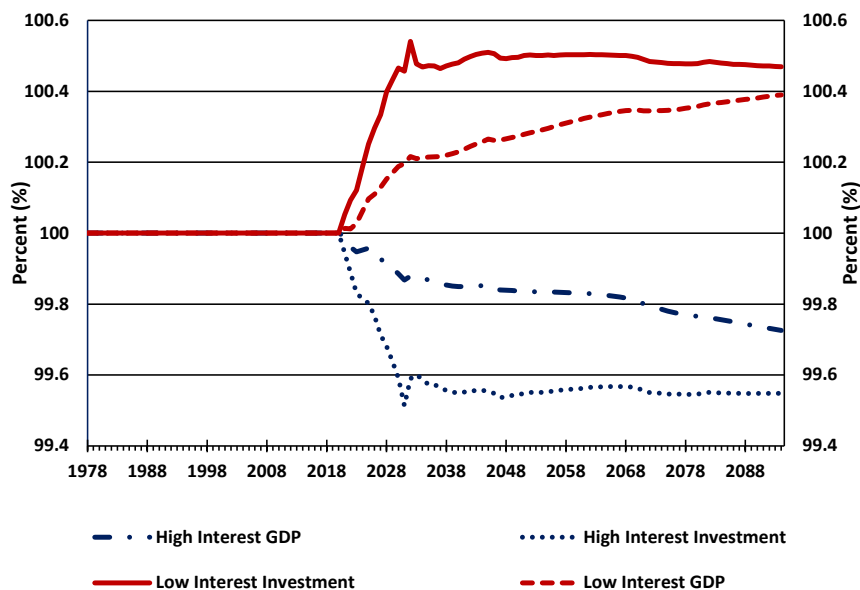
Source: Inforum, based on macro-economic and health spending assumptions adapted from the Medicare Trustees (2020).

Even small changes to interest rates can lead to dramatic changes in federal debt over 75 years. In these scenarios, small changes to Treasury rates cause federal debt to shift by more than 20 percentage points relative to GDP. Because federal tax rates are not changed despite interest-rate effects on the private economy that affect tax revenue, and despite direct effects on federal debt financing costs, debt levels shift dramatically. As federal debt grows larger (smaller), risk premia could rise (fall) further and exacerbate the small adjustment to rates specified in these scenarios.[57]

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[55] In addition to durable goods, other components of consumer spending also are affected by interest rates. For example, credit cards are used to purchase nondurable goods and services, and borrowing facilitates purchase of higher education services. Use of credit to facilitate such expenditure could depend significantly on interest rates.

[56] This depends greatly on the assumptions that 1) adequate financing is available for federal debt despite 2) no change in tax policies. Increased distortionary taxes to sustain federal spending if federal borrowing was limited could cause slower private economic growth, which in turn would offset some of the intended increases in tax revenue. In addition, these scenarios limit the range of effects on interest rates. Rising (falling) debt levels could drive risk premia still-higher (lower), leading to even higher (lower) interest rates and thus substantially higher (lower) debt levels.

[57] As was noted earlier, the ±0.5 percentage-point exogenous adjustments to rates could be interpreted as changes to risk premia, but other interpretations also are reasonable. The adjustments imposed here rise over 10 years and then remain constant, but alternatively the adjustments could continue to rise or fall with changes to debt levels. This could lead to significantly greater economic consequences than are reported here.

Note that interest rates vary in other scenarios as well. The distinction is that we assume that interest rates vary directly in these two scenarios, with additional effects on rates coming through feedback pressures. In other scenarios, interest rates only respond to changing economic conditions. For all scenarios, the structure of rate specification remains identical to that of the baseline. For example, low population growth supports a smaller economy and lower federal revenue, but sustained federal spending drives debt higher. Greater federal borrowing pushes interest rates higher, thus compounding the difficulty of federal debt finance in the smaller economy, where federal debt already is elevated due to greater structural deficits. These high- and low-interest scenarios isolate the effects of interest rate variation on federal finances, but the same mechanisms lead to secondary adjustments on interest rates as government borrowing varies.[58]

In summary, interest rates that are higher than baseline projections imply that federal funding support of NHE might be strained over the coming 75 years. While projected health care expenditure levels still could prove economically feasible and financially sustainable, it could require a greater share of household budgets for federal tax payments, and otherwise federal debt levels likely will rise substantially over baseline levels. On the other hand, lower rates on federal debt could lead to significantly lower federal debt levels. Reduced federal debt could free funds for use in the private sector, encouraging private investment spending and economic growth. Lower interest rates thus could render projected Medicare funding far easier to sustain.

Conclusions

The baseline scenario devised in this project illustrates economic needs, challenges, and capacities in the long run, particularly with respect to health care provision and financing. The baseline scenario illustrates the potential size and composition of the future economy, together with health needs, supplies, and funding. Scenario assumptions are consistent with key economic and health care projections made by the Trustees of the Social Security and Medicare programs.[59] Given these baseline assumptions, projected spending on health care plausibly may prove sustainable for government and household sectors, and production may prove feasible to satisfy projected levels of demand. In this scenario, growth is balanced: consumer spending is balanced between health and other needs and priorities, and demand for health care is matched by adequate supply of workers in health care and supporting industries, even while other resources are devoted to significant non-health production activity. Private and public budgets potentially are sustainable: household spending remains proportional to income, thus preserving savings despite rising health care consumption, and federal debt rises but remains stable despite rising federal financing of health care through the Medicare program. International balances also remain stable, where the trade deficit and the current account deficits remain stable in proportion to GDP. Although these results depend greatly on the assumptions, the work provides a useful illustration of potential developments, and it provides a useful reference for alternative scenarios.

Viability and affordability of projected NHE depends greatly on the scale of the economy. Several alternative scenarios illustrate the implications of changes to the labor force for the provision of

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[58] Interest rates also depend on other factors, including private-sector borrowing.

[59] Social Security Administration (2019) and The Boards Of Trustees, Federal Hospital Insurance And Federal Supplementary Medical Insurance Trust Funds (2019).

health care. Given the level of health care spending, a reduction in the supply of labor due to lower labor force participation makes more difficult the production of health care goods and services, and it threatens the sustainability of federal financing via Medicare. If instead participation rates remain unchanged but the population grows more quickly, even as the age distribution shifts downward so that health care needs diminish, then viability and affordability of health care might be enhanced dramatically. Finally, slower population growth and an upward shift in the age distribution, with correspondingly greater health care needs, could cause substantial strain in the provision of health care and on the ability of the federal government to sustain the Medicare program.

Finally, sustainability of federal financing for health care depends on the ability to sell federal debt instruments at relatively low rates, barring changes to federal fiscal policy to limit deficits. Even moderate persistent increases or decreases in Treasury rates could have substantial cumulative effects on federal debt levels. Consequent effects on the private sector could compound the direct effects on federal balances, with interest rates affecting the scale of the economy and thus the size of the tax base. If the federal government can continue to borrow indefinitely at low interest rates, then funding for Medicare might continue for the foreseeable future while generally maintaining current fiscal policy, but high interest rates could lead to dramatic increases in debt and ultimately force changes to fiscal policy. On the other hand, reduced borrowing costs could relieve pressure to contain spending, and demand for public financing of health care could lead to higher but still-affordable Medicare spending levels.

Together, these scenarios promote greater understanding of potential economic developments in the distant future, indicate the sustainability of health funding, and help to evaluate likely capacities to satisfy expected demand for health care goods and services. The framework developed for this project could support further economic analyses of health care including alternative demographic developments, fiscal policies, health care technologies and practices, health care price inflation, composition of health care spending, and other factors. The framework also is useful for analyses of other matters that have implications for health, such as immigration policy, development of telecommunications and other technologies that facilitate the imports of services to support health care industries, the study of energy production and use, and the progression and consequences of climate change.

Details of life in the distant future remain highly uncertain, but this exercise assembles pertinent facts and specific assumptions in a logical framework that reveals plausible implications of those details. Review of these implications, and the development of alternative assumptions and results, improves our understanding about the current economic trajectory and its long-run viability, and it improves our understanding of vulnerabilities and policies that might counter potential weaknesses. Such efforts contribute to the development of sound fiscal policy that will sustain economic growth and public health in the long run.

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Appendix 1: The Inforum LIFT (Long-term Interindustry Forecasting Tool) Model

The economic model employed in the study (*LIFT*) was developed and is operated by Inforum. LIFT (Long-term Interindustry Forecasting Tool) is an interindustry-macro (IM) model of the U.S. economy. The model is distinguished by its ability to run year-by-year, over a 75-year period, and to produce a projection for each year that is internally consistent and provides detailed accounting for the consumer sector (including detail on health spending); the government sector; and construction, equipment and IP investment expenditures required to provide additional capacity as well as incorporate technical improvements. LIFT is "bottom-up", in the sense that aggregate labor productivity depends on the productivity growth of all industries, and the mix or share of industries. Federal government revenues are linked to private sector activity through accounting for personal and taxable income, corporate profits, indirect taxes (TOPI) and social insurance contributions. LIFT provides a useful context for exploring questions where interactions between industries or between parts of the economy (government and households, for example) are important. LIFT also provides extensive opportunities for exploring the economic impacts of demographic changes, such as the aging of the baby-boomers, or the impacts of slowing immigration.

The Inforum approach to modeling attempts to provide both the dynamics and high-level accounting of macroeconomic models and the industry structure featured in the general equilibrium approach to modeling. LIFT is a dynamic general equilibrium representation of the U.S. national economy. It combines an inter-industry input-output (I-O) formulation with extensive use of regression analysis to employ a "bottom-up" approach to macroeconomic modeling. In this way, the model works like the actual economy, building the macroeconomic totals from details of industry activity, rather than by distributing predetermined macroeconomic quantities among industries. For example, aggregate investment, total exports, and employment are not determined directly, but instead they are computed as the sum of their parts: investment by industry, exports by commodity, and employment by industry. LIFT contains full demand and supply accounting for 121 productive sectors.

This bottom-up technique provides several desirable properties for analyzing the economy. First, the model describes how changes in one industry, such as increasing productivity or changing international trade patterns, affect related sectors and the aggregate quantities. Second, parameters in the behavioral equations differ among products, reflecting differences in, for instance, consumer preferences, price elasticities in foreign trade, and industrial structure. Third, the detailed level of disaggregation permits the modeling of prices by industry, allowing one to explore the causes and effects of relative price changes.

Another important feature of the model is the dynamic determination of endogenous variables. LIFT is an annual model, solving year by year, and it incorporates key dynamics that include investment and capital stock formation. For example, investment depends on a distributed lag in the growth of investing industries and international trade depends on a distributed lag of foreign price changes. Moreover, parameter estimates for structural equations largely are based on time-series regressions, thereby reflecting the dynamic behavior of the economic data underlying the model. Therefore, model solutions are not static, but instead they project a time path for the endogenous quantities. The LIFT model thus simulates the economy year-by-year, allowing analysts to examine both the ultimate economic impacts of projected energy or environmental policies and the dynamics of the economy's adjustment process over time.

Despite its industry basis, LIFT is a general equilibrium model, using bottom-up accounting to determine macroeconomic quantities that are consistent with the underlying industry detail. It includes macroeconomic variables that are consistent with the National Income and Product Accounts (NIPA) and other published data. This macroeconomic "superstructure" contains key functions for household savings behavior, interest rates, unemployment rates, taxes, government spending, and current account balances. Like many aggregate macroeconomic models, this structure is configured to make LIFT exhibit "Keynesian" demand-driven behavior over the short run but neoclassical growth characteristics over the longer term. For example, while monetary and fiscal policies and changes in exchange rates can affect the level of output in the short-to-intermediate term, supply forces – available labor, capital, and technology – will determine the level of output in the long term.

The LIFT model thus is particularly suited to examination and assessment of the macroeconomic and industry impacts of the changing composition of consumption, production, foreign trade, and employment as the economy grows through time.

The inter-industry framework underlying the model is composed of five blocks: final demand, supply, factor income, prices, and the accountant. The first block of LIFT uses econometric equations to predict the behavior of real final demand (consumption, investment, imports, exports, and government expenditures). The components are modeled at various levels of detail. For example, aggregate consumption is the sum of 83 consumption products, and aggregate construction investment is the sum of expenditures for 26 types of private structures. Demand by product, with product sectors consistent with the input-output table (A matrix), is determined using bridge matrices to convert final demand to the commodity level. Following Wilson (2001), this equation is specified as:

$$f_{121} = B^C_{121 \times 83} c_{83} + B^E_{121 \times 71} e_{71} + B^S_{121 \times 26} s_{26} + g_{121} + v_{121} + x_{121} - m_{121}$$

where B represents a bridge matrix for the various components (consumption, equipment investment by purchasing industry, and construction by type[60]) and where remaining variables represent consumption by product, equipment investment by purchasing industry, structures by type, inventory change, exports and imports, and government spending.

In the supply block, these detailed demand predictions then are used in an input-output production identity to calculate real gross output:

$$q = A \times q + f$$

where q and f are vectors of output and final demand by commodity, respectively, each having 121 elements, and where A is a 121x121 matrix of input-output coefficients. Input-output coefficients and the bridge matrix coefficients vary over time according to historical trends evident in available data and, in some cases, using assumptions about how technology and tastes might develop in the future.

Commodity prices are determined in a similar fashion. In the factor income block, econometric behavioral equations predict each value-added component (including compensation, profits,

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[60] Note that some details presented here are simplified accounts of the actual model, such as the presentation of the government demand vector. Government spending by commodity type within the model is the constructed as sum of several bridged demand vectors that provide detail for federal defense, federal nondefense, and state and local spending. Also, private nonresidential investment includes Intellectual Property, such as spending for software and R&D.

interest, rent, and indirect taxes) by industry. Labor compensation depends on industry-specific wages that are determined by industry-specific factors as well as overall labor market conditions. Profit margins are dependent on measures of industry slack (excess supply or demand) and, for tradable sectors, on international prices. Depreciation depends on capital stock levels. Indirect taxes and subsidies are imposed, in most cases, through exogenous ad-valorum rates on overall nominal output.

The industry value added levels are allocated to production commodities using a make matrix. The fundamental input-output price identity then combines value added per unit of output with unit costs of intermediate goods and services to form an indicator of commodity prices:

$$p' = p' \times A + v'$$

where p and v have 121 elements to represent production prices, unit costs, and unit value added, respectively. This identity ensures that income, prices, and output by sector are directly related and are consistent. In turn, relative prices and income flows are included as independent variables in the regression equations for final demand, creating simultaneity between final demand and value added.

As noted above, LIFT also calculates all of the major nominal economic balances for an economy: personal income and expenditure, the government fiscal balance (at both the federal and state and local government levels), and the current account balance. It also contains a full accounting for population, the labor force, and employment. This content is important for building alternative simulations because it ensures consistency between economic growth determined on the product side and the inflation and income components. The model allows us to examine how alternative microeconomic conditions or policies will affect other aspects of the economy. Because the input-output structure allows a bottom-up approach to modeling the macro economy, macroeconomic results fully are consistent with simulated industry disruptions.

The model features production and demand for 121 commodities, where 12 of the commodities explicitly represent health care goods and services. The structure of the model allows calculation of the needs of the health sector for other commodities, such as accounting and legal support. The 121 commodities are produced by 71 industries, including three health services industries. Personal consumption spending is the greatest source of demand for health care and other commodities; the model identifies expenditure for 83 types of consumer goods and services, including 11 types of health care spending. In addition, the model incorporates extensive detail for federal revenue and expenditure, including taxes collected from households and Medicare payments to households. Together with other details of private and public sectors, the model provides extensive representation of the overall economy. The details are summarized with macroeconomic measures such as GDP, total employment, and inflation. This model is used widely for forecasting and policy analysis.

In addition to its ongoing use for health care analyses including projections of personal income details over ten years and construction of simulations over 75 years, past projects include analyses of the effects of the sequester and other recent changes to fiscal policy (Werling, Fiscal Shock: America's Economic Crisis, 2012) and analysis of the harm done by policies that allow deterioration of infrastructure (Werling, Failure to Act: The Economic Impact of Current Investment Trends in Airports, Inland Waterways, and Marine Ports Infrastructure, 2012). Long-run economic effects of technological development were assessed in Meade (2010), in the case of vehicle electrification, and in Meade (2009) for the case of policies that encourage technological

development to combat climate change. Examples of impact analysis conducted with the Lift model include a study of the economic effects of port closures following a terroristic attack (reported in Arnold, et al., (2006)) and in two private studies) and the economic impacts of the September 2001 attacks (Werling & Horst, 2009). Other studies of macro and industry impacts of supply constraints include the "Macroeconomic and Industrial Effects of Higher Natural Gas Prices" (Henry & Stokes Jr, 2006) and "Immigration Impacts on the U.S. Economy."[61]

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[61] Many of these studies, along with other studies and materials, may be found on the Inforum web site: www.InforumEcon.com. Additional information and resources are available upon request.

Appendix 2: Previous Studies of Health Care Economics in the Long Run

This appendix provides summary information about two previous studies completed by Inforum and CMS. The first was conducted in 2010 and 2011, with results presented at the 2011 IIOA conference in Alexandria, VA. The second study was conducted in 2016 and 2017. Additional details are available upon request. A brief description follows for each scenario developed for the studies.

Scenarios completed in 2009 and 2010

• **Scenario A: Doomsday scenario.** Federal income tax rates remain at their 2011 levels. Modeling results suggest that the economy no longer will be viable by 2040.

• **Scenario B: Baseline scenario.** Assumptions are consistent with those in the 2009 TR: health care costs per person initially grow 1.5% faster than GDP but gradually are reduced to about 0.15% faster by 2083. TR assumptions were maintained but with added fiscal policy adjustments so that the Federal government deficit rose by no more than about 1.7% of GDP and the current account surplus/deficit held to within +/- 3% of GDP. NHE grew from 17% of GDP to approximately 45% by 2083.

• **Scenario C: Pessimistic scenario.** NHE excess cost ratios are assumed to be half a percentage point higher than in the baseline scenario (Scenario B) from 2018 to 2083.

• **Scenario D: Optimistic scenario.** NHE excess cost ratios are assumed to be half a percentage point lower than in the baseline scenario (Scenario B) from 2018 to 2083.

• **Scenario E: Lower health care productivity scenario.** Health expenditure levels are assumed to be identical to those in the baseline scenario but health care productivity growth was roughly 0.3 percentage points lower each year than the relatively optimistic productivity growth rates assumed in the baseline scenario.

• **Scenario F. Higher non-health productivity scenario.** This scenario considered implications of constant health care productivity but significantly higher non-health productivity growth (by about 0.5 percentage point a year).

• **Scenario G. Very optimistic health productivity scenario.** Non-health productivity was assumed to be same as in the baseline but health care labor productivity growth rose to economy-wide average growth rates within 10 years and then rose at average rates for the rest of the period.

• **Scenario H. Lower labor productivity and reduced real GDP growth.** Health expenditures remained at baseline levels, but health care productivity growth remained constant. Lower labor productivity and consequent smaller economy mean that health care spending and funding is more difficult to sustain.

Scenarios completed in 2017

• **Scenario 1: Long-Term Baseline.** The baseline is consistent with the Trustees projections of economic growth, population and demographic composition, productivity growth, and national health expenditures.

• **Scenario 2: Higher Health Spending.** This scenario was similar to the Baseline and maintained those economic specifications, but it followed the higher-growth trajectories for Medicare and NHE from the "Illustrative Alternative" from the TR. Tax rates and other variables are adjusted

to target the same GDP, inflation, and productivity trajectories as in the baseline. This scenario can be considered an alternative baseline, and in fact it is the baseline corresponding to Scenario 3.

• **Scenario 3: Higher Taxes Reduce Economic Growth.** This was related to Scenario 2, but labor productivity, labor supply (hours worked), and GDP growth were reduced to reflect the disincentives from higher tax rates that were introduced to fund higher health expenditures while maintaining plausible federal debt levels.

• **Scenario 4: Lower Aggregate Productivity.** This scenario used the baseline (Scenario 1) NHE and Medicare assumptions but had slower average labor productivity growth. This slower productivity growth implied lower growth in potential and actual GDP, and it implied lower non-health consumption spending. This implied a smaller tax base for government and either higher deficits or higher tax rates on households.

• **Scenario 5: High Medicare and NHE.** This scenario explored implications of significantly higher NHE and Medicare growth, with the additional Federal expenditure partially financed by higher personal taxes and partially through higher deficits.

• **Scenario 6. Low Medicare and NHE.** This scenario was nearly the inverse of Scenario 5, with sharply lower NHE and Medicare growth than in the baseline.

Appendix 3: The Baseline Scenario
Macroeconomic Summary

	1978	2000	2010	2020	2030	2040	2050	2060	2070	2080	2090	2094
Real GDP (Billions 2012$)	6,569	13,131	15,599	19,377	24,196	29,381	35,819	43,690	52,814	64,117	78,217	84,537
Personal Consump Expenditures	4,157	8,643	10,643	13,505	16,775	19,826	23,790	28,410	33,413	39,446	47,026	50,326
Gross private domestic investment	928	2,347	2,216	3,435	4,846	6,648	9,017	12,203	16,473	22,389	30,557	34,563
Real Net Exports (Billions 2012$)	-97	-551	-566	-958	-1,114	-1,204	-1,448	-1,501	-1,423	-1,235	-1,183	-1,139
Government Consumption & Investment	1,671	2,663	3,307	3,367	3,687	4,203	4,759	5,383	6,100	6,926	7,875	8,294
Price Indicators (2012 = 100)												
GDP Deflator	35.8	78.1	96.1	114.9	140.9	172.4	211.0	258.7	317.3	389.3	478.0	518.7
PCE Deflator	34.2	78.2	95.7	112.0	137.9	170.2	211.0	262.8	328.5	411.8	518.1	568.3
Interest Rates (Annual Average)												
Treasury Bills, 3-Month	7.2	5.8	0.1	1.5	2.5	2.9	3.0	3.0	3.0	3.0	3.0	2.9
Treasury Bonds, 10-Year	8.4	6.0	3.2	1.8	3.1	3.5	3.6	3.6	3.6	3.6	3.6	3.6
Labor Force & Employment												
Population (Millions)	222.6	282.4	309.8	333.4	358.7	379.4	395.0	411.3	430.1	447.5	464.5	471.6
Households (Millions)	76.0	104.7	117.5	129.8	140.3	148.8	155.0	161.3	168.7	175.5	182.1	184.9
Civilian Labor Force (Millions)	102.3	142.6	153.9	165.2	177.0	184.9	193.2	201.9	210.9	220.4	230.3	234.4
Total Jobs (Millions)	99.8	145.6	143.2	166.0	176.4	184.0	192.0	200.4	209.2	218.4	228.0	231.9
Total Domestic Employment (Millions)	96.0	136.9	139.1	159.1	168.2	175.7	183.5	191.8	200.4	209.4	218.8	222.6
Labor Force Participation Rate (%)	63.2	67.1	64.7	63.0	62.1	61.9	61.7	61.7	61.8	61.9	62.1	62.2
Unemployment Rate	6.1	4.0	9.6	3.7	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Personal Income												
Disposable Income (Billions)	1,634.1	7,416.3	11,314.3	17,223.0	26,094.6	38,723.0	57,269.3	85,088.9	125,945.2	187,155.7	279,341.9	327,638.0
Real Disposable Income (Billions 2012$)	4,776.4	9,479.5	11,822.1	15,372.2	18,925.5	22,745.2	27,137.2	32,371.7	38,345.0	45,450.1	53,921.2	57,652.8
2012$ per Household (Dollars)	62,823.0	90,535.0	100,581.3	118,438.1	134,863.2	152,867.9	175,133.0	200,668.3	227,340.9	259,006.8	296,051.8	311,766.4
Average Wage ($/Hour)	7.4	23.6	33.2	43.0	61.7	88.0	126.5	182.5	263.5	380.7	551.1	638.2
Average Real Wage (2012$/Hour)	21.7	30.1	34.7	38.4	44.8	51.7	59.9	69.4	80.2	92.5	106.4	112.3
Personal Savings Rate	10.7	4.8	6.5	8.7	7.5	8.7	8.1	8.0	8.6	8.9	8.5	8.4
Nominal Fiscal Balances (Billions of Dollars)												
Federal Net Borrowing	58.0	-223.1	1,469.4	4,231.2	1,700.3	2,679.6	3,678.6	5,346.0	8,446.6	13,099.1	18,626.1	21,965.7
as percent of GDP	2.5	-2.2	9.8	19.0	5.0	5.3	4.9	4.7	5.0	5.2	5.0	5.0
Federal Debt	607.1	3,409.8	9,018.9	21,102.2	38,673.0	60,870.9	92,931.7	137,919.5	207,019.4	316,415.3	476,130.9	558,767.9
as percent of GDP	25.8	33.3	60.2	94.8	113.5	120.2	123.0	122.0	123.5	126.8	127.4	127.4
State & Local Net Borrowing	8.6	119.9	376.4	225.3	177.7	222.4	310.3	393.8	625.8	956.2	1,327.2	1,623.8
as percent of GDP	0.4	1.2	2.5	1.0	0.5	0.4	0.4	0.3	0.4	0.4	0.4	0.4
State & Local Debt	280.4	1,451.8	2,844.2	4,103.7	6,050.1	7,949.0	10,703.8	14,218.1	19,250.9	27,421.9	38,979.1	44,993.9
as percent of GDP	11.9	14.2	19.0	18.4	17.8	15.7	14.2	12.6	11.5	11.0	10.4	10.3
Current Account Balance (Billions of Dollars)												
Current Account Balance	-12.6	-396.4	-436.7	-475.2	-605.4	-653.9	-968.1	-1,141.3	-1,376.5	-2,012.4	-4,491.9	-6,199.5
as percent of GDP	-0.5	-3.9	-2.9	-2.1	-1.8	-1.3	-1.3	-1.0	-0.8	-0.8	-1.2	-1.4

Appendix 3: The Baseline Scenario (Continued)
Personal Income Summary

	1978	2000	2010	2020	2030	2040	2050	2060	2070	2080	2090	2094
Personal Income (Billions)	1,863.7	8,652.6	12,551.6	19,623.7	30,478.6	45,413.3	67,418.5	100,251.0	148,371.6	220,594.6	329,383.2	386,234.1
Wages and Salaries	1,120.6	4,825.9	6,372.1	9,671.3	14,639.1	21,352.4	31,655.7	47,177.7	69,739.7	103,626.5	155,053.9	181,603.5
Proprietors Income	166.0	753.9	1,108.7	1,731.9	2,582.4	3,920.9	5,836.8	8,623.0	12,598.1	18,455.4	27,215.8	31,688.8
Rental Income	16.5	183.5	394.2	831.1	1,220.4	1,834.3	2,749.7	4,105.6	6,073.0	9,016.0	13,526.2	15,878.4
Dividends	50.7	383.5	543.9	1,411.3	1,933.3	2,811.0	4,160.2	6,112.9	8,942.4	13,344.5	20,411.2	24,163.5
Personal Interest Income	235.1	1,102.2	1,238.5	1,924.0	2,998.6	4,330.8	6,209.5	8,742.1	12,246.4	17,430.8	25,220.6	29,195.9
Transfer Payments	209.9	1,087.3	2,325.2	3,302.5	5,811.7	9,229.8	13,936.6	21,193.3	32,380.6	49,187.2	73,619.0	86,881.5
Federal	162.7	773.4	1,757.5	2,424.4	4,299.5	6,868.3	10,275.7	15,565.2	23,737.6	35,943.3	53,350.5	62,864.5
Social security	91.4	401.4	690.2	1,083.1	1,933.7	3,053.7	4,589.8	7,116.6	11,127.0	17,150.9	25,901.8	30,878.1
Medicare	25.5	219.1	513.4	836.7	1,700.2	2,904.9	4,429.5	6,732.1	10,275.9	15,638.3	23,223.4	27,241.6
Other	45.7	152.9	553.9	510.2	677.6	932.0	1,291.8	1,775.3	2,432.6	3,313.6	4,475.3	5,045.8
State and Local	40.8	271.4	523.9	821.6	1,419.8	2,222.6	3,452.3	5,310.6	8,164.4	12,520.1	19,162.7	22,709.8
Social Benefit Payments to Persons	40.8	271.4	523.9	821.6	1,419.8	2,222.6	3,452.3	5,310.6	8,164.4	12,520.1	19,162.7	22,709.8
Medicaid	19.3	205.0	411.0	688.0	1,234.3	1,969.4	3,121.8	4,878.8	7,596.5	11,784.2	18,212.9	21,655.1
Business Current Transfer Payments	10.4	85.4	126.8	163.2	267.2	401.5	602.8	917.6	1,383.3	2,092.0	3,195.4	3,777.7
-: Contributions to Social Insurance	59.7	360.6	514.7	801.3	1,252.4	1,913.1	2,867.0	4,319.0	6,455.8	9,675.8	14,495.2	17,011.6
-: Personal Tax & Nontax Payments	229.6	1,236.3	1,237.3	2,400.7	4,383.9	6,690.3	10,149.2	15,162.2	22,426.5	33,438.9	50,041.3	58,596.1
=: Disposable Income	1,634.1	7,416.3	11,314.3	17,223.0	26,094.6	38,723.0	57,269.3	85,088.9	125,945.2	187,155.7	279,341.9	327,638.0
-: Personal Outlays	1,459.0	7,058.0	10,573.5	15,728.2	24,146.3	35,342.8	52,609.3	78,275.6	115,099.9	170,411.2	255,569.9	300,036.2
Consumption Expenditures	1,422.3	6,762.1	10,185.8	15,131.3	23,129.3	33,753.1	50,205.2	74,674.4	109,747.2	162,430.7	243,618.7	286,003.0
Interest Paid to Businesses	31.3	214.8	242.8	377.8	614.2	941.0	1,408.7	2,098.6	3,111.3	4,632.8	6,929.3	8,128.6
Personal Current Transfer Payments	5.4	81.0	144.8	219.1	402.8	648.6	995.4	1,502.5	2,241.4	3,347.7	5,021.8	5,904.5
=: Personal Savings	175.1	358.3	740.9	1,494.9	1,948.3	3,380.3	4,660.0	6,813.3	10,845.3	16,744.5	23,772.0	27,601.9
ADDENDA:												
Savings rate (Percent)	10.7	4.8	6.5	8.7	7.5	8.7	8.1	8.0	8.6	8.9	8.5	8.4
Fed. income taxes, % Adj. PI	12.4	14.5	10.2	12.1	15.2	15.8	16.2	16.3	16.3	16.3	16.3	16.3

Employment Summary

	1978	2000	2010	2020	2030	2040	2050	2060	2070	2080	2090	2094
Total Employment (Thousands)	99,796	145,640	143,163	165,992	176,366	184,022	192,021	200,436	209,234	218,408	228,021	231,945
Total Domestic Employment	99,768	145,177	142,205	164,289	174,556	182,132	190,045	198,370	207,074	216,150	225,661	229,543
Farms, Forestry, Fishing	2,866	2,327	2,094	2,254	2,213	2,157	2,116	2,123	2,154	2,179	2,211	2,232
Mining	901	530	668	694	712	688	638	619	633	666	719	749
Utilities	629	602	552	543	478	425	380	342	311	283	256	247
Construction	5,757	8,622	7,399	9,209	10,332	11,219	11,547	11,831	12,180	12,473	12,602	12,649
Nondurables Manufacturing	9,065	7,742	5,327	5,630	5,387	5,227	5,052	4,948	4,912	4,902	4,908	4,926
Durables Manufacturing	11,157	9,870	6,500	7,183	6,661	6,300	5,992	5,779	5,632	5,506	5,378	5,335
Trade	16,356	22,498	21,098	23,198	23,319	23,386	23,818	24,387	25,070	25,845	26,885	27,329
Transportation	3,377	4,812	4,545	5,966	6,512	7,150	7,922	8,767	9,808	11,095	12,640	13,342
Finance, Insurance, and Real Estate	5,264	8,598	8,323	9,424	9,404	9,221	9,085	8,942	8,774	8,576	8,350	8,253
Health Care Services	5,303	11,336	14,275	17,136	20,594	22,663	24,421	25,918	27,182	28,628	30,181	30,690
Other Services	23,542	47,893	49,748	61,984	67,107	70,959	75,381	79,986	84,594	88,962	93,129	94,812
Civilian Government	15,578	20,810	22,634	22,769	23,648	24,628	25,669	26,794	27,985	29,294	30,763	31,382
Rest of World	-28	-463	-958	-1,702	-1,810	-1,891	-1,976	-2,066	-2,160	-2,258	-2,361	-2,402
ADDENDA:												
Health Care Services	5,303	11,336	14,275	17,136	20,594	22,663	24,421	25,918	27,182	28,628	30,181	30,690
Ambulatory Health Care	1,720	4,708	6,391	8,272	10,068	11,154	12,184	13,115	13,972	14,977	16,056	16,430
Hospitals	2,308	3,947	4,694	5,332	6,401	7,093	7,583	7,953	8,221	8,502	8,770	8,832
Nursing and Residential Care	1,275	2,680	3,191	3,533	4,124	4,415	4,653	4,850	4,988	5,149	5,355	5,428

Appendix 3: The Baseline Scenario (Continued)
Personal Consumption Expenditure Summary

Nominal Personal Consumption Expenditure (Billions)

	1978	2000	2010	2020	2030	2040	2050	2060	2070	2080	2090	2094
Personal Consumption Expenditures (2012 NIPA)	1,422.3	6,762.1	10,185.8	15,131.3	23,129.3	33,753.1	50,205.2	74,674.4	109,747.2	162,430.7	243,618.7	286,003.0
Durable Goods	213.3	912.6	1,070.7	1,648.8	2,214.1	2,839.5	3,790.0	5,089.5	6,735.3	8,951.9	12,036.5	13,487.6
Motor Vehicles, Parts	89.2	363.2	342.0	547.7	687.4	823.6	1,014.0	1,261.1	1,553.7	1,923.2	2,418.4	2,649.4
Furnishings, Household Equip.	59.0	208.1	250.4	371.4	478.6	586.7	744.3	945.9	1,180.8	1,477.4	1,889.2	2,081.3
Recreational Goods, Vehicles	43.0	239.9	322.2	474.4	649.7	840.6	1,153.5	1,586.7	2,133.3	2,870.4	3,882.8	4,343.9
Other Durable Goods	22.1	101.3	156.2	255.4	398.4	588.5	878.1	1,295.9	1,867.6	2,680.8	3,846.1	4,412.9
Nondurable Goods	450.2	1,540.3	2,292.1	3,118.6	4,447.8	6,287.7	9,093.6	13,296.9	19,612.5	29,539.2	45,571.7	54,309.0
Food & Beverages, Off-Premise	196.1	540.6	788.9	1,044.6	1,435.6	1,884.5	2,447.7	3,158.6	4,060.6	5,193.0	6,750.2	7,537.6
Clothing, Footwear	89.3	280.8	320.6	437.5	581.5	750.0	1,000.9	1,329.0	1,754.7	2,351.7	3,212.8	3,633.9
Gasoline, Fuel, Energy	61.5	184.5	333.4	325.3	398.0	499.8	665.2	881.8	1,168.4	1,547.3	2,047.5	2,289.7
Other Nondurable Goods	103.3	534.4	849.2	1,311.2	2,032.8	3,153.3	4,979.8	7,927.6	12,628.8	20,447.1	33,561.2	40,847.8
Services	762.6	4,339.5	6,839.4	10,393.5	16,512.8	24,692.1	37,420.0	56,434.3	83,614.5	124,258.0	186,488.0	218,767.1
Housing, Utilities	244.3	1,198.6	1,909.0	2,721.4	4,189.8	6,088.5	9,161.4	13,944.6	20,824.7	31,105.7	47,190.8	55,726.3
Health Care Services	131.2	918.4	1,690.7	2,613.6	4,535.1	7,319.9	11,488.6	17,727.9	26,951.8	41,023.8	62,297.4	73,241.5
Transportation Services	45.2	263.5	292.9	460.8	679.4	969.8	1,453.9	2,150.0	3,107.5	4,543.0	6,720.7	7,825.1
Recreation Services	32.9	254.4	385.1	581.8	868.2	1,219.7	1,717.3	2,405.8	3,312.6	4,510.3	6,172.1	6,994.9
Food Services, Accomodations	97.1	408.8	617.7	1,009.2	1,542.8	2,280.2	3,382.8	5,015.0	7,425.4	11,058.8	16,663.9	19,621.2
Financial Services, Insurance	80.6	566.3	763.2	1,195.7	1,782.3	2,551.7	3,728.6	5,414.8	7,748.9	11,230.7	16,570.4	19,288.8
Other Services	131.3	729.6	1,180.8	1,811.1	2,915.2	4,262.3	6,487.5	9,776.3	14,243.6	20,785.7	30,872.8	36,069.3
ADDENDA:												
Total Health Care	162.2	1,204.0	2,216.3	3,509.3	6,091.7	10,040.9	16,125.6	25,520.8	39,900.5	62,647.1	98,468.0	117,495.3
Goods	18.2	191.2	389.7	659.4	1,169.9	2,085.4	3,618.8	6,184.8	10,439.0	17,690.1	30,002.3	36,901.6
Therapeutic appliances	3.9	32.2	55.6	86.4	153.3	251.8	396.2	604.4	895.6	1,310.6	1,886.9	2,163.2
Pharmaceutical products	13.8	157.1	330.1	566.2	1,005.8	1,816.8	3,197.0	5,542.3	9,487.0	16,295.9	27,991.7	34,594.4
Other medical products	0.4	2.0	4.0	6.7	10.7	16.8	25.5	38.2	56.4	83.6	123.7	144.0
Services	131.2	918.4	1,690.7	2,613.6	4,535.1	7,319.9	11,488.6	17,727.9	26,951.8	41,023.8	62,297.4	73,241.5
Physicians	32.7	229.2	402.8	604.8	1,032.8	1,641.2	2,547.7	3,907.3	5,933.7	9,067.5	13,896.7	16,421.5
Dentists	11.3	63.6	104.5	150.7	232.6	352.7	525.0	776.0	1,141.4	1,697.6	2,544.6	2,984.6
Home health care	3.0	42.8	77.0	123.6	213.4	354.5	570.5	899.4	1,392.3	2,150.6	3,303.3	3,897.8
Medical laboratories	1.0	16.9	32.6	40.2	69.5	111.3	173.5	266.2	403.2	612.2	929.0	1,092.3
Other medical services	6.6	84.1	151.0	256.3	443.2	710.7	1,111.7	1,715.7	2,618.2	4,015.0	6,165.6	7,288.9
Hospitals	63.6	393.9	770.5	1,212.9	2,148.8	3,532.8	5,622.4	8,759.6	13,390.2	20,410.6	30,914.8	36,267.4
Nursing Homes	12.8	87.9	152.3	225.1	394.9	616.7	937.7	1,403.5	2,072.8	3,069.9	4,543.3	5,289.1
Net health insurance	12.9	94.4	135.8	236.4	386.7	635.6	1,018.2	1,608.2	2,509.7	3,933.1	6,168.2	7,352.1

Real Personal Consumption Expenditure (Billions 2012$)

	1978	2000	2010	2020	2030	2040	2050	2060	2070	2080	2090	2094
Personal Consumption Expenditures	4,157.3	8,643.4	10,643.0	13,505.2	16,774.8	19,826.0	23,789.9	28,409.6	33,413.4	39,445.7	47,025.5	50,326.5
Durable Goods	296.4	801.0	1,061.0	1,799.3	2,337.2	2,905.2	3,736.6	4,813.6	6,091.1	7,724.9	9,889.5	10,863.1
Motor Vehicles, Parts	183.0	382.1	356.4	539.8	597.0	643.3	709.5	785.1	855.2	934.0	1,033.8	1,076.4
Furnishings, Household Equip.	72.9	176.5	245.8	437.8	608.7	795.0	1,062.4	1,417.4	1,852.3	2,419.2	3,219.0	3,600.3
Recreational Goods, Vehicles	31.7	162.0	297.9	566.0	793.6	1,046.6	1,460.0	2,042.6	2,793.1	3,821.3	5,250.7	5,909.4
Other Durable Goods	42.3	105.5	161.5	263.0	372.3	500.2	675.7	896.1	1,158.2	1,490.1	1,915.4	2,104.0
Nondurable Goods	1,212.3	2,084.5	2,486.8	3,063.7	3,578.2	4,126.3	4,842.0	5,681.0	6,644.1	7,836.5	9,343.1	10,010.7
Food & Beverages, Off-Premise	529.8	730.6	838.9	968.7	1,090.0	1,191.7	1,302.3	1,420.7	1,550.3	1,690.8	1,880.7	1,976.0
Clothing, Footwear	100.5	266.6	337.4	437.9	536.9	645.7	803.0	990.3	1,219.3	1,529.6	1,962.1	2,167.3
Gasoline, Fuel, Energy	380.3	454.6	435.7	425.8	349.7	316.5	313.3	311.0	308.5	305.8	303.0	301.8
Other Nondurable Goods	325.3	669.6	877.1	1,210.8	1,548.7	1,908.8	2,356.2	2,887.7	3,493.2	4,242.3	5,164.1	5,562.1
Services	2,825.9	5,926.8	7,120.4	8,641.3	10,850.8	12,827.1	15,362.5	18,290.2	21,406.2	25,138.5	29,823.0	31,854.8
Housing, Utilities	929.5	1,655.5	1,969.6	2,184.4	2,611.3	2,951.9	3,456.4	4,095.6	4,762.8	5,541.4	6,548.6	6,998.0
Health Care Services	743.4	1,295.7	1,753.2	2,331.9	3,115.8	3,792.8	4,493.2	5,238.0	6,021.8	6,937.8	7,982.1	8,400.4
Transportation Services	149.8	355.6	306.5	409.5	502.1	602.8	763.8	955.2	1,167.3	1,444.1	1,805.8	1,966.1
Recreation Services	114.8	344.5	402.4	491.6	596.6	690.8	808.3	944.8	1,090.1	1,247.7	1,438.4	1,523.9
Food Services, Accomodations	344.2	571.0	651.1	834.4	1,007.9	1,193.5	1,431.5	1,713.1	2,049.3	2,475.4	3,045.7	3,314.1
Financial Services, Insurance	220.2	736.7	820.1	873.8	1,072.1	1,275.5	1,545.7	1,856.6	2,198.4	2,633.4	3,205.7	3,455.0
Other Services	364.3	968.1	1,218.1	1,533.3	1,986.9	2,382.4	2,961.9	3,635.9	4,334.9	5,192.4	6,335.9	6,848.4
ADDENDA:												
Total Health Care	898.4	1,708.0	2,310.2	3,103.0	4,144.8	5,119.2	6,155.9	7,288.1	8,514.1	9,974.7	11,679.0	12,380.8
Goods	80.6	270.1	413.4	568.3	773.3	1,009.2	1,277.3	1,586.0	1,936.8	2,365.2	2,879.1	3,097.8
Therapeutic appliances	10.4	36.4	56.5	81.8	128.4	187.0	261.0	353.1	464.2	602.4	769.3	840.6
Pharmaceutical products	69.7	231.3	352.9	480.4	639.4	821.3	1,026.3	1,261.6	1,529.2	1,857.4	2,252.9	2,421.6
Other medical products	1.1	2.0	4.0	6.7	9.2	11.8	14.9	18.4	22.5	27.5	33.7	36.3
Services	743.4	1,295.7	1,753.2	2,331.9	3,115.8	3,792.8	4,493.2	5,238.0	6,021.8	6,937.8	7,982.1	8,400.4
Physicians	144.9	284.2	413.9	587.6	822.0	1,035.4	1,269.7	1,532.8	1,825.8	2,180.9	2,603.3	2,780.9
Dentists	72.1	102.6	109.3	123.9	134.1	139.8	143.0	145.3	146.9	150.1	154.7	156.2
Home health care	10.3	50.3	77.7	110.1	145.9	183.8	225.4	272.1	324.1	387.1	462.1	493.6
Medical laboratories	3.2	19.8	32.8	38.6	49.2	58.7	68.2	78.0	88.2	100.0	113.5	118.8
Other medical services	25.2	114.1	154.8	232.0	313.7	377.9	443.5	512.8	585.5	670.8	768.5	807.8
Hospitals	464.5	598.0	806.6	1,057.1	1,423.5	1,745.6	2,078.1	2,428.5	2,792.5	3,211.0	3,679.1	3,863.2
Nursing Homes	63.8	132.8	158.2	185.0	239.4	278.5	315.7	352.4	388.5	429.8	475.5	492.8
Net health insurance	79.4	144.4	143.5	203.5	256.6	315.4	377.7	445.5	518.9	606.5	708.9	751.1

Appendix 4: The Alternative Scenarios
Macroeconomic Summary

Baseline
Alternative 1: Lower Labor Supply
Alternative 2: Higher Population Growth
Alternative 3: Lower Population Growth
Alternative 4: Higher Interest Rates
Alternative 5: Lower Interest Rates

Baseline and percentage difference from Baseline, unless specified otherwise.

		1978	2000	2010	2020	2030	2040	2050	2060	2070	2080	2090	2094
Base.	Real GDP (Billions 2012$)	6,568.6	13,131.0	15,598.8	19,377.2	24,195.9	29,380.9	35,819.0	43,689.7	52,814.3	64,117.1	78,217.0	84,536.7
Alt. 1		0.0	0.0	0.0	0.0	-1.0	-1.2	-1.2	-1.2	-1.3	-1.3	-1.4	-1.5
Alt. 2		0.0	0.0	0.0	0.0	1.3	2.7	4.3	6.3	8.5	10.8	13.6	14.8
Alt. 3		0.0	0.0	0.0	0.0	-1.5	-2.9	-4.5	-6.4	-8.5	-10.7	-13.1	-14.1
Alt. 4		0.0	0.0	0.0	0.0	-0.1	-0.2	-0.2	-0.2	-0.2	-0.2	-0.3	-0.3
Alt. 5		0.0	0.0	0.0	0.0	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.4
Base.	Personal Consump Expenditures	4,157.3	8,643.4	10,643.0	13,505.2	16,774.8	19,826.0	23,789.9	28,409.6	33,413.4	39,445.7	47,025.5	50,326.5
Alt. 1		0.0	0.0	0.0	0.0	-0.5	-0.7	-0.6	-0.6	-0.6	-0.6	-0.6	-0.7
Alt. 2		0.0	0.0	0.0	0.0	1.5	3.0	4.5	6.4	8.4	10.5	12.9	14.1
Alt. 3		0.0	0.0	0.0	0.0	-1.4	-2.8	-4.2	-5.9	-7.8	-9.7	-11.8	-12.7
Alt. 4		0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Alt. 5		0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2
Base.	Gross private domestic investment	928.1	2,346.7	2,216.5	3,434.8	4,845.8	6,648.4	9,016.6	12,202.5	16,473.4	22,388.8	30,556.7	34,562.7
Alt. 1		0.0	0.0	0.0	0.0	-1.2	-1.7	-1.6	-1.7	-1.7	-1.7	-1.7	-1.7
Alt. 2		0.0	0.0	0.0	0.0	1.2	2.9	5.1	8.0	11.5	15.3	19.8	21.7
Alt. 3		0.0	0.0	0.0	0.0	-2.3	-4.5	-6.7	-9.6	-12.8	-16.2	-19.9	-21.5
Alt. 4		0.0	0.0	0.0	0.0	-0.4	-0.5	-0.5	-0.4	-0.4	-0.5	-0.5	-0.5
Alt. 5		0.0	0.0	0.0	0.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Base.	Real Net Exports (Billions 2012$)	-97.2	-550.8	-565.9	-957.6	-1,113.6	-1,204.2	-1,447.7	-1,501.1	-1,423.1	-1,235.5	-1,183.4	-1,139.1
Alt. 1		0.0	0.0	0.0	0.0	-88.9	-97.9	-119.0	-166.2	-236.5	-323.2	-424.8	-472.7
Alt. 2		0.0	0.0	0.0	0.0	-21.9	-58.9	-96.0	-135.2	-194.3	-280.0	-498.2	-638.6
Alt. 3		0.0	0.0	0.0	0.0	24.4	64.2	104.0	133.2	169.9	213.2	317.6	372.5
Alt. 4		0.0	0.0	0.0	0.0	-22.9	-33.6	-49.0	-69.3	-95.6	-128.0	-176.6	-199.8
Alt. 5		0.0	0.0	0.0	0.0	18.2	25.1	33.8	44.4	60.8	88.4	123.5	141.3
Base.	Government Consumption & Investment	1,670.9	2,663.0	3,307.2	3,367.2	3,686.8	4,203.4	4,759.1	5,383.1	6,100.1	6,925.6	7,874.8	8,293.6
Alt. 1		0.0	0.0	0.0	0.0	-0.5	-0.5	-0.5	-0.5	-0.4	-0.3	-0.3	-0.3
Alt. 2		0.0	0.0	0.0	0.0	0.9	1.8	2.6	3.5	4.4	5.3	6.1	6.4
Alt. 3		0.0	0.0	0.0	0.0	-0.9	-1.8	-2.5	-3.3	-4.2	-4.8	-5.3	-5.4
Alt. 4		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1
Alt. 5		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
	Price Indicators (2012 = 100)												
Base.	GDP Deflator	35.8	78.1	96.1	114.9	140.9	172.4	211.0	258.7	317.3	389.3	478.0	518.7
Alt. 1		0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1
Alt. 2		0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.3	0.4	0.4	0.3
Alt. 3		0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.2	-0.3	-0.3	-0.3	-0.3
Alt. 4		0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2
Alt. 5		0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.2	-0.2	-0.2
Base.	PCE Deflator	34.2	78.2	95.7	112.0	137.9	170.2	211.0	262.8	328.5	411.8	518.1	568.3
Alt. 1		0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.2
Alt. 2		0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.2	-0.4	-0.5
Alt. 3		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.4	0.5
Alt. 4		0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Alt. 5		0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
	Interest Rates (Annual Avg., Difference from baseline)												
Base.	Treasury Bills, 3-Month	7.2	5.8	0.1	1.5	2.5	2.9	3.0	3.0	3.0	3.0	3.0	2.9
Alt. 1		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1
Alt. 2		0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.2	-0.3	-0.4	-0.5	-0.5
Alt. 3		0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.5	0.8	1.2	1.5
Alt. 4		0.0	0.0	0.0	0.0	0.5	0.6	0.6	0.7	0.7	0.7	0.8	0.8
Alt. 5		0.0	0.0	0.0	0.0	-0.5	-0.6	-0.6	-0.6	-0.6	-0.7	-0.7	-0.7
Base.	Treasury Bonds, 10-Year	8.4	6.0	3.2	1.8	3.1	3.5	3.6	3.6	3.6	3.6	3.6	3.6
Alt. 1		0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1
Alt. 2		0.0	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.3	-0.4	-0.5	-0.6	-0.6
Alt. 3		0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.3	0.6	0.9	1.4	1.7
Alt. 4		0.0	0.0	0.0	0.0	0.4	0.5	0.5	0.5	0.6	0.6	0.7	0.7
Alt. 5		0.0	0.0	0.0	0.0	-0.4	-0.5	-0.5	-0.5	-0.5	-0.6	-0.6	-0.6

Appendix 4: The Alternative Scenarios (Continued)
Macroeconomic Summary (Continued)

Baseline
Alternative 1: Lower Labor Supply
Alternative 2: Higher Population Growth
Alternative 3: Lower Population Growth
Alternative 4: Higher Interest Rates
Alternative 5: Lower Interest Rates
Baseline and percentage difference from Baseline, unless specified otherwise.

		1978	2000	2010	2020	2030	2040	2050	2060	2070	2080	2090	2094
	Labor Force & Employment (Difference from Baseline)												
Base.	**Population (Millions)**	222.6	282.4	309.8	333.4	358.7	379.4	395.0	411.3	430.1	447.5	464.5	471.6
Alt. 1		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alt. 2		0.0	0.0	0.0	0.0	1.8	3.7	5.5	7.9	10.6	13.3	16.3	17.6
Alt. 3		0.0	0.0	0.0	0.0	-1.7	-3.4	-5.1	-7.2	-9.5	-11.9	-14.4	-15.4
Alt. 4		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alt. 5		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Base.	**Civilian Labor Force (Millions)**	102.3	142.6	153.9	165.2	177.0	184.9	193.2	201.9	210.9	220.4	230.3	234.4
Alt. 1		0.0	0.0	0.0	0.0	-3.7	-6.1	-6.3	-6.6	-7.2	-7.8	-9.0	-9.7
Alt. 2		0.0	0.0	0.0	0.0	1.7	3.1	6.2	10.6	15.3	21.6	29.2	32.5
Alt. 3		0.0	0.0	0.0	0.0	-1.4	-2.5	-5.4	-9.4	-13.9	-19.6	-26.4	-29.4
Alt. 4		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alt. 5		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Base.	**Total Jobs (Millions)**	99.8	145.6	143.2	166.0	176.4	184.0	192.0	200.4	209.2	218.4	228.0	231.9
Alt. 1		0.0	0.0	0.0	0.0	-1.8	-3.1	-2.9	-2.9	-3.3	-3.6	-4.5	-5.1
Alt. 2		0.0	0.0	0.0	0.0	1.7	3.1	6.1	10.5	15.2	21.4	28.9	32.1
Alt. 3		0.0	0.0	0.0	0.0	-1.4	-2.5	-5.3	-9.3	-13.7	-19.3	-26.1	-29.0
Alt. 4		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alt. 5		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Base.	**Labor Force Participation Rate (%)**	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Alt. 1		0.0	0.0	0.0	-0.3	-2.1	-3.3	-3.3	-3.3	-3.4	-3.6	-3.9	-4.1
Alt. 2		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alt. 3		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alt. 4		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alt. 5		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Base.	**Unemployment Rate (%)**	6.1	4.0	9.6	3.7	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Alt. 1		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alt. 2		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alt. 3		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alt. 4		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alt. 5		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Personal Income												
Base.	**Real Disposable Income (Billions 2012$)**	4,776.4	9,479.5	11,822.1	15,372.2	18,925.5	22,745.2	27,137.2	32,371.7	38,345.0	45,450.1	53,921.2	57,652.8
Alt. 1		0.0	0.0	0.0	0.0	-0.8	-1.0	-1.0	-1.1	-1.2	-1.3	-1.4	-1.5
Alt. 2		0.0	0.0	0.0	0.0	1.2	2.4	3.7	5.4	7.3	9.3	11.8	13.0
Alt. 3		0.0	0.0	0.0	0.0	-1.3	-2.5	-3.7	-5.4	-7.3	-9.2	-11.4	-12.5
Alt. 4		0.0	0.0	0.0	0.0	-0.1	0.0	-0.1	-0.1	-0.2	-0.2	-0.3	-0.3
Alt. 5		0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.2	0.2	0.2	0.2	0.2
Base.	**Personal Savings Rate (%, Difference)**	10.7	4.8	6.5	8.7	7.5	8.7	8.1	8.0	8.6	8.9	8.5	8.4
Alt. 1		0.0	0.0	0.0	0.0	-0.2	-0.3	-0.4	-0.5	-0.6	-0.6	-0.7	-0.7
Alt. 2		0.0	0.0	0.0	0.0	-0.3	-0.5	-0.7	-0.8	-0.8	-0.8	-0.8	-0.7
Alt. 3		0.0	0.0	0.0	0.0	0.1	0.3	0.4	0.4	0.4	0.3	0.1	-0.1
Alt. 4		0.0	0.0	0.0	0.0	-0.2	-0.2	-0.2	-0.3	-0.3	-0.4	-0.4	-0.4
Alt. 5		0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.1	0.2	0.2	0.2

Appendix 4: The Alternative Scenarios (Continued)
Macroeconomic Summary (Continued)

Baseline
Alternative 1: Lower Labor Supply
Alternative 2: Higher Population Growth
Alternative 3: Lower Population Growth
Alternative 4: Higher Interest Rates
Alternative 5: Lower Interest Rates

Baseline and percentage difference from Baseline, unless specified otherwise.

		1978	2000	2010	2020	2030	2040	2050	2060	2070	2080	2090	2094
Nominal Fiscal Balances (Billions of Dollars and Difference from Baseline)													
Base.	**Federal Debt**	607.1	3,409.8	9,018.9	21,037.6	38,248.6	59,758.3	90,667.8	133,881.3	200,298.8	305,615.3	459,172.3	538,561.9
Alt. 1		0.0	0.0	0.0	0.0	520.8	1,650.6	4,112.1	8,537.8	16,506.9	30,722.6	55,775.9	70,630.8
Alt. 2		0.0	0.0	0.0	0.0	-323.4	-2,528.0	-9,671.9	-27,470.6	-65,694.6	-142,596.4	-289,919.4	-376,863.5
Alt. 3		0.0	0.0	0.0	0.0	332.6	2,745.0	10,998.9	32,129.2	79,541.6	182,928.9	409,664.9	560,202.6
Alt. 4		0.0	0.0	0.0	0.0	598.2	3,011.4	7,962.8	17,390.3	34,540.6	65,672.4	121,687.1	154,624.6
Alt. 5		0.0	0.0	0.0	0.0	-595.0	-2,903.3	-7,485.8	-15,777.1	-30,128.7	-54,569.5	-95,594.4	-118,689.0
Base.	**as percent of GDP (%)**	25.8	33.3	60.2	94.5	112.2	118.0	120.0	118.4	119.5	122.4	122.8	122.8
Alt. 1		0.0	0.0	0.0	0.0	2.6	4.7	6.9	9.1	11.4	14.0	16.7	18.0
Alt. 2		0.0	0.0	0.0	0.0	-2.4	-8.1	-17.3	-30.0	-45.7	-63.7	-83.1	-90.8
Alt. 3		0.0	0.0	0.0	0.0	2.7	9.2	21.0	38.7	63.4	97.4	145.4	169.8
Alt. 4		0.0	0.0	0.0	0.0	1.7	6.0	10.5	15.4	20.6	26.4	32.6	35.3
Alt. 5		0.0	0.0	0.0	0.0	-1.9	-5.9	-10.1	-14.2	-18.2	-22.0	-25.7	-27.2
Base.	**State & Local Debt**	280.4	1,451.8	2,844.2	3,885.2	4,900.0	5,458.6	6,240.1	6,829.9	7,490.2	9,075.1	10,716.7	11,473.6
Alt. 1		0.0	0.0	0.0	0.0	47.2	117.6	219.7	333.4	455.0	694.3	1,036.2	1,192.8
Alt. 2		0.0	0.0	0.0	0.0	8.4	24.4	62.3	108.5	186.6	500.9	1,751.2	2,340.9
Alt. 3		0.0	0.0	0.0	0.0	-40.5	-233.7	-672.4	-1,544.7	-3,134.6	-5,746.2	-7,996.0	-9,004.9
Alt. 4		0.0	0.0	0.0	0.0	14.4	6.8	-15.7	-18.2	-72.8	-93.5	-108.0	-140.6
Alt. 5		0.0	0.0	0.0	0.0	-32.1	-77.5	-110.0	-129.8	-165.1	-186.3	-284.2	-316.7
Base.	**as percent of GDP (%)**	11.9	14.2	19.0	17.4	14.4	10.8	8.3	6.0	4.5	3.6	2.9	2.6
Alt. 1		0.0	0.0	0.0	0.0	0.3	0.4	0.4	0.4	0.3	0.3	0.3	0.3
Alt. 2		0.0	0.0	0.0	0.0	-0.2	-0.2	-0.3	-0.3	-0.3	-0.2	0.1	0.1
Alt. 3		0.0	0.0	0.0	0.0	0.1	-0.1	-0.5	-1.0	-1.6	-2.1	-2.0	-2.0
Alt. 4		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alt. 5		0.0	0.0	0.0	0.0	-0.1	-0.2	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1

Appendix 4: The Alternative Scenarios (Continued)
Personal Income Summary

Baseline
Alternative 1: Lower Labor Supply
Alternative 2: Higher Population Growth
Alternative 3: Lower Population Growth
Alternative 4: Higher Interest Rates
Alternative 5: Lower Interest Rates

Baseline and percentage difference from Baseline, unless specified otherwise.

		1978	2000	2010	2020	2030	2040	2050	2060	2070	2080	2090	2094
Base.	Personal Income (Billions)	1,863.7	8,652.6	12,551.6	19,623.7	30,478.6	45,413.3	67,418.5	100,251.0	148,371.6	220,594.6	329,383.2	386,234.1
Alt. 1		0.0	0.0	0.0	0.0	-0.7	-0.9	-0.9	-1.0	-1.0	-1.1	-1.2	-1.2
Alt. 2		0.0	0.0	0.0	0.0	1.2	2.4	3.6	5.3	7.1	8.9	11.1	12.2
Alt. 3		0.0	0.0	0.0	0.0	-1.2	-2.4	-3.7	-5.3	-7.0	-8.8	-10.7	-11.5
Alt. 4		0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
Alt. 5		0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	-0.1
Base.	Wages and Salaries	1,120.6	4,825.9	6,372.1	9,671.3	14,639.1	21,352.4	31,655.7	47,177.7	69,739.7	103,626.5	155,053.9	181,603.5
Alt. 1		0.0	0.0	0.0	0.0	-0.9	-1.1	-1.1	-1.2	-1.2	-1.2	-1.3	-1.4
Alt. 2		0.0	0.0	0.0	0.0	1.4	3.0	4.6	6.8	9.2	11.8	14.7	16.0
Alt. 3		0.0	0.0	0.0	0.0	-1.5	-3.1	-4.7	-6.7	-9.0	-11.4	-14.0	-15.0
Alt. 4		0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.2	-0.2	-0.2
Alt. 5		0.0	0.0	0.0	0.0	0.2	0.2	0.3	0.3	0.4	0.4	0.4	0.4
Base.	Capital Income	468.3	2,423.1	3,285.3	5,898.3	8,734.7	12,897.0	18,956.2	27,583.5	39,860.0	58,246.8	86,373.8	100,926.5
Alt. 1		0.0	0.0	0.0	0.0	-3.4	-5.0	-5.3	-6.2	-6.7	-7.5	-8.4	-8.6
Alt. 2		0.0	0.0	0.0	0.0	5.7	12.6	19.6	27.4	35.9	43.4	50.6	53.7
Alt. 3		0.0	0.0	0.0	0.0	-6.1	-13.7	-21.3	-30.0	-39.5	-48.4	-54.9	-56.9
Alt. 4		0.0	0.0	0.0	0.0	0.5	0.9	0.3	0.2	-0.1	-0.4	-0.2	-0.2
Alt. 5		0.0	0.0	0.0	0.0	-0.2	-0.8	-0.6	-0.6	-0.7	-1.3	-2.0	-2.3
Base.	Personal Interest Income	235.1	1,102.2	1,238.5	1,924.0	2,998.6	4,330.8	6,209.5	8,742.1	12,246.4	17,430.8	25,220.6	29,195.9
Alt. 1		0.0	0.0	0.0		-0.9	-1.4	-1.6	-2.3	-2.6	-3.1	-3.6	-3.7
Alt. 2		0.0	0.0	0.0	0.0	1.7	3.2	4.1	4.4	4.4	3.2	1.1	0.3
Alt. 3		0.0	0.0	0.0	0.0	-1.8	-3.9	-5.3	-6.4	-7.1	-6.0	-0.8	2.4
Alt. 4		0.0	0.0	0.0	0.0	2.9	4.4	4.4	4.7	4.8	5.2	5.8	6.0
Alt. 5		0.0	0.0	0.0	0.0	-2.9	-4.5	-4.8	-5.1	-5.5	-6.1	-6.9	-7.3
Base.	Transfer Payments	209.9	1,087.3	2,325.2	3,302.5	5,811.7	9,229.8	13,936.6	21,193.3	32,380.6	49,187.2	73,619.0	86,881.5
Alt. 1		0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.3	0.3
Alt. 2		0.0	0.0	0.0	0.0	0.1	-0.2	-0.5	-0.4	-0.1	0.1	1.0	2.0
Alt. 3		0.0	0.0	0.0	0.0	0.0	0.7	1.4	1.3	1.1	1.0	0.1	-1.1
Alt. 4		0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2
Alt. 5		0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.2	-0.2	-0.2	-0.3	-0.3
Base.	Federal	162.7	773.4	1,757.5	2,424.4	4,299.5	6,868.3	10,275.7	15,565.2	23,737.6	35,943.3	53,350.5	62,864.5
Alt. 1	Social security	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.3	0.3
Alt. 2		0.0	0.0	0.0	0.0	-0.4	-1.5	-2.5	-3.1	-3.5	-4.2	-4.0	-3.1
Alt. 3		0.0	0.0	0.0	0.0	0.5	2.0	3.5	4.1	4.6	5.2	5.0	3.8
Alt. 4		0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2
Alt. 5		0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.2	-0.2	-0.3	-0.3	-0.3
Base.	Social security	91.4	401.4	690.2	1,083.1	1,933.7	3,053.7	4,589.8	7,116.6	11,127.0	17,150.9	25,901.8	30,878.1
Alt. 1		0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3
Alt. 2		0.0	0.0	0.0	0.0	-0.8	-2.2	-3.6	-4.4	-5.0	-5.8	-5.7	-4.7
Alt. 3		0.0	0.0	0.0	0.0	0.9	2.9	4.7	5.5	6.1	6.8	6.6	5.3
Alt. 4		0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2
Alt. 5		0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.2	-0.2	-0.3	-0.3	-0.3
Base.	Medicare	25.5	219.1	513.4	836.7	1,700.2	2,904.9	4,429.5	6,732.1	10,275.9	15,638.3	23,223.4	27,241.6
Alt. 1		0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3
Alt. 2		0.0	0.0	0.0	0.0	-0.8	-2.2	-3.6	-4.4	-5.0	-5.8	-5.7	-4.7
Alt. 3		0.0	0.0	0.0	0.0	0.9	2.9	4.7	5.5	6.1	6.8	6.6	5.3
Alt. 4		0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2
Alt. 5		0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.2	-0.2	-0.3	-0.3	-0.3
Base.	Other	45.7	152.9	553.9	504.6	665.5	909.7	1,256.3	1,716.4	2,334.7	3,154.0	4,225.3	4,744.7
Alt. 1		0.0	0.0	0.0	0.0	-0.1	-0.1	-0.2	-0.2	-0.2	-0.3	-0.3	-0.4
Alt. 2		0.0	0.0	0.0	0.0	1.2	3.0	4.7	5.8	6.5	7.4	7.4	6.3
Alt. 3		0.0	0.0	0.0	0.0	-1.3	-3.7	-5.8	-6.9	-7.6	-8.4	-8.2	-6.8
Alt. 4		0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1	-0.2	-0.2	-0.2	-0.2
Alt. 5		0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.3	0.3	0.3

Appendix 4: The Alternative Scenarios (Continued)
Personal Income Summary (Continued)

Baseline
Alternative 1: Lower Labor Supply
Alternative 2: Higher Population Growth
Alternative 3: Lower Population Growth
Alternative 4: Higher Interest Rates
Alternative 5: Lower Interest Rates

Baseline and percentage difference from Baseline, unless specified otherwise.

		1978	2000	2010	2020	2030	2040	2050	2060	2070	2080	2090	2094
Base.	State and Local	40.8	271.4	523.9	821.6	1,419.8	2,222.6	3,452.3	5,310.6	8,164.4	12,520.1	19,162.7	22,709.8
Alt. 1		0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3
Alt. 2		0.0	0.0	0.0	0.0	1.7	3.4	5.1	7.1	9.3	11.5	14.0	15.1
Alt. 3		0.0	0.0	0.0	0.0	-1.6	-3.2	-4.6	-6.4	-8.4	-10.3	-12.4	-13.4
Alt. 4		0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2
Alt. 5		0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.2	-0.2	-0.3	-0.3	-0.3
Base.	Business Current Transfer Payments	10.4	85.4	126.8	163.2	267.2	401.5	602.8	917.6	1,383.3	2,092.0	3,195.4	3,777.7
Alt. 1		0.0	0.0	0.0	0.0	-0.9	-1.2	-1.1	-1.2	-1.3	-1.4	-1.5	-1.5
Alt. 2		0.0	0.0	0.0	0.0	1.2	2.8	4.6	6.9	9.5	12.3	15.3	16.6
Alt. 3		0.0	0.0	0.0	0.0	-1.3	-2.9	-4.8	-7.1	-9.7	-12.8	-16.2	-17.8
Alt. 4		0.0	0.0	0.0	0.0	-0.3	-0.4	-0.6	-0.7	-0.8	-1.0	-1.1	-1.1
Alt. 5		0.0	0.0	0.0	0.0	0.4	0.5	0.7	0.8	0.9	0.9	1.0	1.0
Base.	-: Contributions to Social Insurance	59.7	360.6	514.7	801.3	1,252.4	1,913.1	2,867.0	4,319.0	6,455.8	9,675.8	14,495.2	17,011.6
Alt. 1		0.0	0.0	0.0	0.0	-0.8	-0.9	-0.8	-0.9	-0.9	-0.9	-0.9	-1.0
Alt. 2		0.0	0.0	0.0	0.0	1.0	1.9	2.8	4.2	5.9	7.6	9.8	11.0
Alt. 3		0.0	0.0	0.0	0.0	-1.0	-1.8	-2.7	-4.0	-5.5	-7.0	-9.0	-10.1
Alt. 4		0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Alt. 5		0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.2	0.2	0.2	0.3	0.3
Alt. 1	-: Personal Tax & Nontax Payments	229.6	1,236.3	1,237.3	2,400.7	4,383.9	6,690.3	10,149.2	15,162.2	22,426.5	33,438.9	50,041.3	58,596.1
Alt. 2		0.0	0.0	0.0	0.0	-0.8	-0.9	-0.8	-0.9	-0.8	-0.8	-0.8	-0.8
Alt. 3		0.0	0.0	0.0	0.0	1.1	2.3	3.5	4.9	6.5	7.9	9.6	10.4
Alt. 4		0.0	0.0	0.0	0.0	-1.0	-2.2	-3.4	-4.8	-6.3	-7.8	-8.3	-8.2
Alt. 5		0.0	0.0	0.0	0.0	0.4	0.6	0.6	0.6	0.8	0.9	1.1	1.2
		0.0	0.0	0.0	0.0	-0.3	-0.5	-0.6	-0.6	-0.6	-0.7	-0.8	-0.8
Base.	=: Disposable Income	1,634.1	7,416.3	11,314.3	17,223.0	26,094.6	38,723.0	57,269.3	85,088.9	125,945.2	187,155.7	279,341.9	327,638.0
Alt. 1		0.0	0.0	0.0	0.0	-0.7	-0.9	-0.9	-1.1	-1.1	-1.2	-1.3	-1.3
Alt. 2		0.0	0.0	0.0	0.0	1.2	2.4	3.7	5.3	7.2	9.1	11.3	12.5
Alt. 3		0.0	0.0	0.0	0.0	-1.3	-2.5	-3.7	-5.3	-7.2	-9.0	-11.1	-12.1
Alt. 4		0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	-0.1	-0.2	-0.2	-0.2
Alt. 5		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
Base.	=: Personal Savings	175.1	358.3	740.9	1,494.9	1,948.3	3,380.3	4,660.0	6,813.3	10,845.3	16,744.5	23,772.0	27,601.9
Alt. 1		0.0	0.0	0.0	0.0	-3.4	-4.2	-5.2	-6.8	-7.5	-8.2	-9.6	-10.0
Alt. 2		0.0	0.0	0.0	0.0	-2.3	-3.8	-4.7	-5.0	-3.2	-1.1	1.1	3.1
Alt. 3		0.0	0.0	0.0	0.0	0.1	0.9	1.4	-0.1	-3.1	-5.4	-9.6	-13.4
Alt. 4		0.0	0.0	0.0	0.0	-2.2	-1.7	-2.8	-3.5	-4.0	-4.4	-5.1	-5.4
Alt. 5		0.0	0.0	0.0	0.0	1.1	0.5	0.9	1.3	1.5	1.8	2.0	2.0
	ADDENDA:												
Base.	Savings rate (%)	10.7	4.8	6.5	8.7	7.5	8.7	8.1	8.0	8.6	8.9	8.5	8.4
Alt. 1		0.0	0.0	0.0	0.0	-2.7	-3.3	-4.3	-5.8	-6.5	-7.2	-8.5	-8.8
Alt. 2		0.0	0.0	0.0	0.0	-3.4	-6.0	-8.1	-9.8	-9.7	-9.3	-9.2	-8.3
Alt. 3		0.0	0.0	0.0	0.0	1.4	3.4	5.3	5.5	4.4	3.9	1.7	-1.4
Alt. 4		0.0	0.0	0.0	0.0	-2.2	-1.7	-2.8	-3.5	-3.9	-4.3	-4.9	-5.2
Alt. 5		0.0	0.0	0.0	0.0	1.1	0.5	0.9	1.2	1.4	1.7	1.9	1.9

Appendix 4: The Alternative Scenarios (Continued)
Employment Summary

Baseline
Alternative 1: Lower Labor Supply
Alternative 2: Higher Population Growth
Alternative 3: Lower Population Growth
Alternative 4: Higher Interest Rates
Alternative 5: Lower Interest Rates
  Baseline and difference from Baseline, unless specified otherwise.

		1978	2000	2010	2020	2030	2040	2050	2060	2070	2080	2090	2094
Base.	Total Employment (Thousands)	99,796	145,640	143,163	165,992	176,366	184,022	192,021	200,436	209,234	218,408	228,021	231,945
Alt. 1		0	0	0	0	-1,765	-3,059	-2,916	-2,894	-3,319	-3,634	-4,529	-5,090
Alt. 2		0	0	0	0	1,696	3,089	6,150	10,480	15,200	21,394	28,916	32,136
Alt. 3		0	0	0	0	-1,411	-2,515	-5,320	-9,310	-13,727	-19,346	-26,138	-29,009
Alt. 4		0	0	0	0	1	9	10	17	5	24	14	24
Alt. 5		0	0	0	0	4	7	1	11	7	18	-5	3
Base.	Health Care Services	5,303	11,336	14,275	17,136	20,594	22,663	24,421	25,918	27,182	28,628	30,181	30,690
Alt. 1		0	0	0	0	-10	-14	-15	-16	-16	-17	-21	-23
Alt. 2		0	0	0	0	78	92	191	434	740	1,121	1,760	2,144
Alt. 3		0	0	0	0	-73	-85	-218	-477	-816	-1,257	-1,894	-2,241
Alt. 4		0	0	0	0	3	3	4	5	5	5	5	5
Alt. 5		0	0	0	0	-1	-1	1	2	3	2	3	3

Appendix 4: The Alternative Scenarios (Continued)
Personal Consumption Expenditure Summary

Baseline
Alternative 1: Lower Labor Supply
Alternative 2: Higher Population Growth
Alternative 3: Lower Population Growth
Alternative 4: Higher Interest Rates
Alternative 5: Lower Interest Rates
  Baseline and percentage difference from Baseline, unless specified otherwise.

Nominal Personal Consumption Expenditure (Billions and Percentage Difference)

		1978	2000	2010	2020	2030	2040	2050	2060	2070	2080	2090	2094
Base.	Personal Consumption Expenditures	1,422.3	6,762.1	10,185.8	15,131.3	23,129.3	33,753.1	50,205.2	74,674.4	109,747.2	162,430.7	243,618.7	286,003.0
Alt. 1		0.0	0.0	0.0	0.0	-0.5	-0.6	-0.6	-0.6	-0.5	-0.5	-0.5	-0.5
Alt. 2		0.0	0.0	0.0	0.0	1.5	3.0	4.5	6.3	8.3	10.2	12.5	13.5
Alt. 3		0.0	0.0	0.0	0.0	-1.4	-2.8	-4.2	-5.9	-7.7	-9.5	-11.5	-12.3
Alt. 4		0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1
Alt. 5		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0
Base.													
Base.	Total Health Care	162.2	1,204.0	2,216.3	3,509.3	6,091.7	10,040.9	16,125.6	25,520.8	39,900.5	62,647.1	98,468.0	117,495.3
Alt. 1		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alt. 2		0.0	0.0	0.0	0.0	0.4	0.5	1.0	1.9	3.1	4.4	6.4	7.5
Alt. 3		0.0	0.0	0.0	0.0	-0.4	-0.5	-1.1	-2.1	-3.3	-4.8	-6.8	-7.8
Alt. 4		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alt. 5		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Base.	Goods	18.2	191.2	389.7	659.4	1,169.9	2,085.4	3,618.8	6,184.8	10,439.0	17,690.1	30,002.3	36,901.6
Alt. 1		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alt. 2		0.0	0.0	0.0	0.0	0.4	0.5	1.1	2.2	3.4	4.9	7.0	8.1
Alt. 3		0.0	0.0	0.0	0.0	-0.4	-0.4	-1.2	-2.4	-3.6	-5.3	-7.4	-8.3
Alt. 4		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alt. 5		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Base.	Services	131.2	918.4	1,690.7	2,613.6	4,535.1	7,319.9	11,488.6	17,727.9	26,951.8	41,023.8	62,297.4	73,241.5
Alt. 1		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alt. 2		0.0	0.0	0.0	0.0	0.3	0.3	0.6	1.5	2.5	3.6	5.5	6.6
Alt. 3		0.0	0.0	0.0	0.0	-0.3	-0.3	-0.8	-1.7	-2.8	-4.2	-6.1	-7.1
Alt. 4		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alt. 5		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Base.	Net health insurance	12.9	94.4	135.8	236.4	386.7	635.6	1,018.2	1,608.2	2,509.7	3,933.1	6,168.2	7,352.1
Alt. 1		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alt. 2		0.0	0.0	0.0	0.0	1.3	2.7	4.1	5.9	7.9	10.0	12.6	13.8
Alt. 3		0.0	0.0	0.0	0.0	-1.3	-2.6	-4.0	-5.7	-7.6	-9.6	-11.9	-12.9
Alt. 4		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alt. 5		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Appendix 4: The Alternative Scenarios (Continued)
Personal Consumption Expenditure Summary (Continued)

Baseline
Alternative 1: Lower Labor Supply
Alternative 2: Higher Population Growth
Alternative 3: Lower Population Growth
Alternative 4: Higher Interest Rates
Alternative 5: Lower Interest Rates
  Baseline and percentage difference from Baseline, unless specified otherwise.

Nominal Personal Consumption Expenditure (Billions and Percentage Difference)

		1978	2000	2010	2020	2030	2040	2050	2060	2070	2080	2090	2094
Real Personal Consumption Expenditure (Billions 2012$ and Percentage Difference)													
Base.	**Personal Consumption Expenditures**	4,157.3	8,643.4	10,643.0	13,505.2	16,774.8	19,826.0	23,789.9	28,409.6	33,413.4	39,445.7	47,025.5	50,326.5
Alt. 1		0.0	0.0	0.0	0.0	-0.5	-0.7	-0.6	-0.6	-0.6	-0.6	-0.6	-0.7
Alt. 2		0.0	0.0	0.0	0.0	1.5	3.0	4.5	6.4	8.4	10.5	12.9	14.1
Alt. 3		0.0	0.0	0.0	0.0	-1.4	-2.8	-4.2	-5.9	-7.8	-9.7	-11.8	-12.7
Alt. 4		0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Alt. 5		0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2
Base.	**Total Health Care**	898.4	1,708.0	2,310.2	3,103.0	4,144.8	5,119.2	6,155.9	7,288.1	8,514.1	9,974.7	11,679.0	12,380.8
Alt. 1		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alt. 2		0.0	0.0	0.0	0.0	0.4	0.5	1.0	1.9	3.0	4.3	6.3	7.4
Alt. 3		0.0	0.0	0.0	0.0	-0.4	-0.5	-1.1	-2.1	-3.3	-4.8	-6.7	-7.7
Alt. 4		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alt. 5		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Base.	**Goods**	80.6	270.1	413.4	568.3	773.3	1,009.2	1,277.3	1,586.0	1,936.8	2,365.2	2,879.1	3,097.8
Alt. 1		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alt. 2		0.0	0.0	0.0	0.0	0.4	0.5	1.1	2.3	3.5	4.9	7.1	8.2
Alt. 3		0.0	0.0	0.0	0.0	-0.4	-0.4	-1.2	-2.4	-3.7	-5.3	-7.4	-8.4
Alt. 4		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alt. 5		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Base.	**Services**	743.4	1,295.7	1,753.2	2,331.9	3,115.8	3,792.8	4,493.2	5,238.0	6,021.8	6,937.8	7,982.1	8,400.4
Alt. 1		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alt. 2		0.0	0.0	0.0	0.0	0.3	0.3	0.6	1.5	2.4	3.5	5.4	6.5
Alt. 3		0.0	0.0	0.0	0.0	-0.3	-0.3	-0.8	-1.7	-2.8	-4.1	-6.0	-7.0
Alt. 4		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alt. 5		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Base.	**Net health insurance**	79.4	144.4	143.5	203.5	256.6	315.4	377.7	445.5	518.9	606.5	708.9	751.1
Alt. 1		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alt. 2		0.0	0.0	0.0	0.0	1.3	2.7	4.1	5.9	7.9	10.0	12.6	13.8
Alt. 3		0.0	0.0	0.0	0.0	-1.3	-2.6	-4.0	-5.7	-7.6	-9.6	-11.9	-12.9
Alt. 4		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alt. 5		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0