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The **Global Aging Preparedness Index**

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ABOUT THE GLOBAL AGING PREPAREDNESS INDEX

The Global Aging Preparedness Index (or GAP Index) was developed by the Center for Strategic and International Studies' Global Aging Initiative with financial support from Prudential plc. The goal of the GAP Index is to help inform the policy debate about global aging and focus attention on the need for constructive reform in confronting one of the transformative challenges of the twenty-first century. CSIS hopes that the GAP Index will become the centerpiece of an ongoing project that includes updates of the Index itself as well as in-depth country and issue studies. Supplemental data and analysis related to the GAP Index are available on the Index website at gapindex.csis.org.

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Executive Summary

Global aging promises to affect everything from business psychology and worker productivity to rates of savings and investment, long-term returns to capital, and the direction of global capital flows. Perhaps most fatefully, it could throw into question the ability of many societies to provide a decent standard of living for the old without placing a crushing burden on the young.

The purpose of the Global Aging Preparedness Index (or GAP Index) is to provide a comprehensive assessment of the progress that countries are making in preparing for global aging, and particularly the "old-age dependency" dimension of the challenge. The GAP Index covers twenty countries, including most major developed countries and a selection of economically important emerging markets for which adequate data were available. Its projection horizon extends through the year 2040 in order to capture the full impact of the demographic transformation now sweeping the world.

The overall GAP Index consists of two separate subindices—the "fiscal sustainability index" and the "income adequacy index."

On the fiscal side, the GAP Index begins by looking at projections of public old-age benefit spending, including both pensions and health benefits. But the Index also goes further. It takes into account the differing fiscal room that countries have to accommodate their growing old-age dependency burdens by raising taxes, cutting other spending, or borrowing. It also considers the degree of elderly dependence on public benefits in different countries, which may be a crucial factor in determining how politically easy or difficult it will be to enact new cost-cutting reforms—

GAP Index Country Rankings

	Fiscal Sustainability Index		Income Adequacy Index
1	India	1	Netherlands
2	Mexico	2	Brazil
3	Chile	3	US
4	China	4	Germany
5	Russia	5	UK
6	Poland	6	Australia
7	Australia	7	Sweden
8	Japan	8	Chile
9	Canada	9	Spain
10	Sweden	10	India
11	US	11	Canada
12	Korea	12	Japan
13	Switzerland	13	Poland
14	Germany	14	Switzerland
15	UK	15	Russia
16	Italy	16	France
17	France	17	Italy
18	Brazil	18	China
19	Netherlands	19	Korea
20	Spain	20	Mexico

Note: Countries are ranked from best to worst.

GAP Index Reform Strategy Guide

	1 Reduce Public Pension Benefits	2 Reduce Health-Care Cost Growth	3 Extend Work Lives	4 Increase Funded Pension Savings	5 Strengthen Poverty Floors	6 Increase Fertility Rates	7 Increase Immigration
Australia	★	★★	★		★★	★	
Brazil	★★★	★	★	★★		★	★
Canada	★	★★	★			★★	★
Chile	★		★	★	★	★	★
China	★		★★	★★	★★★	★★	★
France	★★★	★★★	★★★	★★★		★	★
Germany	★★★	★★	★★	★★		★★★	★★★
India			★★	★★	★★		
Italy	★★★	★★	★★★	★★	★	★★★	★★
Japan	★★★	★★		★★	★★	★★★	★★★
Korea	★	★		★★★	★★★	★★★	★★★
Mexico				★★	★★★		★
Netherlands	★★	★★★	★★			★★	★★
Poland	★★★		★★	★★		★★★	★★
Russia	★		★★	★★	★	★★★	★
Spain	★★★	★★	★★★	★★★	★★	★★★	★★
Sweden	★★	★★	★	★		★	
Switzerland	★	★★	★		★	★★★	★
UK	★	★★	★★	★	★	★	
US	★	★★★		★	★★		

Reform Guide Key — No Stars = Not a Priority; ★ = Low Priority; ★★ = Significant Priority; ★★★ = High Priority

or indeed, to follow through on reforms that have already been enacted but not yet phased in.

On the adequacy side, the GAP Index tracks trends in the living standard of the elderly relative to the nonelderly in each country based on projections that factor in the impact of changes in public benefit programs, private pension provision, and labor-force participation rates. It also includes indicators that measure the robustness of old-age safety nets and family support networks, which play a crucial role in retirement security in many emerging markets and some developed countries.

The GAP Index reveals that most countries are doing much better on one dimension of aging pre-

paredness than the other, suggesting that today's retirement policies often entail a worrisome trade-off between fiscal sustainability and income adequacy. Three of the seven highest-ranking countries on the fiscal sustainability index (Mexico, China, and Russia) are among the seven lowest-ranking countries on the income adequacy index. Four of the seven highest-ranking countries on the income adequacy index (the Netherlands, Brazil, Germany, and the UK) are among the seven lowest-ranking countries on the fiscal sustainability index.

There are, however, some notable exceptions. Australia, which combines a low-cost, means-tested floor of public old-age poverty protection with a large, mandatory, and fully funded private pension system, scores in the top half of both indices. Although some real concerns about the adequacy of retirement provision for low earners remain, Australia appears to be on track to meet the aging challenge. France and Italy, on the other hand, score near the bottom of both indices. Each has legislated large future cuts in the generosity of its public pension system in an effort to shore up its long-term sustainability. Yet despite the reforms, old-age benefits will continue to impose a heavy fiscal burden even as they become increasingly inadequate.

The GAP Index includes a reform guide that assesses the potential payoff of seven key reform strategies, from reducing public pension benefits and health-care cost growth to increasing fertility rates and immigration. Two strategies in particular—extending work lives and increasing funded pension savings—are especially important, since they allow countries to escape, or at least to mitigate, the trade-off between fiscal sustainability and income adequacy. They offer the best means for the world's aging societies to maintain the living standard of the old without imposing a steeply rising burden on the young.

It is encouraging that countries around the world have begun to move in this direction. From Germany, Poland, and Sweden to Chile, China, and India, governments are expanding existing funded pension systems or jump-starting new ones. Elderly labor-force participation rates have also begun to rise in many countries, with especially large increases in some continental European countries long known for generous early retirement benefits. The lesson of the GAP Index is not that governments are doing nothing to respond to the challenge of global aging, but that they are not yet doing enough.

Ten or fifteen years ago, global aging barely registered as a policy issue. Today, with large age waves looming just over the horizon in most of the world's leading economies, it has become the focus of growing concern. Many governments are beginning to debate—and some have enacted—major reforms. Yet despite this progress, there exists no satisfactory measure of how well countries worldwide are actually responding to the challenge. The Global Aging Preparedness Index is designed to fill this gap.

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The Challenge of Global Aging

The world stands on the threshold of a stunning demographic transformation. It is called global aging, and it promises to reshape virtually every dimension of the economy and society over the next few decades.

There are two forces behind the transformation. The first force is falling fertility. People are having fewer babies, and this decreases the relative number of young in the population. As recently as the mid-1960s, every developed country was at or above the so-called 2.1 replacement rate needed to maintain a stable population from one generation to the next. Today, every developed country is at or below it—and most are far below it. In Italy and Spain the fertility rate is 1.4 and in Germany and Japan it is 1.3.

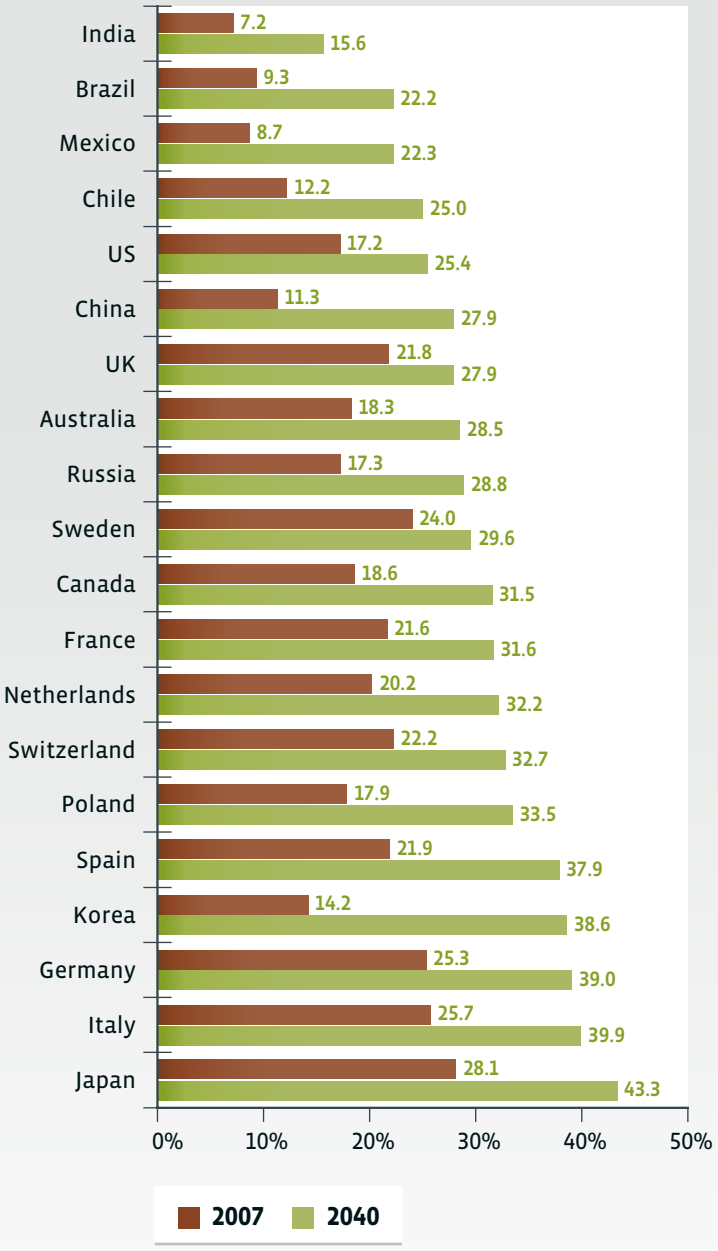
The trend toward lower birthrates began in the rich world, but has now overtaken most emerging markets as well. Fertility has fallen beneath the replacement rate in all of East Asia—and in Korea and the other Tigers it has dropped to levels as low as the lowest in the developed world. Fertility is also far beneath replacement throughout Central and Eastern Europe, and it is near, at, or beneath replacement in all of Latin America's leading economies. Although it remains higher elsewhere, it has begun to fall rapidly in South Asia and much of the Muslim world.

The second force is rising life expectancy. People are living longer, and this increases the relative number of old in the population. Worldwide, life expectancy at birth has increased by twenty-one years since 1950, a bigger gain over the past sixty years than humanity had achieved over the previous six thousand. In the developed world, life expectancy is now in the late seventies to early eighties in every country—and it has reached the same level, or nearly the same level, in some emerging markets. Life expectancy today is 73 in China (up from 41 in 1950), 76 in Mexico (up from 51 in 1950), and 79 in Korea (up from 48 in 1950).

Put these two forces together and the result is a dramatic aging of the population. It is today's developed countries, of course, that are leading the way into humanity's graying future. For most of history until well into the nineteenth century, the elderly—defined throughout this report as

FIGURE 1

Elderly (Aged 60 and Over), as a Percent of the Population in 2007 and 2040



adults aged 60 and over—comprised only a tiny fraction of the population, never more than 4 or 5 percent in any country. In the developed countries today, they comprise 22 percent. Three decades from now in 2040, the share is on track to reach 31 percent—and that's just the average. In Japan and the fastest-aging European countries, it will be approaching or passing 40 percent.

The developing world as a whole is still much younger, but it too is aging—with some countries traversing the entire demographic distance from young and growing to old and stagnant or declining at a breathtaking pace. By 2040, Brazil and Mexico will be nearly as old as the United States—and China will be older. Poland will be older than France and the UK, while Korea will be vying with Germany, Italy, and Japan for the title of oldest country on earth. (See Figure 1.)

We live in an era of many challenges, from global warming to global terrorism. But few are as certain as global aging and few are as likely to have such a large and enduring impact on the size and shape of government budgets, on the future growth in living standards, and on the stability of the global economy. Global aging promises to affect everything from business psychology and worker productivity to rates of savings and investment, long-term returns to capital, and the direction of global capital flows. Perhaps most fatefully, it could throw into question the ability of societies to provide a decent standard of living for the old without placing a crushing burden on the young. It is this "old-age dependency" dimension of the global aging challenge that the current report explores.

Ten or fifteen years ago, global aging barely registered as a policy issue. Today, with large age waves looming just over the horizon in most of the world's leading economies, it has become the focus of growing concern. Many governments are beginning to debate—and some have enacted—major reforms.

Most of the concern, especially in the developed world, is focused on the rising fiscal cost of government benefit programs. Most developed countries have expensive pay-as-you-go public

pension systems that were put in place back in the early postwar decades when workers were abundant and retirees were scarce, but which have now been rendered unsustainable by the collapse in birthrates and the steady rise in longevity. Graying also means paying much more for health care, because the elderly typically consume at least three times more per capita in acute-care services and at least ten times more in long-term care services than the nonelderly.

Faced with this daunting arithmetic, several countries have dramatically cut the generosity of the "deal" future retirees will receive compared with today's retirees. France, Germany, Italy, Japan, Poland, and Sweden have all revised the benefit structure of their public pension systems in ways that, over time, are scheduled to result in deep reductions in the share of wages they replace. Many countries are also beginning to raise retirement ages, especially by closing down no-penalty early retirement options that in some European countries allowed workers to collect full benefits in their mid- or late fifties. At the same time, governments in many countries are trying to expand existing funded pension systems or jump-start new ones in an effort to fill the income gap left as state provision is scaled back.

Meanwhile in the developing world, countries are beginning to worry that they may grow old before they grow rich. Although the rising fiscal burden of pay-as-you-go benefit systems is a major issue in a few countries, notably Brazil and Korea, the most pressing concern is often the growing vulnerability of the old. Many developing countries are aging before they have had time to put in place the social protections of a modern welfare state. In China and India, only a fraction of the workforce is earning a benefit under a pension system, public or private, and the majority of elders still depend heavily on the extended family for support in old age. Yet the informal support networks on which elders depend are already under assault by the forces of modernization and will soon come under intense new pressure as populations age and family size declines. In response, some countries are putting in place universal public floors of old-age poverty protection (Brazil and Chile), while others are expanding coverage under formal retirement systems (China and India).

Almost everywhere, governments are also considering policies designed to ease the challenge of global aging by altering the underlying demographics themselves. Increasing immigration is one option. Countries like Australia, Canada, and the United States that have high rates of net immigration—and also do a good job of assimilating new arrivals—have a significant demographic and economic advantage over countries that do not. Not surprisingly, the pros and cons of stepped-up immigration are being debated wherever native-born workforces are projected to stagnate or decline in the decades ahead. The issue is even on the table in countries like Korea and Japan that have traditionally valued their ethnic homogeneity. Typically, policy and business leaders favor higher immigration, especially when it is targeted at skilled workers, while the broader public in many countries is opposed.

There is also surging interest in pronatal policies in low-fertility countries around the world. A few developed countries, most notably France and Sweden, have long had comprehensive pronatal policy regimes—including cash benefits, subsidized daycare, paid maternity leave, and job guarantees—that make it easier for women to balance jobs and babies. Now even a country like Germany, where any suggestion that government should encourage higher birthrates was politically taboo until a few years ago, is studying and implementing pronatal reforms. In a remarkable about-face, Korea recently redefined the mission of its government family planning bureau from discouraging births to encouraging them. Japan is debating how it can reorient its conservative workplace and family cultures to make them more supportive of working mothers. Meanwhile in Russia, Vladimir Putin, citing future economic and security needs, has flatly declared the nation's birth dearth to be "the most acute problem facing our country today."

Yet despite all the concern about global aging, there exists no satisfactory measure of how well countries worldwide are actually responding to the challenge. Not all national governments make long-term projections of the fiscal burden of old-age benefit spending, and those that do rarely include all benefit programs. Virtually no government makes any attempt to evaluate how reforms are likely to affect the long-term adequacy of elderly income. To be sure, there are many specialized academic studies that evaluate various dimensions of aging or retirement "preparedness" in particular countries. There are also a few broader studies that compare selected indicators, such as retirement ages and replacement rates, across many countries. But while these studies are useful, they only give a partial and incomplete picture.

The purpose of the Global Aging Preparedness Index (or GAP Index) is to provide a more comprehensive and realistic assessment of the progress that countries are making in preparing for their onrushing age waves. The GAP Index builds on, but refines and expands, an analytical framework first developed by the Center for Strategic and International Studies (CSIS) for a study of "aging vulnerability" in the developed world.[1] To assess preparedness, the GAP Index looks at projections of total public benefit spending and total household income by age through the year 2040. The Index covers twenty countries, including most major developed countries and a selection of economically important emerging markets for which adequate data were available.

[1] Richard Jackson and Neil Howe, *The 2003 Aging Vulnerability Index: An Assessment of the Capacity of Twelve Developed Countries to Meet the Aging Challenge* (Washington, DC: CSIS and Watson Wyatt Worldwide, March 2003).

The overall GAP Index consists of two separate subindices—the "fiscal sustainability index" and the "income adequacy index."

On the fiscal side, the GAP Index begins by looking at projections of public old-age benefit spending, including both pensions and health benefits. But the Index also goes further. It takes into account the differing fiscal room that countries have to accommodate their growing old-age dependency burdens by raising taxes, cutting other spending, or borrowing. It also considers the degree of elderly dependence on public benefits in different countries, which may be a crucial factor in determining how politically easy or difficult it will be to enact new cost-cutting reforms—or indeed, to follow through on reforms that have already been enacted but not yet phased in.

On the adequacy side, the GAP Index tracks trends in the living standard of the elderly relative to the nonelderly in each country based on income projections that factor in the impact of changes in public benefit programs, private pension provision, and labor-force participation rates. It also includes indicators that measure the robustness of old-age safety nets and family support networks, which play a crucial role in retirement security in many emerging markets and some developed countries.

Chapter 1 of the report describes the overall structure of the GAP Index in more detail and briefly explains the key assumptions underlying the projections. Chapter 2 discusses the fiscal sustainability index and the individual indicators that comprise it—why they were selected, how they are calculated, and what they reveal. Chapter 3 does

the same for the income adequacy index. Chapter 4 then gathers together the strands of the story and assesses the potential payoff of key reform strategies in different countries.

The story contains both good news and bad news. The bad news is that very few countries score well on both the fiscal sustainability and income adequacy indices. Countries that score well on income adequacy generally have costly public old-age benefit systems, while countries that score well on fiscal sustainability tend to have relatively low elderly living standards. The good news is that there are exceptions. Australia, which combines a low-cost, means-tested floor of public old-age support with a large, mandatory, and fully funded private pension system, scores in the top half of both indices. So does Chile, which has a similar mix of retirement policies. There are also a few countries that are clearly moving in the right direction. Germany and Sweden, for instance, have scheduled deep reductions in the generosity of their public pension systems, but appear to be on track to fill in the resulting income gap by extending work lives and increasing funded retirement savings. Although their fiscal burdens remain high, they have been cut well beneath what they would otherwise be without undermining adequacy.

The GAP Index also suggests that demography need not be destiny. Japan, which must cope with a massive age wave, nonetheless scores in the middle of both the fiscal sustainability and income adequacy indices. France, which by comparison faces a relatively benign demographic future, scores toward the bottom of both indices. The lesson is that policy choices make a critical difference. It is in the hope of stimulating debate and focusing attention on the need for constructive reform that we offer this first edition of the Global Aging Preparedness Index.

The GAP Index Framework

The Global Aging Preparedness Index offers many new insights into one of the greatest challenges of our time. Before examining the results, however, it is essential to understand the scenario and assumptions that underlie the projections. While the overview that follows covers the critical issues, the interested reader may wish to consult the technical appendix for additional details.

The most important assumption is that current retirement policies and behavior in each country will remain unchanged in the future. There are only two significant exceptions to this "no change" rule. The GAP Index projections fully reflect the future impact of retirement policy reforms, from changes in benefit formulas to changes in retirement ages, that have already been enacted into law but are being phased in over time. They also incorporate certain highly predictable cohort effects. If private pension coverage rates have been rising among younger workers, as is the case in several Index countries, the increase in pension coverage is ultimately reflected in an increase in pension receipt among the elderly. Similarly, if labor-force participation rates have been rising among workers in their fifties and sixties, as is also the case in several Index countries, that increase is assumed to translate with a lag into an increase in labor-force participation among workers in their sixties and seventies. The projections, however, do not include additional policy or behavioral responses beyond those that are already in the pipeline.

The GAP Index uses a no-change baseline because it is designed to serve as a "stress test" of current retirement policy. Its purpose is not to forecast where countries will end up, but rather to show where they are heading on their current course—and hence, by implication, the magnitude of the policy and behavioral responses that may be required to ensure a satisfactory outcome. Trying to anticipate these responses and build them into the baseline would obscure the very need for reform that the Index is designed to highlight.

The Index projections extend from 2007 through the year 2040. We selected 2007 as the base year not only because it is the most recent year for which many data series are available, but also because we wanted to use a snapshot of the "present" that is not distorted by the current economic crisis when comparing near- and long-term indicator values. The 2040 projection horizon was

selected because the "demographic transition" in most Index countries will by then be largely complete. Even after 2040, rising longevity will continue to push the old-age dependency burden steadily upward. But in most countries, the era of swiftest aging will occur between the mid-2010s and the mid-2030s, as the collapse in fertility rates that has occurred over the past few decades hollows out the bottom of the population pyramid and as the retirement of large postwar baby boom generations broadens the top. A country that can successfully navigate the demographic rapids over the next three decades will, presumably, be quite prepared to manage the gentler current thereafter. A country that fails to meet the challenge by 2040 may be far more concerned with confronting the destructive legacy of that failure, from high tax levels to runaway debt, than with managing any new demographic developments after 2040.

It is also worth stressing that the demographic projections—or more precisely, the relevant demographic outcomes—are virtually locked in over the next thirty years. Even if fertility, the main driver of demographic aging, were suddenly to surge, it would have a negligible impact on the projected size of the working-age population or the ratio of workers to retirees until 2035 or 2040. Demography is like an ocean liner. Once it is steaming full speed ahead, it takes a long time to turn around. Beyond 2040, however, unexpected demographic changes could significantly alter the Index results.

In the near term, our projections naturally factor in the impact of the global economic crisis that began in 2008. Although the base year for the Index is 2007, the projection model incorporates actual 2008 and 2009 economic and fiscal data. For 2010 and 2011, the model follows the near-term projections published by the OECD or, for non-OECD members, projections published by the IMF or national governments. Between 2012 and 2015, the model assumes that the economic performance and fiscal stance of each country return to pre-crisis "normalcy." As a result of the crisis, GDP is of course lower and the public debt higher than they would otherwise have been. Unemployment, productivity, and government taxation and spending, however, all return to pre-crisis levels. Our assumption of a complete and relatively rapid return to normalcy may be optimistic. To the extent that the crisis lingers, the projections in this report may underestimate the economic and fiscal challenge that many countries face.

In the long term, we make no attempt to model future business cycles. On the economic side, we use a standard global GDP projection model that assumes a gradual convergence in productivity growth rates across countries. On the fiscal side, we make two critical assumptions designed to isolate the impact of demographic aging on public budgets.

The first assumption is that, after the initial 2010–2015 transition period, each country adopts a long-term policy of "debt neutrality"—that is, each country moves toward a government deficit (or surplus) which, when continued unchanged as a share of GDP, would keep net government debt unchanged as a share of GDP. We assume that each country will achieve its new budget balance by an increase (or decrease) in taxes combined with an equal decrease (or increase) in government spending. While unrealistic as a short- or medium-term forecast, debt neutrality is a standard assumption in long-term budget models. Governments cannot indefinitely accumulate debt—and it is doubtful that they can indefinitely accumulate assets either. To suppose that they can would obscure the true impact of demographic aging on the future fiscal burden.

We considered making—but decided against—an exception for countries that are targeting budget surpluses as a partial solution to the aging challenge. The historical failure of governments throughout the world to validate retirement "trust-fund" savings by running sustained general government surpluses raises serious questions about the feasibility of this strategy. Unless retirement savings are personally owned or contractually based, there is nothing to prevent governments from spending, borrowing against, or

otherwise nullifying the savings. In any case, only two of the twenty Index countries—Canada and Korea—have announced plans to pursue such a policy on a significant scale. If we factored their trust-fund savings into the projections, it would push Canada up by one place and Korea by five places in the fiscal sustainability index. Naturally, it would have no impact on their rankings in the income adequacy index.

The second assumption is that, once debt neutrality is achieved, nonbenefit government spending will remain constant as a share of GDP and taxes will be raised (or lowered) in each future year in accordance with the projected change in benefit spending. In most countries, of course, this means that taxes must be raised in every year. This rising tax assumption is only relaxed for two indicators—the "budget room" and "borrowing room" indicators—where the object is to assess the feasibility of alternative means of paying for the growth in old-age benefit costs.

The Index model divides government benefits into three categories: public pensions, health benefits, and other benefits. The public pension category includes all social insurance retirement and survivors benefits, means-tested retirement benefits, and government employee pensions—provided that they are financed primarily on a pay-as-you-go basis. If public pension systems are funded *and* benefits are personally owned (as the personal accounts systems are in Chile, Mexico, Poland, and Sweden) or contractually based (as government employee pensions are in some countries), benefits are considered economically equivalent to funded private pension benefits and are not included in the government benefit projections. The rationale is simple: Whether funded pensions are constituted as public or private programs, they represent a return on retirees' prior savings and do not impose a burden on current workers. The health benefits category includes both acute care and long-term care. The other benefits category includes everything else, from disability benefits to unemployment benefits and housing benefits.

The public pension projections used in the Index are based on the specific benefit rules in each country and, as already indicated, take into account reforms that have been enacted but not yet phased in. Whenever possible we rely on official projections by national governments or, for EU-member countries, the European Commission. The health benefit projections, which were made by CSIS, are based on a standard methodology. The projections reflect the impact of demographic aging itself, which alone will push up spending as a share of GDP as more of the population moves into the older and higher-cost age brackets. They also take into account the fact that advances in medical technology and rising public expectations about care and cure are pushing up per capita costs at all ages faster than per capita GDP in most countries. It is the interaction of this "excess cost growth" with demographic aging that makes health-care spending such an explosive component of the old-age dependency burden.

In order to assess trends in income adequacy, the GAP Index also includes projections of total income by age. The model divides household income into five broad categories: employment income, asset income other than funded pension income, funded pension income, public benefits, and family transfers. We treat funded pensions as a special class of assets because they are explicitly designed to provide retirement income, are often intended to substitute in whole or in part for pay-as-you-go public pension benefits, and are growing in importance in many countries. The Index definition of funded pensions is fairly broad. They include public programs and private programs, mandatory schemes and voluntary schemes, employer pensions and personal pensions, and annuities and lump-sum payments. The Index projections of funded pension benefits, most of which were made by CSIS, are based on a detailed analysis of recent trends and policy reforms in each country. Other types of privately earned income are projected according to stylized rules that are described in the technical appendix.

Throughout the Index, the "elderly" are defined as persons aged 60 and over, the "nonelderly" as persons under age 60. The income of each age group refers to the income of individuals within that age group, with the exception of spouses of heads of households, who are considered to belong to the same age group as the head of household. In households containing both elderly and nonelderly persons who are not spouses, income is split between the two age groups. Such income sharing is very common in most developing and a few developed countries like Italy, Spain, and Japan, where the elderly and their adult children often live together.

The threshold between elderly and nonelderly may strike some readers as early, since in today's developed countries most sixty-year-olds seem relatively "young." The threshold, however, is not meant to indicate anything about health, capacity, or vigor. Nor does it mean that the GAP Index assumes that all adults under age 60 work and all adults over age 60 are retired. The model takes into account actual patterns of employment in each country. To the extent that the nonelderly do not work (because they are students or stay-at-home moms), the projections reflect this; to the extent that the elderly do work (because they are not retired or only semiretired), the projections also reflect this. However, we require some fixed dividing line between young and old in order to compare intergenerational transfer burdens and relative income adequacy across countries and across time. Age 60 was chosen because it is now close to the typical age of retirement on public benefits in most countries—much closer, in fact, than age 65.

The GAP Index measures the performance of countries relative to each other rather than against some absolute standard of "preparedness." We considered establishing such a standard, but concluded that any absolute benchmark would be arbitrary. There is no real consensus within countries, much less across countries, about what constitutes an acceptable old-age benefit burden on workers or an acceptable living standard for retirees. Yet almost everyone would agree that the lower the worker burden is and the higher the retiree living standard is the more prepared the country is.

As already explained, the overall Global Aging Preparedness Index consists of two separate subindices—the fiscal sustainability index and the income adequacy index. The subindices in turn are based on indicators grouped into distinct categories, each dealing with a different dimension of the challenge.

Fiscal Sustainability Index

- **PUBLIC BURDEN.** This category contains two indicators that measure the sheer magnitude of each country's projected public old-age dependency burden.
- **FISCAL ROOM.** This category contains three indicators that measure each country's ability to accommodate the growth in its public old-age dependency burden by raising taxes, cutting other spending, or borrowing.
- **BENEFIT DEPENDENCE.** This category contains two indicators that measure how dependent the elderly in each country are on public benefits and thus how politically difficult it may be to reduce those benefits beneath current law—or even to carry out reductions in benefits that are already scheduled to take place.

Income Adequacy Index

- **TOTAL INCOME.** This category contains two indicators that measure the overall level of and trend in the income of the elderly relative to the nonelderly in each country.
- **INCOME VULNERABILITY.** This category contains three indicators—two that measure income adequacy for "middle class" elders in each country, a group that will be disproportionately affected by changes in the generosity of retirement income systems, and one that measures the extent of elderly poverty.

- **FAMILY SUPPORT.** This category contains two indicators that measure the robustness of family support networks in each country.

For each of the subindices, the country rankings are calculated as follows. We first tabulate the results for individual indicators, ranked from one (best) to twenty (worst). We then transform the indicator results into index values. For each indicator, the mean result is set to an index value of 50; results that lie above and below the mean by one standard deviation are set, respectively, to index values of 100 and zero. The indicator index values thus preserve the indicator rankings while also reflecting the relative distance of each ranked country, positively or negatively, from the "center of the pack." We next combine the indicator index values into category scores, which are used to determine the category rankings. Finally we combine the category scores into overall scores and rankings for each of the two subindices. The weights given to each indicator and category are described in the technical appendix.

We considered but rejected the idea of combining the two subindices into a single comprehensive index. Because the Global Aging Preparedness Index includes countries at such different stages of economic development, averaging the results for fiscal sustainability and income adequacy might obscure more than it illuminates. Consider: Many developing countries have low fiscal burdens and low income adequacy, while many developed countries have average fiscal burdens and average income adequacy. In a combined index, these two groups of countries would have similar rankings, though it is not at all clear that they are similarly prepared to meet the aging challenge. On the other hand, the meaning of the rankings in the separate fiscal sustainability and income adequacy indices is perfectly clear.

The Fiscal Sustainability Index

The late Herb Stein, a former chairman of the U.S. Council of Economic Advisers, was fond of saying that things that are unsustainable tend to stop. The GAP fiscal sustainability index cannot tell us when different countries will take action to slow the growth in old-age dependency costs, much less what form the action will take. What it does provide is a comprehensive measure of the fiscal risks they face. The public burden indicators, which focus on the projected magnitude of the old-age dependency burden if current law remains in force, are presented first. The fiscal room indicators, which focus on how easily each country can accommodate the growth in that burden, are presented second. The benefit dependence indicators, which focus on how politically difficult it may be for countries to reduce that burden—or indeed, to keep the burden from rising even faster than current law would dictate—are presented last.

Category One: Public Burden

The public burden category includes two indictors that track the claim that public old-age benefits will place on society's total economic resources:

- **BENEFIT LEVEL:** *Total public benefits to the elderly in 2040 as a percent of GDP*
- **BENEFIT GROWTH:** *The growth in total public benefits to the elderly as a percent of GDP from 2007 to 2040*

As Table 1 (on page 14) shows, there is an enormous variation in the public old-age dependency burden across the twenty countries in the GAP Index. Today's emerging markets generally have low public burdens compared with the fully developed economies, both because they have relatively young populations and because coverage under their public benefit systems is often far from universal. The high-cost exceptions are Poland, which has a typical European age profile, and Brazil, which spends lavishly on public pensions even though it is still demographically a young country. Total old-age benefits in Brazil weighed in at 9 percent of GDP in 2007, compared with 2 percent in India and Mexico and 3 percent in Korea and China. Old-age benefits in most emerging markets are projected to grow rapidly as their popula-

TABLE 1

Total Public Benefits to the Elderly, as a Percent of GDP, 2007–2040

Country Ranking		% of GDP			
		2007	2020	2030	2040
1	India	1.9	3.1	4.2	**3.6**
2	Mexico	2.4	3.2	3.9	**5.1**
3	Chile	6.0	6.8	7.0	**7.5**
4	China	2.8	4.6	6.1	**8.0**
5	Russia	5.8	7.5	8.7	**10.2**
6	Poland	10.1	12.0	13.1	**13.9**
7	Korea	3.4	7.5	11.0	**14.1**
8	Canada	8.3	10.9	13.2	**14.7**
9	Australia	8.9	10.7	12.9	**14.9**
10	US	8.9	12.5	15.1	**16.3**
11	Switzerland	9.8	12.6	15.7	**17.4**
12	UK	12.1	14.0	16.4	**18.2**
13	Japan	14.1	15.4	15.9	**18.4**
14	Sweden	15.7	16.6	18.1	**19.2**
15	Brazil	8.8	12.5	16.3	**20.4**
16	Germany	15.8	17.3	20.0	**21.7**
17	Netherlands	12.0	15.7	20.0	**23.2**
18	France	16.6	19.4	21.8	**23.5**
19	Italy	18.0	19.9	22.3	**24.7**
20	Spain	14.3	17.0	20.6	**26.1**

Note: Countries are ranked from best to worst according to the projection results for 2040.

tions age, nearly doubling in India, nearly tripling in China, and quadrupling in Korea. Even so, only Brazil, where they are projected to reach 20 percent of GDP, will rank among the ten highest-burden countries in 2040.

Even within the developed world, there is a wide spread in outcomes. Total old-age benefits in Canada, Australia, the United States, Switzerland, the UK, Japan, and Sweden are projected to grow to between 15 and 20 percent of GDP by 2040. In Germany, the Netherlands, France, Italy, and Spain, they are projected to grow to between 22 and 26 percent of GDP. The differences are due in part to demographics and in part to the varying generosity of benefit systems, especially pensions. The lower-burden English-speaking countries both spend less per capita on old-age benefits and are due to age less. Switzerland spends relatively little on old-age benefits by European standards, and though Sweden spends heavily today it has enacted an overhaul of its pension system designed to keep benefits from rising much in the future and also has a relatively low rate of growth in health-care spending. Japan is a special case: It faces a massive age wave, but its pension benefits are already less than generous and are scheduled to be reduced even further in the future. The higher-burden countries of continental Europe generally have the most expensive public old-age benefit systems and the fastest-aging populations.

Contrary to what some readers may suppose, pensions and other cash benefits—not health benefits—account for most of the total projected old-age spending burden in 2040. On average

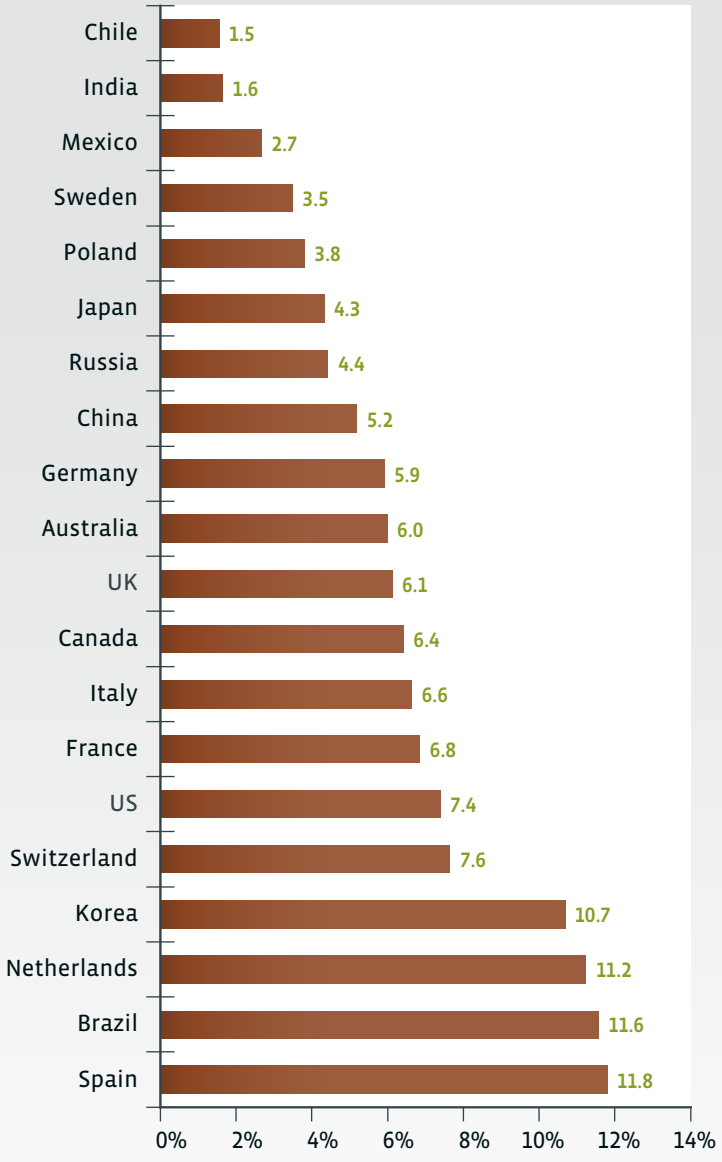
across all twenty Index countries, health benefits represent 38 percent of the total burden. In only three countries do they represent more than half: Canada (52 percent), Mexico (55 percent), and the United States (57 percent). Health benefits, however, do account for a disproportionate share of the projected *growth* in total old-age benefit spending. In twelve of the countries, the share is more than 50 percent and in six of the countries it is more than 60 percent. In one country—Chile—health benefits account for more than 100 percent of the growth, since cash benefits to the elderly are actually projected to decline as a share of GDP. (Detailed projections of public benefits by type are available at gapindex.csis.org.)

Although the rankings for the benefit level and benefit growth indicators are similar for most countries, there are some important differences. (See Figure 2.) A few countries, notably Korea and the United States, score much better on level than on growth. In the case of Korea, the difference is dramatic: a ranking of seven versus a ranking of seventeen. The explanation lies mainly in Korea's unusually severe demographics. Its public pension system is not especially generous and leaves large gaps in coverage, but the elderly share of its population is projected to soar from 14 percent in 2007 to 39 percent in 2040, by far the largest increase of any country in the Index. The United States, in contrast, faces a relatively mild aging trend. It is the youngest of the developed countries today, and thanks to its relatively high fertility rate and substantial net immigration, it will (despite the retirement of its large baby boom generation) still be the youngest in 2040. The generosity of its public pension system is also modest by developed-world standards. What gives the United States its fifteenth-place ranking on benefit growth is its exceptionally rapid rate of growth in health-care spending.

There are also a number of countries that score significantly better on growth than on level, notably Sweden (ten rankings higher), Germany (seven higher), Japan (seven higher), Italy (six higher), and France (four higher). All have enacted reforms

FIGURE 2

Growth in Total Public Benefits to the Elderly from 2007 to 2040, as a Percent of GDP



Note: Countries are ranked from best to worst.

TABLE 2

Public Pension Benefits to the Elderly, as a Percent of GDP in 2007 and 2040: Current-Law versus Current-Deal Scenario*

Country	% of GDP		
	2007	Current Law 2040	Current Deal* 2040
Australia	4.6	6.5	8.0
Brazil	6.5	13.4	16.1
Canada	3.9	5.6	7.7
Chile	4.2	3.3	9.4
China	2.2	5.5	6.0
France	11.2	12.8	19.0
Germany	10.0	11.9	18.5
India	1.4	2.2	2.7
Italy	12.3	15.1	23.5
Japan	9.1	10.1	17.4

Country	% of GDP		
	2007	Current Law 2040	Current Deal* 2040
Korea	1.4	7.5	4.8
Mexico	0.8	0.8	2.1
Netherlands	5.3	10.7	10.0
Poland	7.3	8.4	15.8
Russia	3.5	5.6	6.6
Spain	8.0	14.7	17.4
Sweden	8.8	9.9	11.8
Switzerland	5.4	8.5	9.2
UK	5.8	7.9	8.1
US	4.1	6.1	6.8

*The current-deal scenario assumes that workers in the future on average retire at the same age they do today and that benefits replace the same share of wages.

in recent years that are scheduled to cut average public pension benefits relative to average wages over the next few decades. Sweden and Italy are transforming their traditional defined-benefit systems into notional defined-contribution systems in which benefit payouts are effectively indexed to the growth in the payroll tax base. France has re-indexed its second tier ARCO and AGIRC pensions to prices, which again means that average benefits will decline as share of average wages. Germany and Japan have introduced "demographic stabilizers" that will have much the same effect. These countries spend a lot on old-age benefits today and will spend even more tomorrow. But total spending will grow much less than the aging of their populations would otherwise require.

Table 2 compares the current-law public pension projections used in the GAP Index with an alternative "current-deal" scenario that assumes that the average retirement age in each country will remain unchanged in the future and that benefits will continue to replace the same share of wages they do today. As can be seen, scheduled reductions in the generosity of public pension systems are indeed large in many countries. In France, pension spending as a share of GDP will be 33 percent less in 2040 under the current-law projection than the current-deal projection. In Italy

TABLE 3

Public Burden Category

	Category Ranking and Score			Benefit Level Indicator (%)			Benefit Growth Indicator (%)	
1	India	135	1	India	3.6	1	Chile	1.5
2	Mexico	121	2	Mexico	5.1	2	India	1.6
3	Chile	120	3	Chile	7.5	3	Mexico	2.7
4	China	89	4	China	8.0	4	Sweden	3.5
5	Russia	87	5	Russia	10.2	5	Poland	3.8
6	Poland	78	6	Poland	13.9	6	Japan	4.3
7	Sweden	60	7	Korea	14.1	7	Russia	4.4
8	Australia	57	8	Canada	14.7	8	China	5.2
9	Japan	56	9	Australia	14.9	9	Germany	5.9
10	Canada	54	10	US	16.3	10	Australia	6.0
11	UK	43	11	Switzerland	17.4	11	UK	6.1
12	US	40	12	UK	18.2	12	Canada	6.4
13	Switzerland	34	13	Japan	18.4	13	Italy	6.6
14	Germany	31	14	Sweden	19.2	14	France	6.8
15	Korea	22	15	Brazil	20.4	15	US	7.4
16	France	17	16	Germany	21.7	16	Switzerland	7.6
17	Italy	14	17	Netherlands	23.2	17	Korea	10.7
18	Brazil	-9	18	France	23.5	18	Netherlands	11.2
19	Netherlands	-17	19	Italy	24.7	19	Brazil	11.6
20	Spain	-33	20	Spain	26.1	20	Spain	11.8

INDICATOR KEY
Benefit Level Indicator = Total public benefits to the elderly in 2040 as a percent of GDP
Benefit Growth Indicator = Growth in total public benefits to the elderly from 2007 to 2040 as a percent of GDP

Note: Countries are ranked from best to worst.

and Germany it will be 36 percent less and in Japan 42 percent less. Very large benefit reductions are also scheduled in Poland, Chile, and Mexico, but in these countries pay-as-you-go public pensions are being replaced in whole or in part with funded personal accounts.

The benefit level and benefit growth indicators both add an important and different perspective to the Index. The absolute spending level as a share of GDP is clearly the simplest measure of the total resource burden that demographic aging threatens to impose on the economy. Yet the rise in spending is also important, since some societies may be institutionally and culturally better equipped to handle high levels of public benefit spending than others. From this perspective, the

TABLE 4

Total Government Revenue as a Percent of GDP, Assuming Taxes Are Raised to Pay for All Growth in Public Benefits, 2007–2040*

	Country Ranking	% of GDP			
		2007	2020	2030	2040
1	India	23.5	23.8	25.1	**24.2**
2	Mexico	22.6	22.9	23.4	**24.4**
3	Chile	29.5	26.4	26.4	**26.9**
4	China	21.7	23.9	25.2	**27.2**
5	Japan	33.5	33.7	34.0	**36.2**
6	Poland	40.3	39.4	39.8	**40.4**
7	Russia	40.0	38.0	38.9	**40.5**
8	Switzerland	33.9	35.9	38.8	**40.6**
9	Australia	35.7	36.6	38.7	**40.6**
10	US	34.0	37.6	40.3	**41.7**
11	Korea	33.3	36.4	39.4	**42.3**
12	Canada	40.7	41.5	43.5	**45.0**
13	UK	41.4	43.2	45.4	**47.4**
14	Brazil	34.8	39.6	43.5	**47.4**
15	Germany	43.9	43.9	45.8	**47.5**
16	Spain	41.1	42.4	45.6	**50.3**
17	Italy	46.4	47.7	49.5	**51.4**
18	Netherlands	45.7	47.8	51.5	**54.7**
19	France	49.6	52.4	54.6	**56.3**
20	Sweden	56.3	55.1	56.3	**57.4**

Note: Countries are ranked from best to worst according to the projection results for 2040.

*The projections assume that, beginning in 2015, each country moves to a debt-neutral fiscal balance in its "rest of government" budget.

road ahead for Korea or the United States may be just as bumpy as for some countries that are projected to spend much more.

Table 3 (on page 17) summarizes the results for the public burden category. Not surprisingly, India, which has the youngest population and the least-developed welfare state of any country in the Index, ranks first. Spain, which is both one of Europe's fastest-aging countries and one of the few that has yet to undertake any significant reform of its public pension system, ranks last. In calculating the category results, both indicators were weighted equally.

Category Two: Fiscal Room

The first indicator category focused on the projected resource burden of rising old-age benefit spending. While a large and growing burden is certainly a cause for concern, the magnitude of the burden alone does not tell us whether it is sustainable. It is also crucial to look at the fiscal room that different countries have available to accommodate the burden. There are three ways in which countries can adjust to higher old-age benefit spending: pay for the growth by raising taxes,

pay for the growth by cutting other government spending, or pay for the growth by borrowing. The fiscal room category includes three indicators that evaluate the feasibility of these strategies:

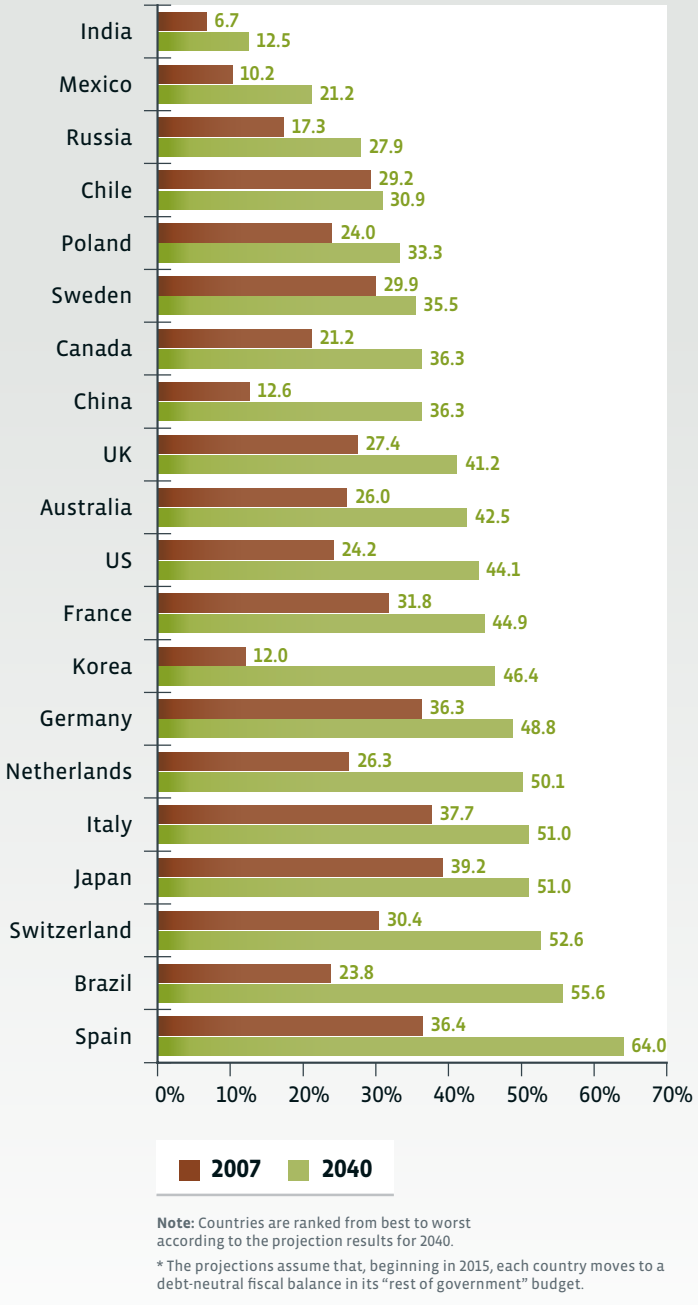
- **TAX ROOM:** *Total government revenue in 2040 as a percent of GDP* (This indicator assumes that all benefit growth is paid for by raising taxes.)
- **BUDGET ROOM:** *Total public benefits to the elderly in 2040 as a percent of government outlays* (This indicator assumes that all benefit growth is paid for by cuts in other government spending.)
- **BORROWING ROOM:** *The net public debt in 2040 as a percent of GDP* (This indicator assumes that all benefit growth is paid for by government borrowing.)

Let us begin with the tax option. Not surprisingly, countries with the largest projected old-age dependency burdens tend to end up with the largest tax burdens. (See Table 4, on page 18.) Since the overall tax burden also depends on the overall size of the public sector, however, there are some exceptions. A few countries with large public sectors score much worse on tax room than they do on the public burden indicators. Sweden, for example, ranks seventh overall in the public burden category, but twentieth on tax room. For a few other countries with large old-age dependency burdens but relatively small public sectors, the reverse is true. Switzerland ranks thirteenth in the public burden category, but eighth on tax room.

In many countries, the tax option would lead to total tax burdens that are considerably higher than today's. In 2007, only ten of the Index countries had a total tax burden of more than 40 percent of GDP and only one—Sweden—had a total tax burden of more than 50 percent of GDP. By 2040, fifteen would have a total tax burden of more than 40 percent of GDP, including such traditionally low-tax countries as Australia, Korea, Switzerland, and the United Sates. Five countries, all in

FIGURE 3

Total Public Benefits to the Elderly as a Percent of Government Outlays in 2007 and 2040, Assuming Cuts in Other Spending Pay for All Growth in Public Benefits*



Note: Countries are ranked from best to worst according to the projection results for 2040.

* The projections assume that, beginning in 2015, each country moves to a debt-neutral fiscal balance in its "rest of government" budget.

TABLE 5

Net Public Debt as a Percent of GDP, Assuming that Borrowing Pays for All Growth in Public Benefits, 2007–2040*

Country Ranking		% of GDP			
		2007	2010	2015	2040
1	Chile	-13.7	-14.5	-26.0	**-31.1**
2	Sweden	-25.0	-12.9	-14.1	**17.8**
3	Russia	0.0	1.6	-6.2	**32.0**
4	China	1.7	-1.5	-1.1	**39.0**
5	Mexico	31.4	44.4	43.0	**66.8**
6	Poland	17.0	32.4	41.7	**70.1**
7	Australia	-6.6	-1.1	1.3	**73.9**
8	Korea	-35.8	-33.4	-36.8	**87.4**
9	Switzerland	11.0	9.3	5.8	**98.9**
10	Canada	23.1	32.6	32.7	**104.8**
11	India†	78.3	84.6	80.0	**108.0**
12	Germany	42.9	54.7	56.7	**127.2**
13	Japan	80.4	104.6	114.9	**133.6**
14	France	34.0	60.7	73.5	**149.2**
15	UK	28.8	58.3	76.9	**152.6**
16	Italy	87.1	100.8	103.6	**168.2**
17	Netherlands	28.0	36.5	41.3	**169.1**
18	Spain	18.7	41.6	49.2	**175.1**
19	Brazil	42.0	37.3	37.2	**175.2**
20	US	42.3	65.0	76.2	**179.0**

Note: Countries are ranked from best to worst according to the projection results for 2040.

*The projections assume that, beginning in 2015, each country moves to a debt-neutral fiscal balance in its "rest of government" budget.
†Data for India refer to gross debt.

Europe, would have a total tax burden of more than 50 percent of GDP.

Some European countries may literally find it impossible to raise taxes enough to pay for the full cost of their age waves. At some point, rather than generate new revenue, higher tax rates may simply slow the economy, exacerbate unemployment, and push more workers into a growing gray economy. The tax option may also prove unsustainable in some emerging markets with fast-growing old-age dependency burdens. Most emerging markets start with relatively small public sectors and so would seem to have an advantage. This advantage may be more apparent than real, however, since many also have large informal sectors which by definition cannot be taxed. While the developed countries may have difficulty pushing total taxation above 50 percent of GDP, emerging markets like Korea and Brazil may have difficulty pushing it above 40 percent.

To the extent that taxes cannot be raised, countries may be able to accommodate the growing burden of old-age benefit spending by reducing other categories of government spending. The budget room indicator looks at what would happen if, instead of raising taxes, governments simply allowed old-age benefits to crowd out other spending "dollar for dollar." By 2040, benefits to the elderly would account for over 40 percent of

TABLE 6

Fiscal Room Category

Category Ranking and Score			Tax Room Indicator (%)*			Budget Room Indicator (%)*			Borrowing Room Indicator (%)*		
1	Chile	127	1	India	24.2	1	India	12.5	1	Chile	-31.1
2	India	117	2	Mexico	24.4	2	Mexico	21.2	2	Sweden	17.8
3	Mexico	117	3	Chile	26.9	3	Russia	27.9	3	Russia	32.0
4	China	99	4	China	27.2	4	Chile	30.9	4	China	39.0
5	Russia	91	5	Japan	36.2	5	Poland	33.3	5	Mexico	66.8
6	Poland	73	6	Poland	40.4	6	Sweden	35.5	6	Poland	70.1
7	Australia	59	7	Russia	40.5	7	Canada	36.3	7	Australia	73.9
8	Sweden	57	8	Switzerland	40.6	8	China	36.3	8	Korea	87.4
9	Canada	52	9	Australia	40.6	9	UK	41.2	9	Switzerland	98.9
10	Korea	48	10	US	41.7	10	Australia	42.5	10	Canada	104.8
11	Switzerland	39	11	Korea	42.3	11	US	44.1	11	India	108.0
12	Japan	38	12	Canada	45.0	12	France	44.9	12	Germany	127.2
13	UK	28	13	UK	47.4	13	Korea	46.4	13	Japan	133.6
14	US	26	14	Brazil	47.4	14	Germany	48.8	14	France	149.2
15	Germany	25	15	Germany	47.5	15	Netherlands	50.1	15	UK	152.6
16	France	10	16	Spain	50.3	16	Italy	51.0	16	Italy	168.2
17	Italy	4	17	Italy	51.4	17	Japan	51.0	17	Netherlands	169.1
18	Brazil	3	18	Netherlands	54.7	18	Switzerland	52.6	18	Spain	175.1
19	Netherlands	0	19	France	56.3	19	Brazil	55.6	19	Brazil	175.2
20	Spain	-14	20	Sweden	57.4	20	Spain	64.0	20	US	179.0

INDICATOR KEY

Tax Room Indicator = Total government revenue in 2040 as a percent of GDP, assuming taxes are raised to pay for all growth in public benefits

Budget Room Indicator = Total public benefits to the elderly as a percent of government outlays in 2040, assuming cuts in other spending pay for all growth in public benefits

Borrowing Room Indicator = Net public debt in 2040 as a percent of GDP, assuming borrowing pays for all growth in public benefits

Note: Countries are ranked from best to worst.

*The projections assume that, beginning in 2015, each country moves to a debt-neutral fiscal balance in its "rest of government" budget.

total spending in twelve of the twenty Index countries, over 50 percent in six of them, and over 60 percent in one: Spain. In the country with the largest share today—Japan—they account for just 39 percent. (See Figure 3, on page 19.)

The budget room indicator points to some useful policy lessons. Countries with large public sectors but relatively small old-age dependency burdens tend to have much more budget room than tax room, Sweden being the most striking instance. It ranks last on tax room, but sixth on bud-

get room—ahead of any other developed country. Canada and France also score considerably better on budget room than tax room. The implication is that such countries may be able to carve out a lot of extra space in their budgets for old-age benefit programs, since presumably they can find a lot of lower-priority government spending that can be cut without much cost to society. On the other hand, countries with relatively small public sectors like Japan and the United States may be able to accommodate relatively little growth in old-age spending without crowding out vital public services.

The final option, at least in theory, is to cover rising old-age benefit costs by borrowing. Whether this option is feasible in practice, of course, depends both on a country's initial debt level and the projected growth in its old-age dependency burden. For countries like Chile, Sweden, Russia, and China, which have a small net public debt (indeed, in the case of Chile and Sweden, a negative net public debt, meaning that the government's assets exceed its liabilities), it may well be feasible. For most countries, however, it is not. If governments simply borrowed to cover the projected year-to-year growth in old-age benefit spending, eleven of the twenty Index countries would have a net debt exceeding 100 percent of GDP by 2040 and six would have a net debt exceeding 150 percent of GDP. (See Table 5, on page 20.) This last high-debt group includes not just high benefit-growth countries like Brazil and Spain, but also the UK and the United States, which have already used up most of whatever borrowing room they had during the economic crisis.

It is worth recalling that the borrowing room indicator, like the other fiscal room indicators, is designed to isolate the budgetary impact of rising old-age benefit costs. Apart from what countries borrow to pay for the growth in old-age benefits, they are still assumed, beginning in 2015, to run a debt-neutral fiscal policy in the rest of the budget. Without this constraint, the public debt in countries that are now running large deficits would reach economically unsustainable levels long before 2040.

Table 6 (on page 21) summarizes the results for the fiscal room category. Chile, which ranks in the top four countries on all three indicators, scores best overall. Spain, which ranks in the bottom five countries on all three, scores worst. In calculating the category results, all three indicators were weighted equally.

Category Three: Benefit Dependence

How big is the risk that countries with large and growing old-age benefit burdens won't be able to make the necessary adjustments until they hit a fiscal wall—at which point they will have to make the adjustments suddenly and without giving people time to adjust and prepare? Just as important, how big is the risk that countries which have made significant progress in curbing future cost growth will have to roll back the reforms once they begin to cut deeply into benefit payments—and elderly living standards?

Clearly, one factor that may help or hinder reform is the degree to which the elderly in different countries are dependent on public benefits. The larger public benefits loom as a component of total elderly income, the more difficult it may be to reduce those benefits. The less important public benefits are, the less political resistance there is likely to be to reform. Another factor that may help or hinder reform is the extent to which reductions in public benefits would push elders into poverty, a concern to which most societies are quite sensitive. Accordingly, the benefit dependence category includes two indicators:

- **BENEFIT SHARE:** *Total public benefits as a percent of elderly income: Average for 2007 to 2040*
- **BENEFIT CUT:** *The percent of elderly households that would be pushed into poverty today by a 10 percent cut in public benefits*

Not surprisingly, the degree of elderly dependence on public benefits, like the size of the old-

TABLE 7

Public Benefits, as a Percent of Elderly Income, 2007–2040

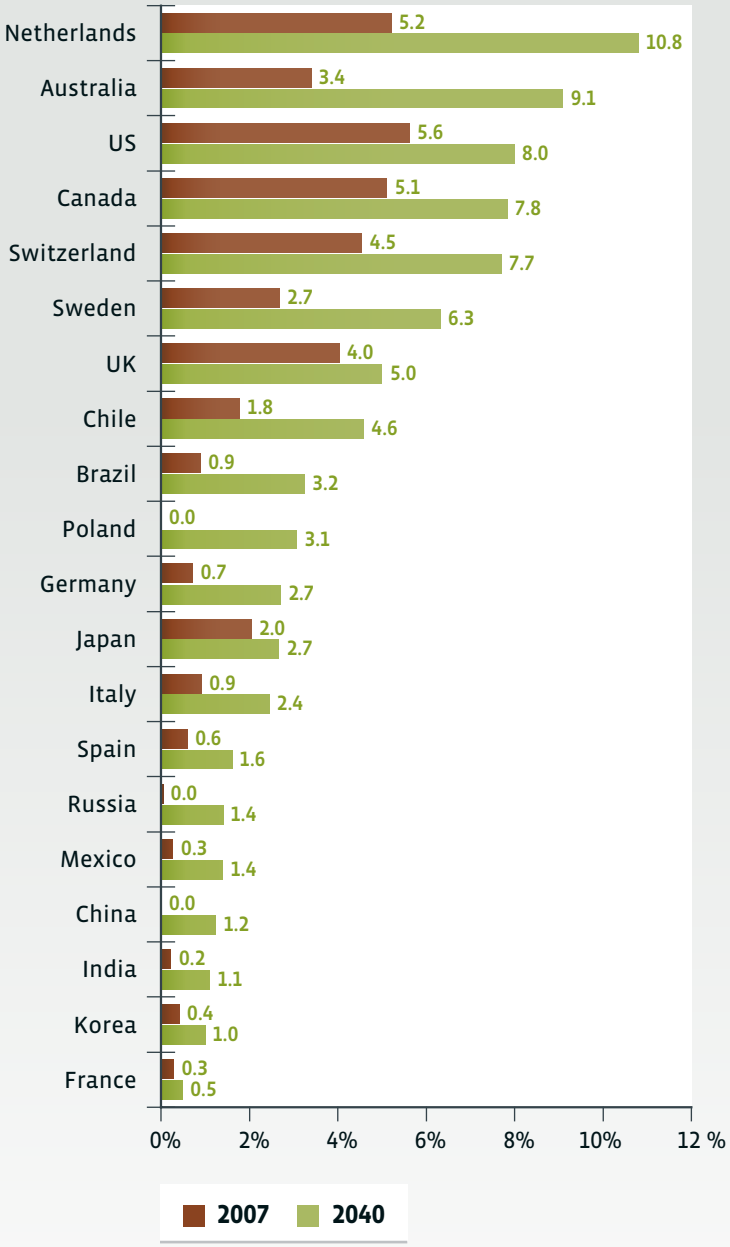
Country Ranking		*Excluding* Public Health Benefits				Country Ranking		*Including* Public Health Benefits			
		2007	2020	2030	2040			2007	2020	2030	2040
1	Mexico	19.0	17.4	14.9	**13.9**	1	Chile	34.8	30.6	26.9	**26.3**
2	Chile	30.5	24.4	19.0	**16.7**	2	India	27.4	32.2	34.5	**26.5**
3	India	25.2	29.3	31.0	**21.0**	3	Mexico	25.3	26.6	26.0	**26.5**
4	US	22.2	22.7	22.9	**22.4**	4	US	35.1	37.2	38.8	**40.3**
5	Canada	30.8	30.0	30.2	**28.9**	5	Australia	43.1	39.5	40.3	**41.2**
6	Australia	34.4	29.2	29.0	**29.3**	6	Japan	46.9	44.5	42.2	**42.6**
7	Japan	38.7	34.7	31.2	**31.5**	7	Korea	29.9	40.9	44.0	**45.9**
8	Switzerland	31.5	31.8	32.6	**33.5**	8	Canada	43.8	43.3	44.8	**46.0**
9	Korea	21.1	30.4	32.8	**34.4**	9	Germany	54.5	47.8	45.2	**47.1**
10	Germany	47.0	39.2	36.1	**37.1**	10	Switzerland	41.5	43.6	44.9	**47.1**
11	Netherlands	40.0	39.1	39.3	**40.4**	11	Netherlands	49.6	48.9	49.6	**51.6**
12	UK	41.6	41.5	40.3	**41.9**	12	Sweden	53.6	52.6	51.2	**52.8**
13	Sweden	44.4	43.5	41.3	**42.1**	13	China	48.0	52.5	51.0	**54.8**
14	Russia	49.7	48.0	48.5	**44.5**	14	Russia	57.4	55.9	57.4	**54.9**
15	China	42.0	45.8	42.7	**46.2**	15	UK	51.5	52.5	52.2	**55.1**
16	Italy	55.4	51.9	48.7	**48.1**	16	Italy	60.5	58.1	55.8	**55.9**
17	Poland	73.7	63.6	57.1	**49.1**	17	Poland	77.1	68.6	63.0	**56.7**
18	Brazil	60.1	56.5	55.4	**54.7**	18	Brazil	64.2	62.6	62.3	**62.2**
19	France	59.4	56.7	55.8	**55.7**	19	Spain	63.1	63.3	63.0	**64.2**
20	Spain	57.1	56.9	55.8	**56.9**	20	France	66.7	65.8	66.2	**67.4**

Note: Countries are ranked from best to worst according to the projection results for 2040.

age benefit burden, varies tremendously across the twenty Index countries. Among the developed countries, the United States, Canada, Switzerland, and Australia, where public benefits now constitute one-third or less of elderly cash income, are at the low end of the spectrum. Benefit dependence is a bit higher in Japan, the Netherlands, the UK, and Sweden—and much higher in the other continental European countries. In Germany, public benefits now constitute nearly 50 percent of total elderly cash income, while in Italy, Spain, and France they constitute between 55 and 60 percent. Among the emerging markets, Mexico, Korea, India, and Chile all have very low dependence, with public benefits now ranging between roughly 20 and 30 percent of elderly cash income.

FIGURE 4

Funded Pension Benefits, as a Percent of GDP in 2007 and 2040



Note: Countries are ranked from best to worst according to the projection results for 2040.

Benefit dependence is considerably higher in the others—42 percent in China, 50 percent in Russia, 60 percent in Brazil, and an astonishing 74 percent in Poland. The figure for China, however, may be misleading, since it is a weighted average for urban and rural elders. In China's cities, where the majority of the elderly collect a public pension, benefit dependence is indeed relatively high. In the countryside it is very low, with public benefits making up just 20 percent of elderly cash income, about what they do in Mexico and Korea. Naturally, all of these shares are larger—and in most developed countries considerably larger—if we include health benefits as part of income. (See Table 7, on page 23.)

It is worth noting that the absolute level of dependence of most elders on public benefits is even higher than these averages suggest. Public benefits in every country except China make up a larger share, and usually a much larger share, of the income of the "typical" elder in the third quintile of the income distribution than they do for the average elder. Even in countries with relatively low levels of benefit dependence like the United States, Japan, and the UK, the differences are striking. In the United States, public benefits make up 22 percent of cash income for the average elder but 38 percent for the typical elder. In Japan the shares are 39 versus 61 percent and in the UK they are 42 versus 69 percent. In France, Germany, Italy, and Spain, more than 70 percent of the cash income of the typical elder arrives in the form of a government check, suggesting that some of the countries that most need to cut benefits may have the most difficulty doing so.

A high level of public benefit dependence of course means a low level of reliance on private income sources, and vice versa. All of the low-dependence countries in the Index either have relatively high elderly labor-force participation rates, relatively large funded pension systems, or both. The high-dependence countries tend to have few working elders and little funded retirement savings. In France, the overall elderly labor-force participation rate is just 5 percent and funded pension

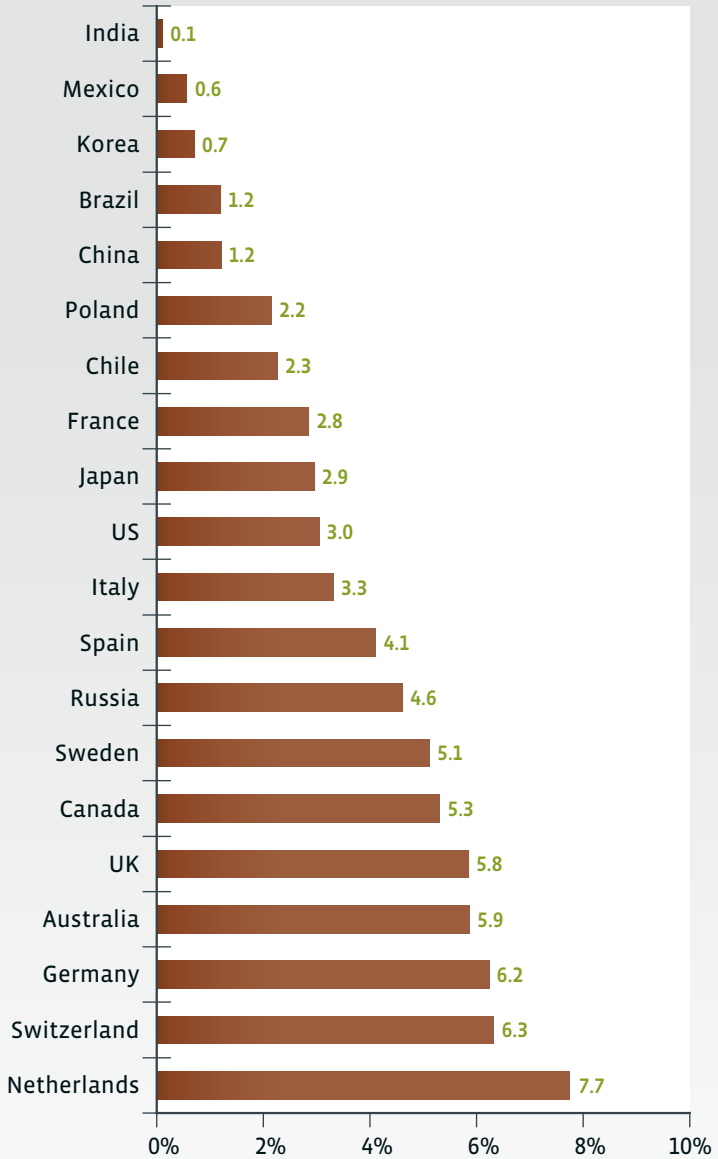
benefits account for a mere 1 percent of elderly cash income. In the United States, 26 percent of the elderly still work, at least part time, and funded pension benefits account for 20 percent of income.

In some medium- and high-dependence countries, however, the balance may be shifting. Over the past decade, elderly labor-force participation rates have begun to rise rapidly in Germany and the Netherlands—and they are projected to rise rapidly over the next decade in Poland. Funded pension benefits are also on track to grow substantially in many medium- and high-dependence countries, including Brazil, Germany, Italy, Poland, Russia, and Sweden. (See Figure 4, on page 24.) The relative importance of funded pension benefits in elderly income will thus increase in all of these countries. Since the growth is from a small base, however, they will still be a relatively small share of elderly income in 2040. The only countries where funded pensions will exceed 20 percent of elderly cash income in 2040—Australia, Canada, the Netherlands, Switzerland, and the United States—are countries where funded retirement provision is already important today. (Detailed projections of elderly income by type are available at gapindex.csis.org.)

Although the overall level of benefit dependence is probably the single best indicator of potential political resistance to cost-cutting reform, the reliance of the low-income elderly on public benefits may also be an important factor. The benefit cut indicator measures the percentage of elderly households that would be pushed into poverty by an immediate 10 percent cut in public benefits. A poor elderly household is defined as a household having an income of less than 50 percent of the median income for all households in each country, a standard definition in cross-country comparisons of income distribution. How countries perform on this indicator is determined, first, by the distribution of elderly income around the poverty threshold and, second, by the degree of dependence on public benefits among elderly households around the poverty threshold.

FIGURE 5

Percent of Elderly Households That Would Be Pushed into Poverty Today by a 10 Percent Cut in Public Benefits*



Note: Countries are ranked from best to worst.

* Data refer to various years between 1999 and 2007 and exclude public health benefits. Poor households are households with incomes beneath 50 percent of the median income for all households.

The countries that do best on this indicator are generally those in which overall benefit dependence is low. (See Figure 5, on page 25.) In India, Mexico, or Korea, it would be possible to zero out nearly all public benefits without significantly increasing elderly poverty. The countries that do worst generally have expansive welfare states. In Sweden, Germany, or the Netherlands, with their higher degree of benefit dependence, any given percentage cut in benefits translates into a larger percentage cut in total household income. There are, however, some important exceptions. France scores relatively well, even though it is the Index country with the highest level of benefit dependence. Apparently, its public benefits are generous enough to lift most elders far enough above the poverty threshold that a 10 percent cut in benefits tumbles relatively few back into poverty. Low-dependence Canada, the UK, and Switzerland, on the other hand, score poorly. Apparently, their modest public benefits leave a large share of elders clustered just above the poverty threshold—and vulnerable to any reduction at all in public income support.

Australia's low ranking merits a special explanation. Unlike other developed countries, its only public pension benefit is means-tested. At 50 percent of the all-household median income, a large share of elders meet the means test and are highly dependent on public benefits. If the Index's poverty threshold were set a bit higher at 60 percent of the all-household median, Australia would score much better.

Table 8 (on page 27) summarizes the results for the benefit dependence category. India, with a third-place ranking on the benefit share indicator and a first-place ranking on the benefit cut indicator, scores best overall. Spain, with an eighteenth-place ranking on the benefit share indicator and a twelfth-place ranking on the benefit cut indicator, scores worst. In calculating the category results, the more important benefit share indicator received a two-thirds weight and the benefit cut indicator a one-third weight. Note that because benefit dependence is projected to rise in some countries and fall in others, we calculate the benefit share indicator based on the average level of dependence on public benefits between 2007 and 2040. To capture the full dependence of the elderly, the indicator also includes health benefits.

Overall Fiscal Sustainability Results

The GAP fiscal sustainability index combines the results for the three indicator categories into a single overall score and ranking for each country. The central public burden category receives a weight of 40 percent, while the fiscal room and benefit dependence categories receive weights of 30 percent each. Table 9 (on page 28) presents the results—and offers some interesting additional insights.

A glance at the results reveals that there is a fairly smooth progression in overall index scores as we move down through the country rankings—except at the very top and bottom, where a few countries are obvious outliers. At the top, there is a very large gap in scores between India, Mexico, and Chile and the next highest-ranking country, China. Together, these three countries constitute a high-fiscal preparedness—or perhaps better, low-fiscal vulnerability group. They not only earn the top three rankings overall in the fiscal sustainability index, but also earn the top three rankings in each of the three indicator categories. At the bottom of the fiscal sustainability index, Italy, France, Brazil, the Netherlands, and Spain constitute a low-fiscal preparedness or high-fiscal vulnerability group. All five countries not only rank in the bottom five countries overall, but also rank in the bottom five in the public burden and fiscal room categories and in the bottom eight in the benefit dependence category. Although the gap in scores that separates them from the next-highest ranking country, the UK, is not as large as the gap separating Chile and China, they clearly face an especially daunting challenge.

It is important to note that the general location of countries in the fiscal sustainability index is more meaningful than the precise country rankings. Large changes in several indicators would be

TABLE 8

Benefit Dependence Category

Category Ranking and Score			Benefit Share Indicator (%)			Benefit Cut Indicator (%)*		
1	India	137	1	Mexico	27.1	1	India	0.1
2	Mexico	133	2	Chile	30.8	2	Mexico	0.6
3	Chile	122	3	India	31.6	3	Korea	0.7
4	Korea	78	4	US	38.1	4	Brazil	1.2
5	US	76	5	Australia	40.5	5	China	1.2
6	Japan	70	6	Korea	41.3	6	Poland	2.2
7	Australia	53	7	Japan	43.9	7	Chile	2.3
8	China	49	8	Canada	44.2	8	France	2.8
9	Canada	44	9	Switzerland	44.3	9	Japan	2.9
10	Poland	37	10	Germany	48.4	10	US	3.0
11	Germany	34	11	Netherlands	49.8	11	Italy	3.3
12	Switzerland	33	12	China	52.1	12	Spain	4.1
13	Italy	30	13	Sweden	52.5	13	Russia	4.6
14	Brazil	28	14	UK	52.8	14	Sweden	5.1
15	Sweden	26	15	Russia	56.5	15	Canada	5.3
16	Russia	24	16	Italy	57.6	16	UK	5.8
17	UK	14	17	Brazil	62.8	17	Australia	5.9
18	Netherlands	10	18	Spain	64.0	18	Germany	6.2
19	France	2	19	France	66.3	19	Switzerland	6.3
20	Spain	1	20	Poland	66.8	20	Netherlands	7.7

INDICATOR KEY
Benefit Share Indicator = Total public benefits as a percent of elderly income: Average for 2007 to 2040
Benefit Cut Indicator = Percent of elderly households that would be pushed into poverty today by a 10 percent cut in public benefits

Note: Countries are ranked from best to worst.
* Data refer to various years between 1999 and 2007 and exclude public health benefits. Poor households are households with incomes beneath 50 percent of the median income for all households.

required to move a country from the middle to the top or the bottom of the rankings—and a policy revolution would be required to move a country from the bottom to the top or vice versa. Even minor changes in assumptions, however, could flip some of the individual country rankings. Mexico and Chile could easily change places, since their scores are virtually identical. The same is true of Australia and Japan, Canada and Sweden, and Germany and the UK.

While most of the results comport with conventional wisdom, there are a few instructive surprises. Japan ranks far higher than one might expect, while the UK and the Netherlands rank

TABLE 9

GAP Fiscal Sustainability Index

Overall Index			Public Burden Category			Fiscal Room Category			Benefit Dependence Category		
1	India	130	1	India	135	1	Chile	127	1	India	137
2	Mexico	123	2	Mexico	121	2	India	117	2	Mexico	133
3	Chile	123	3	Chile	120	3	Mexico	117	3	Chile	122
4	China	80	4	China	89	4	China	99	4	Korea	78
5	Russia	69	5	Russia	87	5	Russia	91	5	US	76
6	Poland	64	6	Poland	78	6	Poland	73	6	Japan	70
7	Australia	56	7	Sweden	60	7	Australia	59	7	Australia	53
8	Japan	55	8	Australia	57	8	Sweden	57	8	China	49
9	Canada	50	9	Japan	56	9	Canada	52	9	Canada	44
10	Sweden	49	10	Canada	54	10	Korea	48	10	Poland	37
11	US	47	11	UK	43	11	Switzerland	39	11	Germany	34
12	Korea	46	12	US	40	12	Japan	38	12	Switzerland	33
13	Switzerland	35	13	Switzerland	34	13	UK	28	13	Italy	30
14	Germany	30	14	Germany	31	14	US	26	14	Brazil	28
15	UK	30	15	Korea	22	15	Germany	25	15	Sweden	26
16	Italy	16	16	France	17	16	France	10	16	Russia	24
17	France	10	17	Italy	14	17	Italy	4	17	UK	14
18	Brazil	6	18	Brazil	-9	18	Brazil	3	18	Netherlands	10
19	Netherlands	-4	19	Netherlands	-17	19	Netherlands	0	19	France	2
20	Spain	-17	20	Spain	-33	20	Spain	-14	20	Spain	1

Note: Countries are ranked from best to worst.

lower. Japan faces as severe a demographic challenge as any country, but is pushed up in the rankings because its unusually aggressive public pension reforms have virtually flattened future benefit growth—while its high rates of elderly employment and strong family ties reduce benefit dependence and help insulate the elderly from the pain of cost-cutting reform. Although the UK has relatively mild demographics and a relatively modest old-age benefit burden, it is pulled down in the rankings by its worse than average scores on fiscal room and benefit dependence. The Netherlands has continental Europe's largest funded private pension system, which ought to take pressure off public budgets. But it also has a fast-growing pay-as-you-go public pension burden and must cope with high rates of health-care cost growth and high levels of elderly benefit dependence.

The Income Adequacy Index

Aging preparedness is as much about ensuring income adequacy as fiscal sustainability. Adequacy, of course, can be defined in different ways. The GAP Index takes a broad perspective that looks beyond retirement system parameters like pension replacement rates and takes into account the total economic resources available to the elderly, including earnings, asset income, and assistance from younger family members. It also focuses on the relative rather than the absolute living standard of the elderly. When one country ranks higher than another on adequacy, it means that the elderly in the higher-ranking country are doing better relative to the nonelderly than the elderly in the lower-ranking country are. It does not necessarily mean that the elderly in the higher-ranking country have higher incomes than the elderly in the lower-ranking country do.

In short, the GAP income adequacy index attempts to answer one of the most fundamental questions facing aging societies: How is the coming demographic transformation likely to affect the fortunes of younger and older generations—and in particular, how effective are current retirement policies likely to be in maintaining or improving the relative living standard of the elderly?

Category One: Total Income

The first total income category looks at the broadest possible measure of how the old are faring relative to the young in each country: the per capita ratio of total elderly income to total nonelderly income. The category includes two indicators:

- **TOTAL INCOME LEVEL:** *The ratio of the average after-tax income of the elderly to the average after-tax income of the nonelderly in 2040*
- **TOTAL INCOME TREND:** *The percent change in the ratio of the average after-tax income of the elderly to the average after-tax income of the nonelderly from 2007 to 2040*

The level and trend indicators each offer an important and independent perspective. The level indicator is critical if one assumes that societies compare the living standard of the old and the young directly against each other according

TABLE 10

Ratio of Average After-Tax Elderly to Nonelderly Income, Including Public Health Benefits, 2007–2040

Country Ranking		Income Ratio			
		2007	2020	2030	2040
1	Netherlands	1.29	1.37	1.52	**1.72**
2	US	1.43	1.54	1.62	**1.67**
3	Brazil	1.33	1.40	1.47	**1.54**
4	Germany	1.31	1.43	1.48	**1.48**
5	Chile	1.41	1.45	1.39	**1.38**
6	Sweden	1.26	1.21	1.27	**1.28**
7	Australia	1.04	1.09	1.14	**1.20**
8	UK	1.05	1.08	1.14	**1.19**
9	Canada	1.13	1.11	1.11	**1.14**
10	France	1.16	1.09	1.10	**1.13**
11	Japan	1.19	1.12	1.11	**1.12**
12	Spain	1.00	1.06	1.05	**1.06**
13	Italy	1.12	1.12	1.09	**1.04**
14	Switzerland	0.86	0.87	0.88	**0.89**
15	Mexico	0.94	0.88	0.85	**0.82**
16	Korea	0.81	0.82	0.79	**0.79**
17	India	0.78	0.83	0.85	**0.78**
18	Poland	0.75	0.70	0.76	**0.74**
19	Russia	0.68	0.65	0.65	**0.71**
20	China	0.52	0.53	0.50	**0.51**

Note: Countries are ranked from best to worst according to the projection results for 2040.

to an absolute dollar-value metric that translates into equivalent size of home, model of car, length of vacation, and so forth. The trend indicator is preferable, on the other hand, if one assumes that societies evaluate the relative income of the old and young against some customary standard of generational fairness that may have nothing to do with dollar-value equivalence and may be different for every culture.

What is most striking about the total income of the elderly is how high it is in today's developed countries. (See Table 10.) In every fully developed economy except Switzerland, the ratio of average elderly to nonelderly income is now above 1 to 1, sometimes substantially, and is projected to remain above 1 to 1 in 2040. The elderly in most developed countries are indeed quite well off compared with the young—much more so than the elderly were a generation ago. But the high average income ratios are also explained by two additional factors. First, the measure of total income used in the GAP Index includes public health benefits, and per capita the elderly consume much more in health care than the nonelderly. Second, the ratios refer to after-tax income, and in most developed countries the nonelderly bear a disproportionate share of the total tax burden, both because payroll taxes fall much more heavily on the young than the old and because public (and in some countries private) pension benefits frequently enjoy favorable tax treatment.

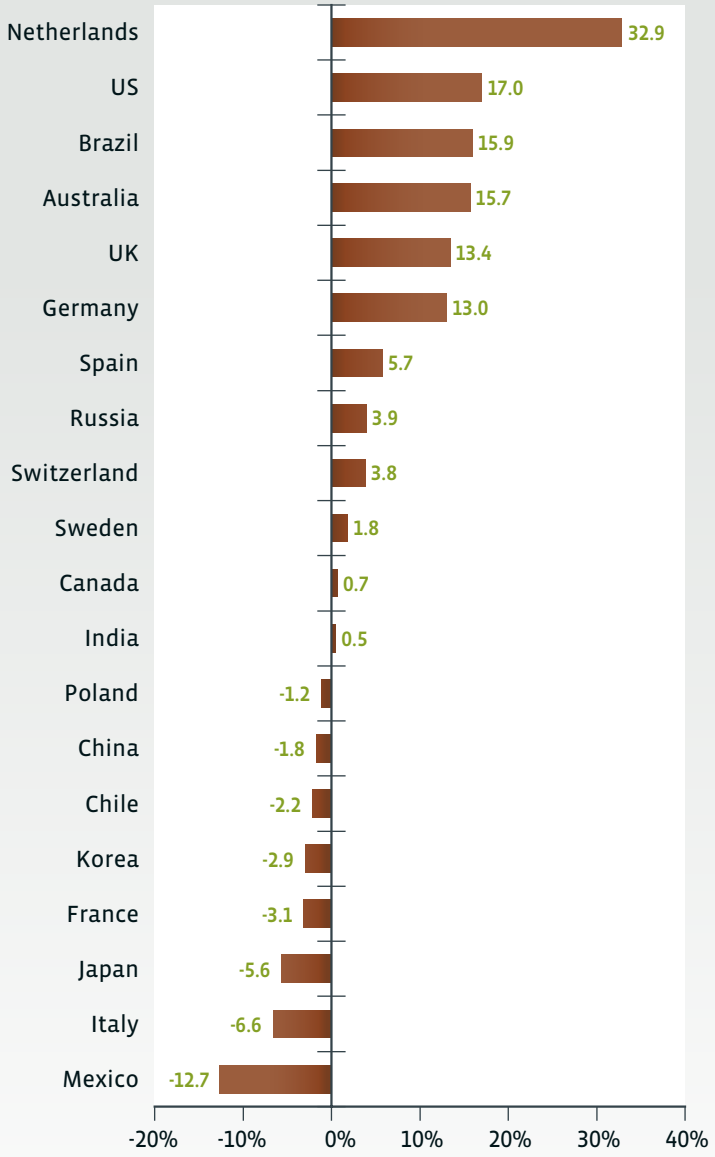
The relative living standard of the elderly is generally lower in developing countries, and in some cases much lower. This is hardly surprising, since most emerging markets have large informal sectors and underdeveloped public and private retirement systems. In the developed world, total cash "retirement benefits" (including both pay-as-you-go public pensions and funded pension benefits) now account for at least 40 percent of elderly cash income in every country and at least 50 percent in every country except Japan and the United States. In India, they account for 27 percent, in Korea 25 percent, and in Mexico 21 percent. Most emerging market governments not only spend less on pensions, but also less on health care. Assistance from children, though a large component of elderly income in countries like China and Korea, fails to make up for the spotty benefit coverage. The fact that a large share of the elderly continue to work in most developing countries helps. The jobs that the elderly have, however, are typically in agriculture or the low-wage service sector, and so fail to do much to boost their living standard relative to the young.

There are two notable exceptions: Brazil and Chile. As we have already seen, Brazil has a public pension system that is exceptionally generous even by developed-world standards. It also has a generous floor of old-age poverty protection, including universal "rural pensions," for workers in the informal sector. Chile has a large and nearly mature funded personal accounts system that has, at least so far, generated high replacement rates. Like Brazil, Chile has also strengthened its old-age safety net, adding a new means-tested "solidarity pension" in 2008. Both countries have very high levels of income inequality, but this tends to favor the elderly, who own a disproportionate share of total assets.

The outlook on the total income trend indicator is also favorable in most developed countries, or at least not worrisome. (See Figure 6.) The ratio of average elderly to nonelderly income is projected to rise by more than 10 percent in five developed countries: the Netherlands, the United States, Australia, the UK, and Germany. In the Netherlands,

FIGURE 6

Percent Change in the Ratio of Average After-Tax Elderly to Nonelderly Income from 2007 to 2040, Including Public Health Benefits



Note: Countries are ranked from best to worst.

where public pensions, private pensions, health benefits, and elderly labor-force participation are all projected to grow rapidly, the increase is an enormous 33 percent. Elsewhere in the developed world, the elderly are at least projected to maintain their relative living standard, except in France, Japan, and Italy, where the total income measure registers modest declines.

The outlook in the world's emerging markets gives more cause for concern—not because the elderly are projected to lose much ground on the total income measure (except in Mexico), but because they are not projected to gain much (except in Brazil). The relative living standard of the elderly is projected to remain low tomorrow in most emerging markets for the same reason it is low today: inadequate retirement income systems. In some countries, the main problem is low coverage. In China, only 34 percent of the total workforce is earning a pension, public or private; in India, the share is just 13 percent. In other countries, the main problem is low replacement rates. Faced with the developing world's largest and fastest-approaching age wave, Korea has already made deep cuts in the generosity of its national pension system twice since it was established in 1988. Poland, which also faces an extreme demographic transformation, is replacing its unsustainable pay-as-you-go public pension system with a more sustainable but much less generous two-tiered system of scaled-back state benefits and personal accounts. Mexico's retirement system labors under both handicaps: low coverage (just 39 percent of the workforce) and low replacement rates (roughly 25 percent for a full-career worker).

As it turns out, there is considerable overlap in the rankings for the two total income indicators—that is, the countries where the elderly are projected to be relatively affluent in 2040 are often the countries where elderly affluence is trending upwards, and vice versa. The Netherlands, the United States, and Brazil occupy the top three rankings on both indicators. In all three countries, the elderly start out well off relative to the young today and keep getting better off. The main reasons for the upward trend: minimal scheduled cuts in current-law public pension benefits combined with large long-term increases in health benefits. Overall, seven of the top ten ranking countries on total income level also rank in the top ten on total income trend, while seven of the countries that rank in the bottom ten on income level also rank in the bottom ten on income trend.

The rankings for some countries, however, differ significantly. France, Japan, and Italy have average rankings on total income level, but very low rankings (seventeen, eighteen, and nineteen, respectively) on total income trend. The main reasons for the downward trend: large scheduled cuts in current-law public pension benefits combined with relatively little growth in funded pensions or elderly labor-force participation. Chile, meanwhile, ranks fifth on total income level but fifteenth on total income trend—an outcome attributable to lower future replacement rates under its personal accounts system, which historically has benefited from unusually high real rates of return. There are also a few countries that rank higher on trend than on level. While Russia, Switzerland, and Spain are in the bottom half of the rankings on level, they all score in the top half on trend.

Table 11 (on page 33) summarizes the results for the total income category. The Netherlands, with first-place rankings on both indicators, scores best overall. Mexico scores worst overall. Its ranking on total income level is low, but not exceptionally so. What drags it down is its performance on total income trend, where it ranks last by a wide margin. In calculating the category results, both indicators were weighted equally.

Category Two: Income Vulnerability

While the total income category tracks how society's overall economic resources are shared between younger and older generations, the income vulnerability category tracks the relative living standard of "middle class" elders, a group whose

TABLE 11

Total Income Category

Category Ranking and Score			Total Income Level Indicator (Ratio)			Total Income Trend Indicator (% Change)		
1	Netherlands	162	1	Netherlands	1.72	1	Netherlands	32.9
2	US	121	2	US	1.67	2	US	17.0
3	Brazil	109	3	Brazil	1.54	3	Brazil	15.9
4	Germany	98	4	Germany	1.48	4	Australia	15.7
5	Australia	83	5	Chile	1.38	5	UK	13.4
6	UK	77	6	Sweden	1.28	6	Germany	13.0
7	Sweden	57	7	Australia	1.20	7	Spain	5.7
8	Chile	55	8	UK	1.19	8	Russia	3.9
9	Spain	49	9	Canada	1.14	9	Switzerland	3.8
10	Canada	43	10	France	1.13	10	Sweden	1.8
11	France	34	11	Japan	1.12	11	Canada	0.7
12	Switzerland	32	12	Spain	1.06	12	India	0.5
13	Japan	28	13	Italy	1.04	13	Poland	-1.2
14	Italy	19	14	Switzerland	0.89	14	China	-1.8
15	Russia	19	15	Mexico	0.82	15	Chile	-2.2
16	India	16	16	Korea	0.79	16	Korea	-2.9
17	Poland	9	17	India	0.78	17	France	-3.1
18	Korea	9	18	Poland	0.74	18	Japan	-5.6
19	China	-9	19	Russia	0.71	19	Italy	-6.6
20	Mexico	-11	20	China	0.51	20	Mexico	-12.7

INDICATOR KEY
Total Income Level Indicator = Ratio of average after-tax elderly to nonelderly income in 2040, including public health benefits
Total Income Trend Indicator = Percent change in the ratio of average after-tax elderly to nonelderly income from 2007 to 2040, including public health benefits

Note: Countries are ranked from best to worst.

income will be much more affected by changes (positive or negative) in the generosity of retirement systems. It also takes into account the degree of elderly poverty in each country. There are three indicators in the category:

- **MEDIAN INCOME LEVEL:** *The ratio of the median after-tax income of the elderly to the median after-tax income of the nonelderly in 2040*
- **MEDIAN INCOME TREND:** *The percent change in the ratio of the median after-tax income of the elderly to the median after-tax income of the nonelderly from 2007 to 2040*

TABLE 12

Ratio of Median After-Tax Elderly to Nonelderly Income, Excluding Public Health Benefits, 2007–2040*

Country Ranking		Income Ratio			
		2007	2020	2030	2040
1	Brazil	1.23	1.24	1.26	**1.30**
2	Netherlands	1.00	1.02	1.13	**1.27**
3	US	1.16	1.22	1.27	**1.26**
4	Germany	1.05	1.04	1.04	**1.04**
5	Chile	1.11	1.11	1.02	**0.99**
6	Japan	1.11	1.00	0.95	**0.96**
7	Sweden	0.94	0.92	0.94	**0.94**
8	Australia	0.89	0.85	0.88	**0.93**
9	Spain	0.93	0.95	0.93	**0.93**
10	UK	0.88	0.88	0.90	**0.93**
11	Italy	1.02	0.99	0.94	**0.87**
12	Canada	0.91	0.87	0.85	**0.81**
13	France	0.89	0.78	0.76	**0.75**
14	Poland	0.80	0.71	0.77	**0.72**
15	Switzerland	0.73	0.71	0.71	**0.71**
16	India	0.76	0.78	0.78	**0.71**
17	Russia	0.64	0.59	0.58	**0.61**
18	Mexico	0.72	0.64	0.60	**0.56**
19	Korea	0.59	0.57	0.53	**0.52**
20	China	0.39	0.38	0.35	**0.34**

Note: Countries are ranked from best to worst according to the projection results for 2040.

*Data for both the elderly and nonelderly refer to the third quintile of the income distribution.

POVERTY LEVEL: *Percent of the elderly with incomes beneath 50 percent of the median income for all persons in 2007 or the most recent available year*

Let us begin with the median income indicators, which focus on the relative living standard of the typical elder rather than the average elder. Naturally, the income of the median (third-quintile) elderly is measured relative to that of the median (third-quintile) nonelderly. As with the total income indicators, the median income indicators are calculated after taxes. Here, however, we exclude government health benefits in order to focus on what most people think of as their "living standard."

As Table 12 reveals, the ratios of median elderly to nonelderly income are significantly lower than the ratios of average elderly to nonelderly income. Nonetheless, the relative living standard of the middle-income elderly is still quite high in most countries. In 2040, the ratio of median elderly to nonelderly income is projected to be above 0.9 in ten countries and above 1.0 in four. In another six countries, the ratio is projected to be between 0.7 and 0.9. Most retirement planners would consider

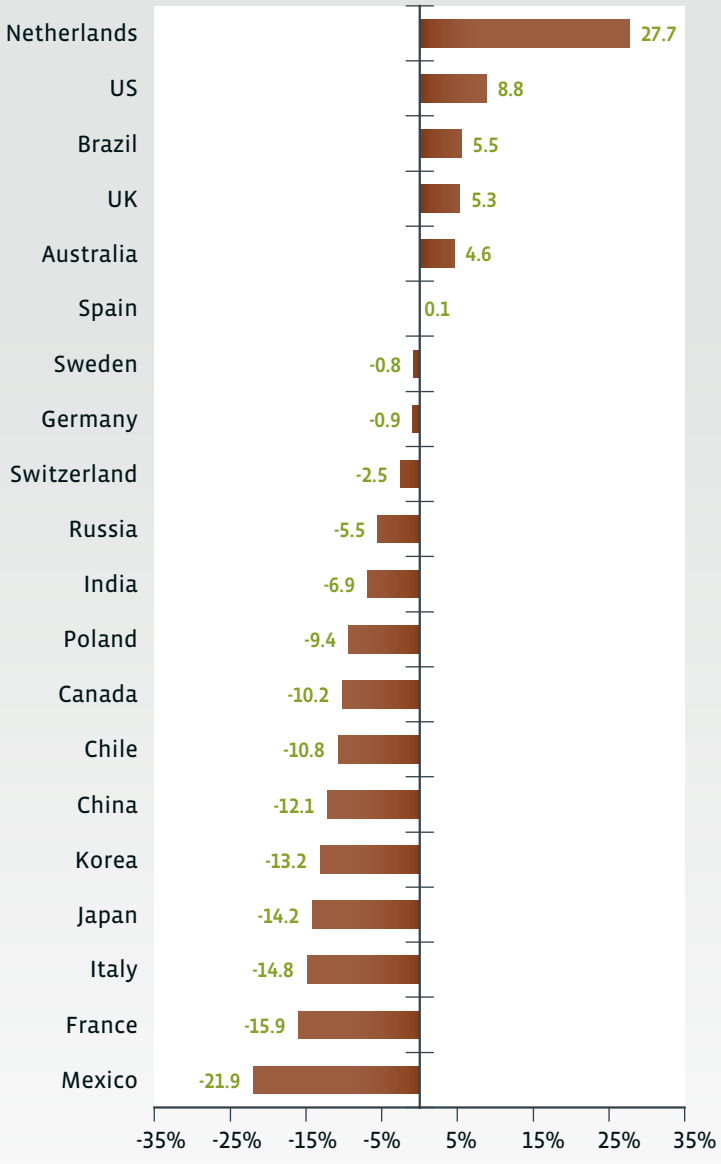
a retirement income equal to 70 percent of preretirement income adequate and a retirement income equal to 90 percent or more excellent. In only four countries—Russia, Mexico, Korea, and China—are the median elderly projected to have incomes that seem unusually low relative to the nonelderly.

The more important story, however, may be told by the trend indicator. (See Figure 7.) The median income trend indicator is negative in more countries than the total income trend indicator and the projected declines are also larger. In eight countries—Canada, Chile, China, Korea, Japan, Italy, France, and Mexico—median elderly income is projected to fall by more than 10 percent relative to nonelderly income. On the total income trend indicator, just one country registered a decline of more than 10 percent: Mexico. Part of the explanation is that the total income measure is buoyed up by rapid growth in health benefits. But part is also that the relative living standard of the median elder suffers more than that of the average elder when the growth in per capita pension benefits fails to keep pace with the growth in per capita wages. In Italy, total retirement benefits (including both pay-as-you-go public pensions and funded pension benefits) now make up 80 percent of the income of the median elder but just 58 percent of the income of the average elder. In Japan the figures are 73 versus 46 percent and in Chile they are 60 versus 40 percent. Median elders in developing countries like China, Korea, and Mexico are also more vulnerable to projected declines in family transfers as the number of young shrinks relative to the number of old.

Although many countries face a declining trend in the relative living standard of the middle-income elderly, there are also a number of countries where their living standard is projected to remain stable over time and one country, the Netherlands, where it is projected to grow rapidly. The favorable outlook on the median income trend indicator in Brazil and Spain, and to some extent in the Netherlands and Switzerland, is due to continued rapid growth in pay-as-you-go public pension benefits, and so comes at the expense of a rising

FIGURE 7

Percent Change in the Ratio of Median After-Tax Elderly to Nonelderly Income from 2007 to 2040, Excluding Public Health Benefits*



Note: Countries are ranked from best to worst.

* Data for both the elderly and nonelderly refer to the third quintile of the income distribution.

fiscal burden. But this is not the case in Germany, Sweden, Australia, the UK, and the United States.

The favorable outlook in Australia is due to the maturation of "Super," its mandatory funded pension system. The UK achieves its satisfactory outcome through a modest increase in state pension provision over its current low level combined with a modest increase in coverage under voluntary funded pension plans. In the United States, the key factors are a relatively high rate of participation in funded pension plans and a relatively high elderly labor-force participation rate. Like the United States, Sweden also has a relatively high elderly labor-force participation rate—and Germany's rate is now rising sharply due in part to the elimination of no-penalty early retirement options. Both countries are also increasing funded retirement savings—Sweden through a new mandatory personal accounts tier to its public pension system and Germany through its new voluntary Riester and Rürup pensions. Together, these factors help explain their success in maintaining the relative living standard of the elderly despite deep scheduled cuts in public pension benefits.

The income prospects of middle-income elders may have especially important implications for the future direction of policy changes. In the developed world, analysis of voter attitudes toward government spending suggests that political support for public benefits to the elderly is strongly associated with perceptions about their relative living standard. Countries where the relative living standard of the elderly is stable or rising may find it easier to rein in the growth in old-age dependency costs, even if the degree of elderly dependence on public benefits is high. On the other hand, countries where the relative living standard of the elderly is falling may find it harder to enact benefit cuts—or to follow through on cuts that are already scheduled but not yet implemented.

The UK has already discovered this. In the early 1980s, it switched the indexation of its basic state pension system from wages to prices, effectively flattening its long-term projected growth as a share of GDP. But as price indexing caused benefits to decline steadily as a share of wages, calls for a repeal of the reform grew louder. In 2007, amid an emerging consensus that current policy would ultimately impoverish the elderly, the government re-indexed benefits to wages.

Although the political calculus in emerging markets is not always so clear-cut, the prospect of growing vulnerability among the elderly is spurring some governments to action. As we have seen, Brazil and Chile have put in place broad-based old-age poverty floors. In China, the government is encouraging more of its vast "floating population" of migrant workers to participate in the basic pension system for urban workers, while also phasing in a modest new rural pension system. Meanwhile in India, the government is taking steps to extend funded pension coverage to more formal-sector workers. Although the recent reforms in China and India will help, the projected impact is too small to fundamentally alter the long-term adequacy outlook.

Along with the living standard of middle-income elders, the degree of elderly poverty is clearly an important dimension of overall income adequacy. The GAP Index's poverty level indicator measures the share of the elderly in each country with an income beneath 50 percent of the median income for all persons in that country—the same standard relative poverty definition used in calculating the benefit cut indicator. Although we are not able to project how poverty rates may change in the future, the indicator provides a valuable additional perspective.

As with many other indicators, the results differ enormously across the Index countries. (See Figure 8, on page 37.) At the low end, the share of the elderly living in relative poverty is just 2 percent in the Netherlands, while at the high end it is 36 percent in Korea. Not surprisingly, most of Europe's other large welfare states also have very low relative poverty rates—under 10 percent in Sweden, France, and Germany and just slightly over 10 percent in Italy and Switzerland. The only continental European country that ranks in the bottom ten countries on this indicator is Spain, where

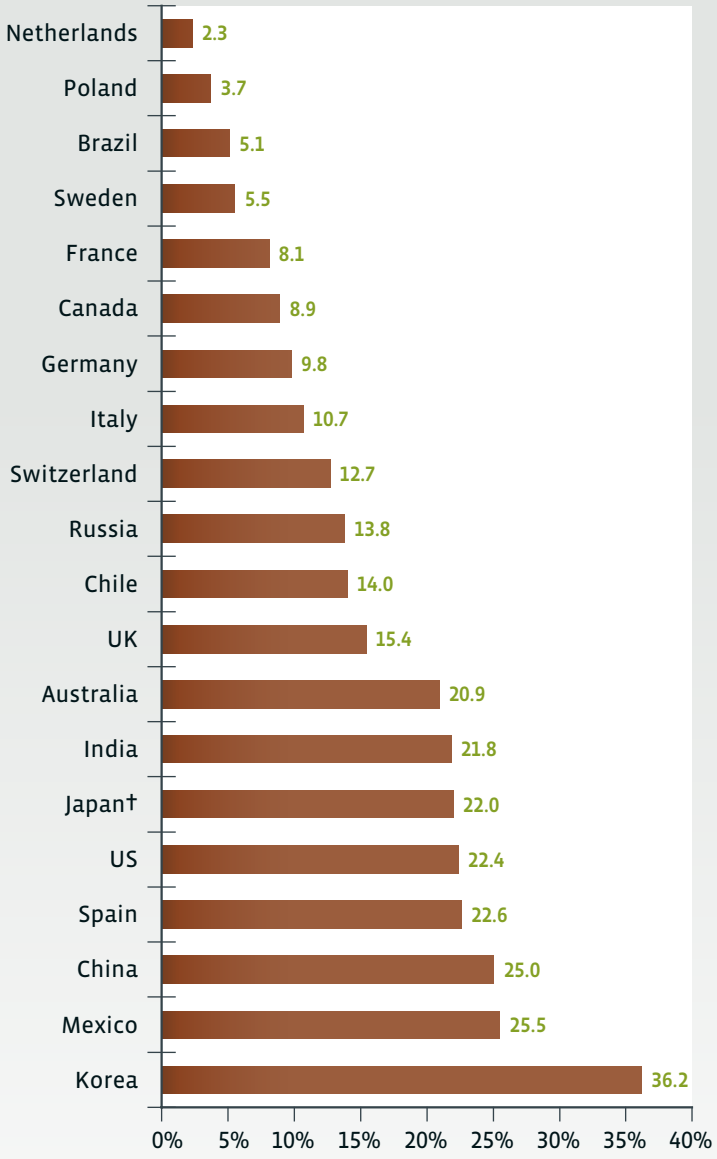
the elderly poverty rate is 23 percent. The low elderly poverty rates in most continental European countries reflect their overall low levels of income inequality as well as the generosity of minimum public pension benefits and other cash support for the low-income elderly. Among the other fully developed economies in the Index, only Canada has an elderly poverty rate under 10 percent. The rates are much higher in the other Anglo-Saxon countries and in Japan—just over 15 percent in the UK and just over 20 percent in Australia, Japan, and the United States. The higher poverty rates in these countries reflect their higher degree of income inequality and their less generous public old-age poverty floors.

With the exception of Brazil and Poland, the emerging markets in the Index all have relatively high elderly poverty rates. Brazil's extraordinarily low rate (just 5 percent) is a testament to the success of its old-age poverty floor. Overall income inequality in Brazil remains very high, but the elderly are not particularly afflicted—and in fact have a lower poverty rate than the nonelderly. In Mexico, which has a similarly skewed income distribution but lacks any floor of old-age poverty protection, the elderly poverty rate is five times higher. Poland's spectacular performance on this indicator (an elderly poverty rate of 4 percent) is more surprising given its relatively low ratio of per capita elderly to nonelderly income. The country's broad-based public pension coverage and strong family support networks, however, appear to do an exemplary job of lifting elders out of poverty.

Table 13 (on page 38) summarizes the results for the income vulnerability category. The Netherlands, with its first-place rankings on poverty level and median income trend and its second-place ranking on median income level, scores best. Korea, with its last-place ranking on poverty level and its low rankings on median income level and trend, scores worst. In calculating the category results, all three indicators were weighted equally.

FIGURE 8

Percent of the Elderly Living in Poverty Today*



Note: Countries are ranked from best to worst.

* Data refer to various years between 1999 and 2007 and exclude public health benefits. Poor persons are persons with incomes beneath 50 percent of the median income for all persons.
† Data for Japan refer to elderly aged 65 and older.

TABLE 13

Income Vulnerability Category

Category Ranking and Score			Median Income Level Indicator (Ratio)*			Median Income Trend Indicator (% Change)*			Poverty Level Indicator (%)		
1	Netherlands	149	1	Brazil	1.30	1	Netherlands	27.7	1	Netherlands	2.3
2	Brazil	113	2	Netherlands	1.27	2	US	8.8	2	Poland	3.7
3	US	83	3	US	1.26	3	Brazil	5.5	3	Brazil	5.1
4	Sweden	79	4	Germany	1.04	4	UK	5.3	4	Sweden	5.5
5	Germany	77	5	Chile	0.99	5	Australia	4.6	5	France	8.1
6	UK	69	6	Japan	0.96	6	Spain	0.1	6	Canada	8.9
7	Australia	58	7	Sweden	0.94	7	Sweden	-0.8	7	Germany	9.8
8	Poland	55	8	Australia	0.93	8	Germany	-0.9	8	Italy	10.7
9	Chile	52	9	Spain	0.93	9	Switzerland	-2.5	9	Switzerland	12.7
10	Canada	51	10	UK	0.93	10	Russia	-5.5	10	Russia	13.8
11	Spain	48	11	Italy	0.87	11	India	-6.9	11	Chile	14.0
12	Switzerland	48	12	Canada	0.81	12	Poland	-9.4	12	UK	15.4
13	Italy	44	13	France	0.75	13	Canada	-10.2	13	Australia	20.9
14	France	39	14	Poland	0.72	14	Chile	-10.8	14	India	21.8
15	Russia	35	15	Switzerland	0.71	15	China	-12.1	15	Japan	22.0
16	Japan	30	16	India	0.71	16	Korea	-13.2	16	US	22.4
17	India	24	17	Russia	0.61	17	Japan	-14.2	17	Spain	22.6
18	China	-14	18	Mexico	0.56	18	Italy	-14.8	18	China	25.0
19	Mexico	-14	19	Korea	0.52	19	France	-15.9	19	Mexico	25.5
20	Korea	-24	20	China	0.34	20	Mexico	-21.9	20	Korea	36.2

INDICATOR KEY
Median Income Level Indicator = Ratio of median after-tax elderly to nonelderly income in 2040, excluding public health benefits
Median Income Trend Indicator = Percent change in the ratio of median after-tax elderly to nonelderly income from 2007 to 2040, excluding public health benefits
Poverty Level Indicator = Percent of the elderly with incomes beneath 50 percent of the median income for all persons in 2007 or the most recent available year

Note: Countries are ranked from best to worst.
*Data for both the elderly and nonelderly refer to the third quintile of the income distribution.

Category Three: Family Support

The final category looks at an important dimension of income security not fully captured elsewhere: the extent to which the elderly may be able to rely on the support of their extended families. There are two indicators in the category:

- **FAMILY TIES:** *Percent of the elderly living in households with their adult children in 2007*

FAMILY SIZE: *Change in the average number of surviving children of the elderly from 2007 to 2040*

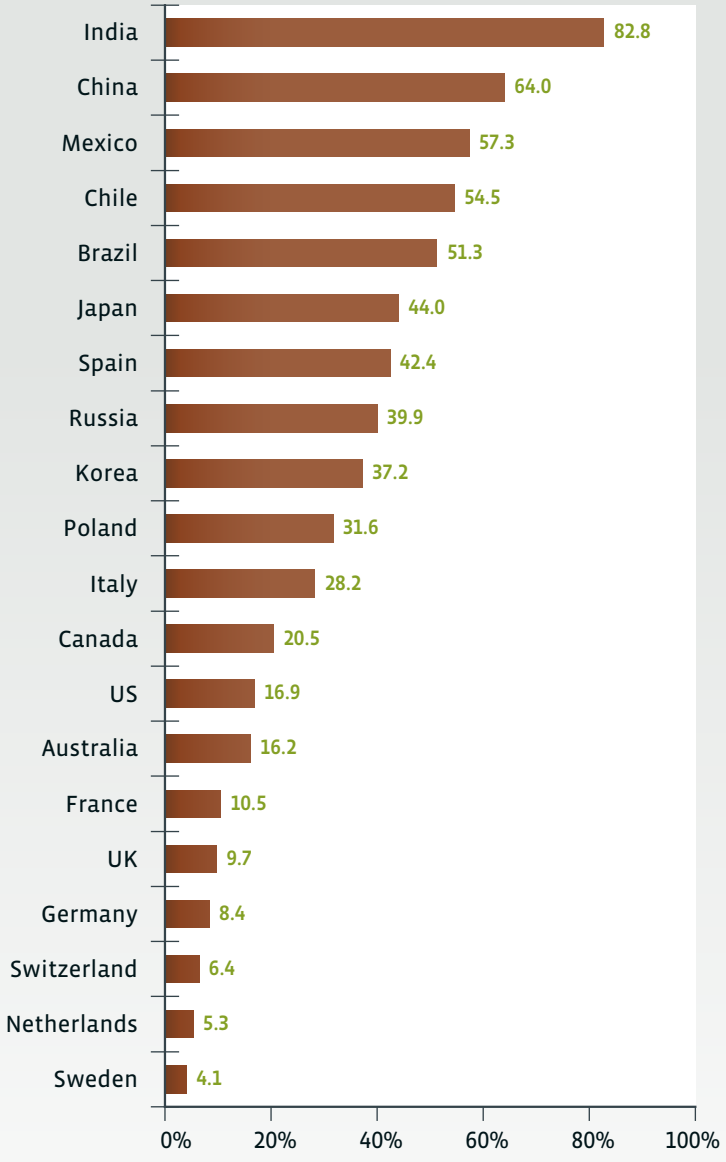
The family ties indicator measures the share of all elderly who now live in extended families with their adult children, whether the parents live in their grown children's household or—what is much more common in most countries—the grown children live in their parents' household. Multigenerational living is still widespread in most developing countries. In fact, at least 30 percent of the elderly now live with their grown children in every emerging market in the GAP Index, including Russia and Poland. In five countries—Brazil, Chile, Mexico, China, and India—more than half do. In contrast, the share in most developed countries is under 20 percent and in some it is under 10 percent. The exceptions are Japan, where the share is 44 percent; Spain, where it is 42 percent; and Italy, where it is 28 percent. (See Figure 9.)

Multigenerational living can constitute an important advantage in confronting the aging challenge. It not only allows relatively poor elders to live with their more affluent adult children, it also allows relatively poor young adults to live with their more affluent parents. It mitigates the old-age dependency burden not just by providing an extra source of support for the old, but by providing a form of "trickle down" support for the young as well. Although the Index projections already factor in estimates of net cash family transfers, we decided that it was important to include multigenerational living as a distinct indicator.

Unless the propensity of grown children to live with their parents changes over time, those countries that have relatively high levels of multigenerational living today will also tend to have relatively high levels in 2040. Because fertility has declined faster in some countries than in others, however, the odds that an elder will be able to live with a grown child will also decline faster in some countries. To capture this risk, we calculated a second indicator: the change from 2007 to 2040

FIGURE 9

Percent of the Elderly Living in Households with Their Adult Children in 2007



Note: Countries are ranked from best to worst.

TABLE 14

Average Number of Surviving Children of the Elderly: 2007, 2040, and Change from 2007 to 2040

Country Ranking		Persons		
		2007	2040	Change
1	Sweden	2.1	2.0	-0.2
2	Japan	2.0	1.5	-0.5
3	Poland	2.6	2.0	-0.6
4	UK	2.4	1.9	-0.6
5	France	2.5	1.9	-0.6
6	Germany	2.1	1.4	-0.7
7	Switzerland	2.2	1.6	-0.7
8	Russia	2.2	1.5	-0.7
9	India	3.5	2.6	-0.9
10	Italy	2.3	1.4	-0.9

Country Ranking		Persons		
		2007	2040	Change
11	US	2.9	1.9	-1.0
12	Australia	3.0	2.0	-1.0
13	Netherlands	2.7	1.6	-1.1
14	Chile	3.5	2.4	-1.1
15	Spain	2.7	1.4	-1.2
16	Canada	3.2	1.7	-1.5
17	China	3.5	2.0	-1.6
18	Brazil	3.8	2.1	-1.7
19	Korea	3.6	1.8	-1.8
20	Mexico	5.0	2.6	-2.5

Note: Countries are ranked from best to worst according to the projected change from 2007 to 2040.

in the average number of surviving children that each elder will have.

This family size indicator also serves another purpose. By looking at the change in the number of children per elder independently from living arrangements, the Index captures broader pressures on family support networks. The young, after all, provide support to the old in many ways even if they do not live with them. In the United States, it is estimated that for every dollar spent on nursing homes, family caregivers, mostly the children of the elderly, provide the equivalent of ten dollars in unpaid care. In China, it is called the 4-2-1 problem—the prospect that one child will have to care for two parents and four grandparents.

As Table 14 reveals, family support networks are likely to come under intense demographic pressure in many developing countries. In China, the average number of surviving children per elder is projected to decline by 1.6 between 2007 and 2040. In Brazil it is projected to decline by 1.7, in Korea by 1.8, and in Mexico by 2.5. In India, however, where fertility has fallen more gradually, the drop is smaller—just 0.9. In the developed countries, fertility rates declined earlier than in the developing world, which means that today's elders already have relatively small families. Nonetheless, a few countries where the slide in birthrates began relatively late (Italy and Spain) or which had large postwar baby booms (Australia, Canada, the Netherlands, and the United States) are also projected to experience significant declines. In Canada, the decline in the average number of surviving children will be 1.5—nearly as large as in China.

Table 15 (on page 41) summarizes the results for the family support category. India ranks first

TABLE 15

Family Support Category

Category Ranking and Score			Family Ties Indicator (%)			Family Size Indicator (Persons)		
1	India	131	1	India	82.8	1	Sweden	-0.2
2	Japan	86	2	China	64.0	2	Japan	-0.5
3	China	82	3	Mexico	57.3	3	Poland	-0.6
4	Chile	81	4	Chile	54.5	4	UK	-0.6
5	Russia	72	5	Brazil	51.3	5	France	-0.6
6	Poland	64	6	Japan	44.0	6	Germany	-0.7
7	Spain	60	7	Spain	42.4	7	Switzerland	-0.7
8	Brazil	58	8	Russia	39.9	8	Russia	-0.7
9	Italy	48	9	Korea	37.2	9	India	-0.9
10	Mexico	45	10	Poland	31.6	10	Italy	-0.9
11	Korea	36	11	Italy	28.2	11	US	-1.0
12	Sweden	35	12	Canada	20.5	12	Australia	-1.0
13	France	32	13	US	16.9	13	Netherlands	-1.1
14	UK	31	14	Australia	16.2	14	Chile	-1.1
15	US	30	15	France	10.5	15	Spain	-1.2
16	Australia	27	16	UK	9.7	16	Canada	-1.5
17	Germany	27	17	Germany	8.4	17	China	-1.6
18	Switzerland	24	18	Switzerland	6.4	18	Brazil	-1.7
19	Canada	20	19	Netherlands	5.3	19	Korea	-1.8
20	Netherlands	9	20	Sweden	4.1	20	Mexico	-2.5

INDICATOR KEY
Family Ties Indicator = Percent of the elderly living in households with their adult children in 2007
Family Size Indicator = Change in average number of surviving children of the elderly from 2007 to 2040

Note: Countries are ranked from best to worst.

overall, due to its enormous advantage on family ties and its relatively modest (by developing-world standards) decline in family size. The Netherlands ranks last overall, due to its next-to-last score on family ties and its large (by developed-world standards) decline in family size. In calculating the category results, the more important family ties indicator received a two-thirds weight, while the family size indicator received a one-third weight.

Overall Income Adequacy Results

Table 16 (on page 42) presents the results for the GAP income adequacy index. Just as with the fiscal sustainability index, the scores for the three separate indicator categories are combined into a single overall score and ranking for each coun-

TABLE 16

GAP Income Adequacy Index

Overall Index			Total Income Category			Income Vulnerability Category			Family Support Category		
1	Netherlands	126	1	Netherlands	162	1	Netherlands	149	1	India	131
2	Brazil	100	2	US	121	2	Brazil	113	2	Japan	86
3	US	88	3	Brazil	109	3	US	83	3	China	82
4	Germany	75	4	Germany	98	4	Sweden	79	4	Chile	81
5	UK	65	5	Australia	83	5	Germany	77	5	Russia	72
6	Australia	62	6	UK	77	6	UK	69	6	Poland	64
7	Sweden	61	7	Sweden	57	7	Australia	58	7	Spain	60
8	Chile	59	8	Chile	55	8	Poland	55	8	Brazil	58
9	Spain	51	9	Spain	49	9	Chile	52	9	Italy	48
10	India	42	10	Canada	43	10	Canada	51	10	Mexico	45
11	Canada	42	11	France	34	11	Spain	48	11	Korea	36
12	Japan	40	12	Switzerland	32	12	Switzerland	48	12	Sweden	35
13	Poland	39	13	Japan	28	13	Italy	44	13	France	32
14	Switzerland	37	14	Italy	19	14	France	39	14	UK	31
15	Russia	36	15	Russia	19	15	Russia	35	15	US	30
16	France	36	16	India	16	16	Japan	30	16	Australia	27
17	Italy	35	17	Poland	9	17	India	24	17	Germany	27
18	China	7	18	Korea	9	18	China	-14	18	Switzerland	24
19	Korea	1	19	China	-9	19	Mexico	-14	19	Canada	20
20	Mexico	-1	20	Mexico	-11	20	Korea	-24	20	Netherlands	9

Note: Countries are ranked from best to worst.

try. The central total income and income vulnerability categories receive a weight of 40 percent each while the family support category receives a weight of 20 percent.

Once again, a glance at the overall scores reveals that there is a substantial gap between the few highest-ranking and few lowest-ranking countries and the rest. At the top of the income adequacy index, the Netherlands, Brazil, and the United States constitute a high-preparedness or low-vulnerability group. These top four ranking countries also rank in the top four in the total income category and the top five in the income vulnerability category, though they do considerably less well in the family support category. At the bottom of the income adequacy index, China, Korea, and Mexico clearly constitute a low-preparedness or high-vulnerability group. They not only occupy the bot-

tom three rankings overall, but the bottom three in both the total income and income vulnerability categories. Although the scores vary considerably among the other countries, there are no exceptionally large gaps between any two countries.

Once again, it is also important to keep in mind that the general location of a country in the rankings is more meaningful than its precise ranking. Australia, Sweden, and Chile all have similar scores, which means that even minor changes in assumptions could cause them to exchange places. The same is true for India, Canada, Japan, and Poland; Switzerland, Russia, France, and Italy; and Korea and Mexico. Large changes in the results for several indicators, however, would be required to push a country in or out of the high- or low-vulnerability groups—or indeed, to move a country more than two or three places anywhere in the rankings.

Although most of the results are explained by developments we have already discussed, a few may be unexpected enough to require special note. Some readers may find it surprising that France, which is known for its unusually generous public retirement system, scores much lower in the income adequacy index than the UK, which is known for its meager state pensions. The explanation is that France is reducing the generosity of its public system without putting anything in its place, while the UK, alone among European countries, is moving in the opposite direction. Other readers may find it surprising that India scores higher than China or Korea. Part of the explanation is that in India the traditional pillar of old-age security—family support networks—is still intact, while in China and Korea it is being eroded by rapid modernization before society has had time to put adequate substitutes in place. Part is also that more rapid development in China and Korea is pushing up the income of the young faster than the income of the old.

It is worth pausing a moment to compare the outlook in the developed and developing worlds. While the relative living standard of the elderly may be at risk of sliding in a number of developed countries, it will still compare favorably with that of the nonelderly in 2040. Apart from Brazil and Chile, the outlook in emerging markets is less encouraging. It is possible that the relative living standard of the old will begin to rise in countries like China and Korea as more affluent generations of younger adults replace today's elderly in old age. We were unable to project cohort shifts in asset ownership with confidence, and so have not factored them into the Index. What the Index does tell us conclusively is that there is nothing in current retirement policy in these countries that will ensure a favorable outcome.

Strategies for the Future

Thus far in the report, we have focused on where countries are heading on their current course. How high will the old-age dependency burden rise in the future and will tomorrow's workers and taxpayers be able to afford it? Are current retirement policies on track to maintain the living standard of the elderly where it is now relatively high—or to raise it where it is now relatively low?

The GAP Index results reveal that there is considerable room for improvement. Only two countries, Australia and Chile, score toward the top of both indices. As we noted at the beginning of the report, most countries score much better on one dimension of aging preparedness than the other, suggesting that today's retirement policies often entail a worrisome trade-off between fiscal sustainability and income adequacy. Three of the seven highest-ranking countries on the fiscal sustainability index (Mexico, China, and Russia) are among the seven lowest-ranking countries on the income adequacy index. Four of the seven highest-ranking countries on the income adequacy index (the Netherlands, Brazil, Germany, and the UK) are among the seven lowest-ranking countries on the fiscal sustainability index. France and Italy, which score near the bottom of both indices, are failing to make even this trade-off. Their old-age benefit systems remain fiscally burdensome, yet at the same time are becoming increasingly inadequate. (See Table 17, on page 46.)

In the final chapter, we shift the focus to what countries can do to steer a surer course. In particular, we look at seven broad reform strategies that can increase long-term aging preparedness by improving fiscal sustainability, by improving income adequacy, or, in some cases, by improving both at the same time. The seven strategies are: reduce public pension benefits; reduce health-care cost growth; extend work lives; increase funded pension savings; strengthen poverty floors; increase fertility rates; and increase immigration.

Obviously, any given strategy will have a bigger impact in some countries than in others. Mexico and India have little to gain fiscally from reducing the cost of public benefits to the elderly since their old-age dependency burdens are already so low. On the other hand, if they were to put in place an old-age safety net like Brazil's rural pension system it would boost adequacy enormously. The situation in the Netherlands and Sweden is precisely the opposite.

The reform guide in Table 18 (on page 48) summarizes our assessment of which strategies

TABLE 17

GAP Index Country Rankings

	Fiscal Sustainability Index		Income Adequacy Index
1	India	1	Netherlands
2	Mexico	2	Brazil
3	Chile	3	US
4	China	4	Germany
5	Russia	5	UK
6	Poland	6	Australia
7	Australia	7	Sweden
8	Japan	8	Chile
9	Canada	9	Spain
10	Sweden	10	India
11	US	11	Canada
12	Korea	12	Japan
13	Switzerland	13	Poland
14	Germany	14	Switzerland
15	UK	15	Russia
16	Italy	16	France
17	France	17	Italy
18	Brazil	18	China
19	Netherlands	19	Korea
20	Spain	20	Mexico

Note: Countries are ranked from best to worst.

different countries should prioritize. Three stars indicate that pursuing a strategy would have a potentially large payoff and should be a high priority. Two stars indicate that a strategy would have a significant payoff and should be a significant priority, one star that it would have a modest payoff and should be a low priority, and no stars that it is not a priority. Most of the data used to assess the relative importance of the seven strategies in different countries are generated by the GAP Index model. The divisions between different priority levels, however, are based on our subjective judgment.

Let us now consider each of the strategies in turn:

Reduce Public Pension Benefits

Reducing the long-term cost of pay-as-you-go pension systems remains the single most pressing challenge facing many of the countries in the GAP Index. Public pension benefits are the largest component of the old-age dependency burden today in every country and are still projected to be the largest in virtually every country in 2040 under the current-law baseline used in the Index. This baseline, moreover, greatly understates the urgency of cost control in some countries because it assumes large prospective benefit cuts that have been legislated, but whose pain is yet to be felt. The fact that countries like France, Germany, Italy, and Japan intend to make large future cuts in per capita pension benefits relative to per worker wages does not mean that reducing benefits is no longer a priority. Actually achieving the savings may require such countries to overcome considerable political resistance from aging electorates. If they fail, the future spending burden will be much larger than the Index projections indicate.

In assessing the relative importance of reducing public pension benefits, we therefore use a current-deal rather than a current-law scenario. As already explained, the current-deal scenario assumes that future workers will on average continue to retire at the same age they do today and that benefits will continue to replace the same share of wages. To the extent that today's benefit rules reflect a social consensus about what constitutes adequate state provision, the current-deal scenario is clearly a better gauge of the potential cost pressure on government budgets than the current-law scenario. We divide the Index countries into four groups based on the current-deal projection for public pension benefits to the elderly in 2040: un-

der 5 percent of GDP (no stars), between 5 and 10 percent of GDP (one star), between 10 and 15 percent of GDP (two stars), and over 15 percent of GDP (three stars).

What is most striking about the results is how many countries face very large current-deal pension burdens. Under current-law projections, spending is due to exceed 15 percent of GDP in just one country: Italy. Under current-deal projections, it would exceed 15 percent of GDP in seven countries: Italy, France, Germany, Japan, Spain, Brazil, and Poland. One can interpret the difference in two ways: that many countries have made a lot of progress in controlling public pension costs or that many countries face a much more daunting challenge than the official projections suggest.

Reduce Health-Care Cost Growth

Health benefits are of course the other principal component of rising old-age dependency burdens. Just as we did with pension benefits, we divide the twenty Index countries into four groups based on the projected level of public spending on the elderly in 2040: under 4 percent of GDP (no stars), 4 to 6 percent of GDP (one star), 6 to 8 percent of GDP (two stars), and more than 8 percent of GDP (three stars). A glance at the reform guide reveals a striking division between the developed and developing countries in the Index. All of the emerging markets receive one star or no stars, indicating that controlling costs is a low priority or not a priority at all, while all of the fully developed economies receive two or three stars.

Although striking, the division is not surprising. The emerging markets spend relatively little on health benefits because their health systems do not generally provide the same standard of care that is available in developed countries, because their public sectors generally cover less of the total bill, or both. They cannot hope to achieve much savings in health care—and indeed may end up spending more than projected in the Index as their affluence grows, their populations age, and their standards of care converge with those of the developed world.

The calculus is different in the developed countries, and especially those with unusually large projected health benefit burdens like the Netherlands, France, and the United States. Here controlling costs must be a high priority. No one should delude themselves, however, that the task will be easy. Governments can tighten controls on the price and volume of the services that public budgets will pay for. Alternatively, they can try to promote greater efficiency in health-care delivery by encouraging competition, penalizing high-cost providers, and investing in outcomes research. But if the history of past cost control efforts is any guide, the underlying drivers of population aging, advances in medical technology, and rising public expectations will continue to put upward pressure on spending. To the extent that health benefits prove difficult to control, reducing pension costs becomes all the more important.

Extend Work Lives

Perhaps no strategy for confronting the aging challenge offers more advantages than extending work lives. Longer work lives increase the adequacy of income for the old without putting a new burden on the young. They can help ease potential labor shortages in fast-aging countries with declining populations in the traditional working ages. To the extent that longer work lives mean higher eligibility ages for public pension benefits, there is also a double fiscal benefit. Unlike cuts in replacement rates or indexing formulas, higher retirement ages both save on benefit costs and increase tax revenues by lengthening the number of years in which contributions are made. Remaining productively engaged, moreover, is not only good for the health of the budget and economy, but according to most gerontologists it is also good for the health of the elderly themselves.

In most of the countries in the Index, there is clearly considerable room to extend work lives. To

TABLE 18

GAP Index Reform Strategy Guide

	1 Reduce Public Pension Benefits	2 Reduce Health-Care Cost Growth	3 Extend Work Lives	4 Increase Funded Pension Savings	5 Strengthen Poverty Floors	6 Increase Fertility Rates	7 Increase Immigration
Australia	★	★★	★		★★	★	
Brazil	★★★	★	★	★★		★	★
Canada	★	★★	★			★★	★
Chile	★		★	★	★	★	★
China	★		★★	★★	★★★	★★	★
France	★★★	★★★	★★★	★★★		★	★
Germany	★★★	★★	★★	★★		★★★	★★★
India*			★★	★★	★★		
Italy	★★★	★★	★★★	★★	★	★★★	★★
Japan	★★★	★★		★★	★★	★★★	★★★
Korea	★	★		★★★	★★★	★★★	★★★
Mexico				★★	★★★		★
Netherlands	★★	★★★	★★			★★	★★
Poland	★★★		★★	★★		★★★	★★
Russia	★		★★	★★	★	★★★	★
Spain	★★★	★★	★★★	★★★	★★	★★★	★★
Sweden	★★	★★	★	★		★	
Switzerland	★	★★	★		★	★★★	★
UK	★	★★	★★	★	★	★	
US	★	★★★		★	★★		

Reform Guide Key	No Stars = Not a Priority	★ = Low Priority	★★ = Significant Priority	★★★ = High Priority
Strategy 1: Stars refer to projected current-deal public pension benefits to the elderly in 2040 as a percent of GDP	‹ 5%	5–10%	10–15%	› 15%
Strategy 2: Stars refer to projected public health benefits to the elderly in 2040 as a percent of GDP	‹ 4%	4–6%	6–8%	› 8%
Strategy 3: Stars refer to projected labor-force participation rate of the elderly aged 60–74 in 2040	› 40%	30–40%	20–30%	‹ 20%
Strategy 4: Stars refer to projected funded pension benefits as a percent of elderly cash income in 2040	› 25%	15–25%	5–15%	‹ 5%
Strategy 5: Stars refer to percent of the elderly living in relative poverty today	‹ 10%	10–20%	20–25%	› 25%
Strategy 6: Stars refer to projected total fertility rates for the period 2010-2040	› 2.0	1.8–2.0	1.5–1.8	‹ 1.5
Strategy 7: Stars refer to a composite measure of net immigration rates and the degree of population aging †	low aging & high immigration	moderate aging & high immigration or low aging & low immigration	moderate aging & low immigration or high aging & high immigration	high aging & low immigration

*Following our priority categories for strategy seven, India, which has a low net immigration rate and low aging, should receive one star. But because its aging trend is so moderate compared with other Index countries, we make an exception and give it no stars.

†Countries are divided into low-immigration countries (those below the mean for all Index countries) and high-immigration countries (those above the mean). They are also divided into three demographic groups according to the projected elderly share of the population in 2040: low (under 30%), moderate (30-35%), and high (over 35%).

gauge the relative importance of the strategy, we look at projected labor-force participation rates of adults aged 60 to 74 in 2040. The four priority groups are: over 40 percent (no stars), 30 to 40 percent (one star), 20 to 30 percent (two stars), and under 20 percent (three stars). We focus on the "young elderly" aged 60 to 74 because, even with improving health at older ages and the less physically taxing nature of work in today's information economies, extending work lives past the early seventies may not be realistic for most people.

In general, it is the European countries that could benefit most from this strategy. All three countries with projected elderly labor-force participation rates under 20 percent are in Europe: France, Italy, and Spain. So are five of the seven countries with projected participation rates between 20 and 30 percent. The only European countries with projected participation rates over 30 percent are Switzerland and Sweden, though the UK, with a rate of 29 percent, comes close. Elderly labor-force participation rates are also surprisingly low in China and India—between 20 and 30 percent—due to very early retirement ages in their formal sectors. At the other end of the spectrum, four countries have participation rates that are projected to exceed 40 percent: Japan, Korea, Mexico, and the United States. Although their economies might benefit from even more working elders, raising participation is clearly not a priority.

Increase Funded Pension Savings

Along with extending work lives, increasing funded pension savings can allow societies to maintain income adequacy for the old without imposing a direct tax or family burden on the young. There are many ways that individuals can accumulate long-term assets, including ordinary personal savings, investment in the family home, and life insurance contracts. Funded pension plans, however, play a uniquely important role. Unlike other forms of savings, they are explicitly designed to provide retirement income and typically include prohibitions or at least limitations on preretirement withdrawals. Moreover, because they are often intended as substitutes for pay-as-you-go state provision, they can take pressure off public budgets.

The benefits of the funding strategy depend on how pension plans are structured and financed. To the extent that pension savings represent new net national savings, the strategy raises the growth path of the economy. In this case, benefits will be paid out of new wealth that would not otherwise have existed. To the extent that the savings are debt-financed, the strategy merely shifts the burden of paying for old-age benefits from current workers to future workers. Diverting payroll taxes to personal accounts and borrowing to cover the revenue shortfall is not a solution to the aging challenge. The funding strategy will also bring larger benefits if the savings are globally invested. As societies age, long-term rates of return to capital are likely to decline. Funded pension systems can allow aging societies to escape the tyranny of their own demography by investing in younger and faster-growing economies around the world.

To assess the potential payoff of increasing funded pension savings, we look at the share of total elderly income projected to come from funded pensions in 2040. The four priority groups are: over 25 percent (no stars), 15 to 25 percent (one star), 5 to 15 percent (two stars), and under 5 percent (three stars). Once again, the priority groups merely indicate the relative urgency of the strategy. Even those countries where funded pension provision is projected to be highest might benefit from an additional increase. Just as with longer work lives, more is always better.

Some important policy lessons emerge from the projections. Of the four countries where funded pension savings are projected to comprise more than 25 percent of elderly income in 2040, three have mandatory or quasi-mandatory funded systems: Australia, the Netherlands, and Switzerland. Only one has a voluntary system: Canada. These results suggest that there are limits to how far tax

incentives can boost coverage—and indeed, no country with a purely voluntary funded pension system now has a coverage rate much above 50 percent. That said, mandates alone are not sufficient to ensure high levels of pension savings. The mandates must be enforceable and contributions must be sufficient to generate adequate replacement rates. Chile, Sweden, Poland, Russia, and Mexico all have some type of mandatory funded system—but the first two fall into the one-star group and the rest into the two-star group.

The projections also reveal that recent initiatives to expand funded pension savings are making a difference. While we project that there will be just three countries in 2040 where funded pension savings comprise less than 5 percent of elderly income, today there are eleven—not just France, Korea, and Spain, but also Brazil, China, Germany, India, Italy, Mexico, Poland, and Russia. The problem is not that these countries are doing nothing, but that that they are not yet doing enough.

Strengthen Poverty Floors

Preventing economic hardship in old age was the original purpose of most public retirement systems and remains a fundamental purpose today. Yet even in some countries with well-developed welfare states and high overall elderly living standards, the share of the elderly living in relative poverty remains high. As the generosity of public pension systems is scaled back in the future, the urgency of strengthening floors of old-age poverty protection will grow. We divide countries into the four priority groups according to their relative elderly poverty rates: under 10 percent (no stars), 10 to 20 percent (one star), 20 to 25 percent (two stars), and over 25 percent (three stars).

Reducing elderly poverty is understandably a high priority in some emerging markets. The three-star group includes three countries—Korea, China, and Mexico—that must rush to put in place universal backstops against destitution in old age before their age waves roll in. Although there are no fully developed economies in the three-star group, there are, surprisingly, four in the two-star group: Spain, the United States, Japan, and Australia. In the future, all will need to redirect some savings from reductions in benefits to the higher-income elderly to improving targeted poverty protection for the lower-income elderly. As for the countries that currently have low elderly poverty rates, they will have to be attentive that poverty does not increase as the generosity of old-age benefit systems is reduced.

Increase Fertility Rates

Throughout this report, we have assumed that each country's demographic trajectory is locked in and that societies must ultimately adjust to the degree of population aging they face. It may be possible, however, for a country to alter that trajectory by raising its fertility rate. Higher birthrates would do little to reduce the magnitude of the aging challenge over the Index's thirty-year projection horizon, but in the longer-term nothing would do more to lower the old-age dependency burden in today's fastest-aging countries.

In assessing the importance of this strategy, we divide countries into the four priority groups as follows: those with a fertility rate of 2.0 or higher (no stars), those with rates between 1.8 and 2.0 (one star), those with rates between 1.5 and 1.8 (two stars), and those with rates under 1.5 (three stars). These divisions are not entirely arbitrary. Countries with replacement-rate fertility do not need to increase birthrates since the elderly share of their populations will stabilize at a sustainable level. Countries in the 1.8 to 2.0 range face a steeper aging trend, but one that can be mitigated by relatively modest levels of net immigration. A fertility rate under 1.8 is probably a cause for concern—and a rate under 1.5 will lead to extreme aging and rapid population decline. What is most striking is how many of the Index countries are in the danger zone. Eleven have fertility rates under 1.8 and eight have fertility rates under 1.5. Only three have fertility rates that are at or above replacement: the United States, Mexico, and India.

There is no certain policy formula for raising birthrates. The experience of countries that have instituted pronatal policies, however, offers some useful lessons. What experience teaches is that one-off incentives like cash "baby bonuses" alone have little effect. They may change the timing of births, but are unlikely to increase the average lifetime number that women have. What works are policies that help women balance jobs and babies. These can take the form of a comprehensive package of cash benefits, subsidized daycare, paid maternity leave, and job guarantees like those in France and Sweden, both of which have fertility rates in the 1.8 to 2.0 range. Large and expensive public programs, however, are not necessarily required. The United States and the UK also have relatively high fertility rates even though they spend little on family benefits. The explanation lies in the structure of their economies, and especially their labor markets. Young people find it easier to launch careers and establish independent households than in most other countries, while women who wish to raise families find it easier to exit and re-enter employment.

Some readers may worry that higher birthrates will reduce female labor-force participation, thus undercutting the long-term economic benefits of this strategy. But in fact, in today's world it is generally the countries with the highest fertility rates that have the highest female labor-force participation rates. When countries make it easier for women to do both, they tend to get more of both. On the other hand, countries like Italy, Japan, and Korea, whose more traditional workplace and family cultures make it difficult for women to balance jobs and family, end up with both low fertility and low female labor-force participation.

Increase Immigration

Higher net immigration functions much like a higher birthrate, but without the lag. Since immigrants tend to be disproportionately young adults, they boost the ratio of the working-age population to the elderly in the destination country and thus slow the aging of its population, at least for a while. The catch, of course, is that the immigrants themselves ultimately grow old—which means that for increased immigration to permanently alter the age structure of the population the new higher immigration rate must be permanent as well.

The potential payoff of the immigration strategy depends both on a country's current immigration rate and its projected degree of population aging. Countries with relatively low net immigration rates and a high projected degree of aging would benefit the most from an increase. In the reform guide, three countries fall into this three-star group: Germany, Japan, and Korea. Countries that have a high projected degree of aging but already have high immigration rates might still benefit significantly from an increase—but obviously less. This two-star group includes Italy, Poland, the Netherlands, and Spain. At the other end of the spectrum, countries that have high immigration rates and a low projected degree of aging would benefit the least from an increase. This no-star group includes Australia, Sweden, the UK, and the United States. The notes to Table 18 explain how countries were divided into the four priority groups.

Countries that are able to leverage immigration effectively enjoy important demographic and economic advantages. Canada, which has in effect made high levels of skilled immigration the centerpiece of its aging strategy, is perhaps the most striking example. Without immigration, its demographic future would resemble Germany's; with immigration, it looks more like Sweden's. Australia and the United States, the other two traditional "immigration countries," also benefit enormously from the infusion of new energy and talent that migrants bring. In principle, so could most of today's low-immigration developed countries—and in the future, a growing number of emerging markets as well. Russia's working-age population is already declining and Poland's will soon be declining. Within a decade, China and Korea will also have contracting working-age populations. Even Brazil, Chile, and Mexico face long-term demographic stagnation. Indeed, among the Index's

low-immigration countries, only India, with its very mild aging trend, would seem to have little to gain.

At the same time, it is important to recognize that immigration is a strategy with limitations. To begin with, some countries are culturally and economically better prepared to assimilate migrants than others. Actually arresting the aging trend in today's fastest-aging countries, moreover, would require vast increases in immigration over today's levels. Even a tripling in Germany's net immigration rate would not solve its aging problem. What it would do is to fundamentally change the composition of Germany's population. By 2050, roughly 30 percent of Germans would be new post-2010 immigrants or their descendants.

Conclusion

Clearly, global aging poses a daunting economic and social challenge. Many fast-aging countries, especially in the developed world, seem to face a choice between relieving the growing fiscal burden on the young and maintaining adequate incomes for the old. Meanwhile, in many developing countries, the choice seems to be just the opposite: whether to impose a new fiscal burden on the young in order to relieve the growing vulnerability of the old.

Yet just as clearly, there are many strategies available to address the challenge—and not all involve painful trade-offs. Two in particular, extending work lives and increasing funded retirement savings, can be win-win solutions that help provide the old the security that they have earned while ensuring the young the future of expanding economic opportunity that they deserve.

Although this report has focused on the importance of government policy choices in confronting the aging challenge, businesses also have a critical role to play—by educating workers about retirement security, by encouraging long-term savings, and by restructuring their workplaces to accommodate older workers. As our societies age, individuals and families inevitably will also have to take greater personal responsibility in planning for old age.

With much of the world still reeling from the global economic crisis, many policy leaders may conclude that now is not the right time to address the long-term challenge of global aging. This would be a mistake. In fact, the economic crisis has made timely action even more urgent than before. On the one hand, the crisis has drastically reduced the room that many countries have to accommodate rising old-age dependency costs, and so has brought their day of fiscal reckoning forward. On the other hand, the market meltdown has left many elders more vulnerable. There is also the critical issue of confidence. Both the public and the markets increasingly worry that governments have lost control over their fiscal future. Taking credible steps to address the long-term aging challenge may thus be a necessary part of addressing the near-term economic challenge as well.

Technical Appendix

The appendix describes the projection model, the critical assumptions, and the most important data sources used in constructing the Global Aging Preparedness Index.

Projection Base and Horizon

The GAP Index projections extend from 2007 through the year 2040. We selected 2007 as the base year not only because it is the most recent year for which many data series are available, but also because we wanted to use a snapshot of the "present" that is not distorted by the current economic crisis when comparing near- and long-term indicator values. To the extent feasible, actual data for 2008 and 2009 are incorporated into the projection model. We selected 2040 as the projection horizon because the "demographic transition" in most Index countries will by then be largely complete. If we cut off the projections much before 2040, we would miss the era of swiftest aging, which in most countries will occur between the mid-2010s and the mid-2030s. If we extended the projections much beyond 2040, we would gain few new analytical insights—but would greatly increase the uncertainty of the Index results.

Demographic Scenario

Most of the basic demographic data used in the Index, both historical and projected, come from the UN Population Division and are published in *World Population Prospects*.[2] For all countries except India, we use the UN's "constant fertility" projection, which assumes that fertility rates in each country will remain unchanged at their 2005–2010 averages. We prefer this scenario to the UN's more commonly cited "medium variant" projection, which arbitrarily assumes that fertility rates in all countries will eventually converge at 1.85. There is no theoretical basis for the convergence assumption, and in fact fertility rates in most Index countries appear to have stabilized around their current levels. We make an exception for India because it is still in the early stages of the demographic transition and fertility rates are now falling rapidly. Here we use the UN's medium variant projection, which allows for a further decline. Both UN projections assume that life expectancy will continue to improve in the future, though at a slower pace than in the recent past. Both also assume that net immigration will continue at close to its recent historical average in most countries.

We believe that this scenario constitutes a prudent baseline for assessing the sustainability and

[2] *World Population Prospects: The 2008 Revision* (New York: UN Population Division, 2009).

adequacy of today's retirement systems. Although it is possible that fertility will rise or fall in some countries, there is little evidence (except in India) to suggest that large changes in current behavior are imminent. All demographers agree that longevity will continue to rise in the future absent a pandemic or other global catastrophe—and indeed, some believe that it may rise faster than the UN projects. Future immigration levels are admittedly highly uncertain. In the past, net immigration has risen and fallen sharply in many countries, sometimes over the span of just a few years. It may do so again. Because immigration is both more volatile and more dependent on policy choices than the other two variables, however, demographers cannot project changes in its magnitude or direction with any confidence. Without a crystal ball, the most prudent baseline assumption is that current law and current practice will continue.

Economic Scenario

The Index's long-term economic projections are based on a standard global GDP model developed by CSIS. We transition to the long-term model as follows. For 2008 and 2009, we use actual data for employment, productivity, and GDP in each country. For 2010 and 2011, we follow the near-term GDP projections published by the OECD (Economic Outlook Database, November 2009) or, for non-OECD members, projections published by the IMF (World Economic Outlook Database, October 2009). Between 2012 and 2015, we assume that the economic performance of each country returns to pre-crisis "normalcy," at which point our long-term model kicks in. Specifically, we assume that employment rates and productivity growth rates return to their averages for 2000–2007, which for most Index countries roughly corresponds to the last full business cycle.

The long-term model projects GDP beyond 2015 based on three critical assumptions. (1) The model assumes that age- and sex-specific labor-force participation rates will, with one important exception, remain unchanged. The exception involves older workers aged 50-74, whose participation rates are assumed to rise in some countries due both to cohort effects and to policy reforms that are scheduled to increase retirement ages. (2) The model assumes that productivity growth—that is, growth in real GDP per employed person—will tend to converge across countries as gaps in stage of development and per capita income narrow. GDP per employed person is initially assumed to grow at the pre-crisis historical average in each country, which is estimated as the slope in log real GDP per employed person between 2000 and 2007. The growth rate in GDP per employed person in each country is then assumed to converge gradually (up or down) to 1.5 percent per year, or roughly the developed-country average over the past twenty-five years. Specifically, the gap between the initial productivity growth rate in each country and the developed-country historical average is cut in half every fifteen years. (3) In addition to growth-rate convergence, the model also allows for some convergence in the absolute level of GDP per employed person across countries. Each year, the gap between the level in each country and the level in the United States is assumed to narrow by 1 percent.

The long-term GDP model uses a fixed-scenario projection framework with no economic feedbacks. The advantage of this framework is its simplicity and transparency. The potential disadvantage is that it ignores the impact of shifts in population age structure and fiscal policy on savings, investment, and productivity growth. Since none of our indicators directly compare absolute levels of GDP or GDP per capita across countries, however, this limitation—and indeed, the overall specification of our GDP scenario—does not have a decisive impact on the Index results.

Fiscal Scenario

Just as with our economic projections, our fiscal projections assume a near-term transition back to pre-crisis normalcy before our long-term model kicks in. For 2008 and 2009, we use actual fiscal

data for revenues, expenditures, and debt in each country. For 2010 and 2011, we follow the near-term projections published by the OECD or, for non-OECD members, projections published by the IMF or national governments.[3] Between 2012 and 2015, we assume that total government spending in each country will trend back to its 2007 level—or, more precisely, to its 2007 level plus or minus any projected change in public benefit spending. Similarly, we assume that total government revenue in each country will trend back to its 2007 level plus or minus an assumed tax adjustment equal to the projected change in benefit spending.

Once the near-term transition is complete, we make two critical long-term assumptions, both designed to isolate the impact of demographic aging on the future fiscal burden in each country. The first is that, beginning in 2015, each country adopts a policy of "debt neutrality"—that is, each country moves to a government deficit (or surplus) which, when continued unchanged as a share of GDP, would keep net government debt unchanged as a share of GDP. We assume that each country will achieve its new budget balance by an increase (or decrease) in taxes combined with an equal decrease (or increase) in nonbenefit spending. The second assumption is that, once debt neutrality is achieved, nonbenefit government spending will remain constant as a share of GDP and taxes will be raised (or lowered) in each future year in accordance with the projected change in benefit spending. This assumption is relaxed for two indicators—the "budget room" and "borrowing room" indicators—where the object is to assess the feasibility of alternative means of paying for the growth in old-age benefits.

The model includes three basic types of taxes: payroll taxes, direct taxes, and indirect taxes. In apportioning future tax changes between the three categories, we follow two simple rules. We first assume that payroll taxes will be raised such that they pay for the same proportion of total public benefits in the future that they do today. Additional taxes are then divided between direct and indirect taxes in proportion to their shares in total taxation today. We considered projecting each country's specific tax rules, but deferred any attempt to a future edition of the Index because of the complexity of the task.

Public Benefit Projections

The Index model divides public benefits into three categories: public pensions, health benefits, and other benefits. The public pension category includes all social insurance retirement and survivors benefits, means-tested retirement benefits, and government employee pensions—provided that they are financed primarily on a pay-as-you-go basis. If public pension systems are funded *and* benefits are personally owned or contractually based, they are considered to be economically equivalent to funded private pension systems and are included in the special funded pension category rather than in the public pension category. The health benefits category includes both acute care and long-term care. The other benefits category includes everything else, from disability benefits to unemployment and housing benefits.

For OECD members, most of the historical data for programs in the public pension and other benefits categories come from the OECD Social Expenditure Database (SOCX); the data for health benefits come from OECD Health Data. For non-OECD members, the data for the public pension and other benefits categories come from international organizations, national governments, and specialized studies;[4] the data for health benefits

[3] OECD Economic Outlook Database; IMF's World Economic Outlook Database; various issues of *OECD Economic Surveys* and *IMF Country Report;* and, for Brazil, China, Chile, India, Mexico, and Russia, data from the ministry of finance or statistical offices of national governments.

[4] **FOR BRAZIL:** *Anuário Estatístico da Previdência Social 2008* (Brasilia: Ministry of Social Welfare of Brazil and National Institute of Social Security, 2009); and CEPALSTAT, UN Economic Commission for Latin America and the Caribbean, http://www.eclac.org. **FOR CHILE:** Fiscal Statistics, Ministry of Finance of Chile, http://www.dipres.cl; Ángel Melguizo et al., "Pension Reform and Fiscal Policy: Some Lessons from Chile," BBVA Economic Research Department Working Papers no. 0915 (Santiago: BBVA, July 2009); and Alberto Arenas de Mesa et al., *Proyecciones Fiscales del Antiguo Sistema de Pensiones: Bono de Reconocimiento y Déficit Operacional 2010–2050* (Santiago: Ministry of Finance of Chile, December 2009). **FOR CHINA:** *Statistical Communiqué on Labor and Social Security Development* (various issues), Ministry of Human Resources and Social Security of China and National Bureau of Statistics of China, http://www.stats.gov.cn; National Bureau of Statistics of China, *China Statistical Yearbook 2009* (Beijing: China Statistics Press, 2009); and Yvonne Sin and Leslie Mao, "Hidden Pot of Gold: Responding to China's Pension Burden," CLSA-U Speaker Series (Shanghai: CLSA, October 2007). **FOR RUSSIA:**

come from the World Health Organization's World Health Statistics.

The Index includes separately modeled projections of public pension and health benefit spending for each of the twenty countries. For the other benefits category, where most programs are not directly affected by demographic aging, we make the simplifying assumption that spending will remain unchanged as a share of GDP.

Public Pensions

The public pension projections used in the Index are based on the benefit rules in effect in each country and take into account reforms that have been enacted but not yet phased in. For most countries, the projections reflect current law as of 2009, though in the case of the EU member countries they only take into account reform developments through 2007. Wherever possible we rely on official projections for public pension spending, but normalize them to our base-year data and sometimes adjust them to conform to the productivity and real-wage growth assumptions in our GDP scenario. When necessary, we make our own projections based on the best available data.

For the EU member countries (France, Germany, Italy, the Netherlands, Poland, Sweden, Spain, and the UK), we use the latest projections by the European Commission.[5] For Australia, Canada, Chile, Japan, Korea, Switzerland, and the United States, we use the latest projections by the respective national governments.[6] For India, Mexico, and Russia, the Index projections are based in part on projection data published by other researchers and in part on our own analysis.[7] For Brazil and China, we generated our own projections based on our assessment of how recent reforms in each country are likely to affect coverage, replacement rates, and retirement ages.

Health Benefits

The Index projections of public health benefit spending were prepared by CSIS using a standard methodology that is often employed by researchers, including those at the OECD. The methodology rests on two critical assumptions.

The first assumption is that current per capita ratios of health-care consumption by the old to health-care consumption by the young will remain unchanged in the future. The assumption represents a compromise between two competing models of aging and health: the "compression of morbidity" model, which predicts that rising longevity will be accompanied by a falling incidence of morbidity at older ages, and the "failure of success" model, which predicts just the opposite. The age-bracket data used to calculate these ratios come from a variety of sources, including national

Statistical Yearbook of Russia 2009 (Moscow: Federal State Statistics Service of Russia, December 2009); and Evsey Gurvich, "The Future of Russia's Pension System," *Problems of Economic Transition* 50, no. 9 (January 2008), 66–104. **FOR INDIA:** *World Social Security Report 2010: Providing Coverage in the Time of Crisis and Beyond* (Geneva: ILO, April 2010); and Gautam Bhardwaj and Surendra A. Dave, "Towards Estimating India's Implicit Pension Debt" (paper presented at the Second International Workshop on The Balance Sheet of Social Security Pensions, Tokyo, December 15, 2005).

[5] "Pension Schemes and Pension Projections in the EU-27 Member States: 2008–2060," European Economy, Occasional Papers no. 56 (Brussels: European Commission, October 2009).

[6] **FOR AUSTRALIA**: Australian Commonwealth Treasury, *Australia to 2050: Future Challenges. The 2010 Intergenerational Report* (Canberra: Commonwealth of Australia, January 2010). **FOR CANADA**: Office of the Chief Actuary of Canada, *Actuarial Report (8th) on the Old Age Security Program, as at 31 December 2006* (Ottawa: Office of the Superintendent of Financial Institutions of Canada, May 2008); Office of the Chief Actuary of Canada, *Actuarial Report (23rd and 24th) on the Canada Pension Plan, as at 31 December 2006* (Ottawa: Office of the Superintendent of Financial Institutions of Canada, October 2007 and October 2009); and *Mise à jour au 31 décembre 2008 de l'Analyse actuarielle du Régime de rentes du Québec au 31 décembre 2006* (Quebec City: Regie des Rentes du Québec, July 2009). **FOR CHILE**: Alberto Arenas de Mesa et al., *Proyecciones Fiscales del Antiguo Sistema de Pensiones: Bono de Reconocimiento y Déficit Operacional 2010–2050* (Santiago: Ministry of Finance of Chile, December 2009). **FOR JAPAN**: *The 2009 Actuarial Valuation of the Employees' Pension Insurance and the National Pension* (Tokyo: Ministry of Health, Labor, and Welfare of Japan, March 2010); *The 2009 Actuarial Valuation of the Mutual Aid Association Pension* (Tokyo: Pension Fund Association for Local Government Officials, July 2009); and Mutual Aid Association for Private School Teachers, "The 2009 Actuarial Valuation of the Mutual Aid Association Pension," *Letter* 72, no. 638 (March 2010), 6–8. **FOR KOREA**: *The 2008 Actuarial Valuation of the National Pension Scheme* (Seoul: Actuarial Valuation Committee of the National Pension Scheme, November 2008); and unpublished projection data for Korea's pension systems for civil servants, military personnel, and school teachers made available to CSIS by the Korea Institute of Public Finance. **FOR SWITZERLAND**: Swiss Federal Council, *Aktualisierung der Berechnungsgrundlagen zur Erstellung von Perspektivrechnungen in der AHV*, January 28, 2009. **FOR THE UNITED STATES**: U.S. Social Security Administration, *The 2009 Annual Report of the Board of Trustees of the Federal Old-Age and Survivors Insurance and Federal Disability Insurance Trust Funds* (Washington, DC: U.S. Government Printing Office, 2009); Single-Year Tables Consistent with 2009 OASDI Trustees Report, U.S. Social Security Administration, 2009, http://www.ssa.gov/OACT/TR/2009/lrIndex.html; *Annual Report of the Board of Actuaries: Civil Service Retirement and Disability Fund, Fiscal Year 2009* (Washington, DC: U.S. Office of Personnel Management, February 2010); *The Budget and Economic Outlook: Fiscal Years 2010 to 2020* (Washington, DC: U.S. Congressional Budget Office, January 2010); *Valuation of the Military Retirement System* (Washington, DC: Office of the Actuary, U.S. Department of Defense, December 2009).

[7] **FOR INDIA**: Gautam Bhardwaj and Surendra A. Dave, "Towards Estimating India's Implicit Pension Debt" (paper presented at the Second International Workshop on The Balance Sheet of Social Security Pensions, Tokyo, December 15, 2005). **FOR MEXICO**: Adolfo Albo et al., *Toward the Strengthening of the Pension Systems in Mexico: Vision and Reform Proposals* (Mexico City: BBVA, 2008). **FOR RUSSIA**: Evsey Gurvich, "The Future of Russia's Pension System," *Problems of Economic Transition* 50, no. 9 (January 2008), 66–104.

government publications[8] and unpublished tabulations made available to CSIS by the OECD Economics Department, the European Commission, and the UN Department of Economic and Social Affairs. For those countries where no age-bracket data were available (Chile, India, Mexico, Russia, and Switzerland), we use the averages for the other Index countries.

The second critical assumption is that the growth rate in real age-adjusted per capita health-care spending will tend to converge across countries. In our projections, we assume that this "excess cost growth" will initially equal its average historical rate in each country over the past twenty-five years, but that it will converge by 2040 to the rate of growth in real GDP per capita plus 0.5 percent, or roughly the twenty-five-year historical average for *all* developed countries. Although complete convergence may be unrealistic, it seems reasonable to expect a significant narrowing in current growth-rate differentials. On the one hand, health-care spending must eventually slow in high-growth countries like the United States or else crowd all other consumption out of GDP. On the other hand, as affluence and expectations rise, governments in countries that now spend relatively little on health care may find it harder to control costs.

In addition to convergence in growth rates, our projections allow for an accelerated "catch up" in the absolute level of GDP dedicated to health-care consumption in low-spending emerging markets. Specifically, we assume that if total personal health-care spending as a share of GDP in a country is less than two-thirds of the developed-country average, the gap will narrow by 5 percent per year until spending reaches two-thirds of the developed-country average. This level-convergence assumption affects six countries: Chile, China, India, Mexico, Poland, and Russia.

Projections of health-care spending are particularly sensitive to assumptions about excess cost growth. To get some sense of the possible range of outcomes, we modeled two alternative scenarios—one in which excess cost growth converges to the rate of per capita GDP growth by 2040 and one in which it continues indefinitely at its historical average in each country. (See Table 19, on page 59.) Under the first alternative, which can be characterized as a "cost containment" scenario, public health benefit spending on the elderly is projected to be at least somewhat less than under the baseline in all countries, with the largest difference—minus 0.7 percent of GDP—registered in Canada, France, the Netherlands, and the United States. Under the second "no convergence" alternative, there is a wider range of outcomes: from plus 1.8 percent of GDP relative to baseline in the United States to minus 1.0 percent of GDP in Japan and Sweden.

Funded Pension Projections

Like public pensions and health benefits, funded pensions are not only an important source of retirement income, but one that is directly affected by demographic aging. The Index therefore includes separately modeled projections of funded pension benefits for each country. The Index definition of funded pensions is fairly broad. They include public programs and private programs, mandatory schemes and voluntary schemes, employer pensions and personal pensions, and annuities and lump-sum payments. Most of the historical data for funded pensions come from OECD and are published in *OECD Private Pensions Outlook*,[9] SOCX, and OECD.Stat. For those countries where OECD provides only partial data or does not provide any data at all, we also rely on data from national governments and specialized studies.[10]

[8] **FOR CANADA**: *National Health Expenditure Trends: 1975 to 2009* (Ottawa: Canadian Institute for Health Information, 2009). **FOR JAPAN**: Fiscal Year 2007 Overview of National Health Care Expenditure, Ministry of Health, Labor, and Welfare of Japan, September 2009, http://www.mhlw.go.jp/toukei/list/37-19.html. **FOR THE UNITED STATES**: National Health Expenditure Data, Centers for Medicare and Medicaid Services, February 2010, http://www.cms.gov/NationalHealthExpendData.

[9] *OECD Private Pensions Outlook 2008* (Paris: OECD, 2009).

[10] **FOR BRAZIL:** *Anuário Estatístico da Previdência Social 2008* (Brasilia: Ministry of Social Welfare of Brazil and National Institute of Social Security, 2009). **FOR CANADA:** Philip Cross and Joe Wilkinson, "What Does the Pension Satellite Account Tell about Canada's Pension System?" *Canadian Economic Observer* 22, no. 11 (November 2009); and CANSIM database, Statistics Canada, May 2010, http://cansim2.statcan.gc.ca. **FOR CHINA:** *Statistical Communiqué on Labor and*

In a few cases, we were able to use or adapt official projections. For the Netherlands, Spain, and Sweden, we use European Commission projections, adjusted in the case of defined-contribution plans to conform to our rate of return assumptions described below. For the UK, we use the projections by the recent Pensions Commission, but adjust them to conform to our rate of return assumptions and update them to reflect the new provision for automatic enrollment, which promises to increase participation. For Russia, we use another researcher's projection for the mandatory personal accounts system but made our own projection for voluntary pension plans. (For the sources for these projections, see the relevant country entries in footnote 10.)

For the other countries, we made our own projections, since there exist no official projections of funded pension benefits—and in many cases, no projections at all. Our projections build on the base-year numbers as follows. (1) We make a "cohort adjustment" to pension benefits to reflect the fact that, even apart from policy changes, rates of participation in some countries are rising rapidly among younger workers. (2) We make a "DB unwinding adjustment" to take into account ongoing shifts in funded pension coverage from defined-benefit to defined-contribution plans in some countries. (3) We make an "earnings maturation adjustment" to reflect the fact that, even assuming no change in participation rates, current per capita benefit levels often do not reflect ultimate benefit levels, because the current average retiree is receiving a benefit based on less than a full career. (4) We make a "policy adjustment" to take into account recent reforms in several countries, including Chile (the extension of mandatory coverage to the self-employed); India (the New Pension Scheme); Mexico (PensionISSSTE); and the UK (automatic enrollment). (5) Finally, we make a "demographic adjustment" to reflect the projected change in the ratio of active contributors to pensioners as countries age. This last adjustment naturally affects all twenty countries.

In the case of defined-contribution systems, projecting future pension benefits also required projecting average replacement rates. Our calculations assume that all contributions are invested in a globally diversified portfolio of stocks and bonds and earn a 4.5 percent real annual rate of return. Administrative charges are assumed to be equal to 0.5 percent of assets. Although our assumptions for real rates of return and administrative charges are stylized, the replacement rate calculations reflect projected real wage growth and life expectancy at the average retirement age in each country.

Elderly and Nonelderly Income

The Index model uses a two-step approach to calculate pre-tax and after-tax elderly and nonelderly income. We first derive totals for broad categories of income and taxation from aggregate data on the household and government sectors. We then allocate the economy-wide totals to the elderly and the nonelderly based, in most cases, on age-bracket data obtained from household income surveys. This approach allows us to take into account society's total economic resources, which are often greatly underreported in income surveys. It

Social Security Development (various issues), Ministry of Human Resources and Social Security of China and National Bureau of Statistics of China, http://www.stats.gov.cn. **FOR CHILE:** *Boletín Estadístico AIOS* (various issues), International Association of Latin American Pension Fund Supervisors (AIOS), http://www.aiosfp.org. **FOR GERMANY:** *Alterssicherungsbericht 2008* (Berlin: Federal Ministry of Labor and Social Affairs of Germany, November 2008); Jarna Bach-Othman, "Pension Contribution Level in Germany," Finnish Centre for Pensions Reviews, no. 11 (2009). **FOR INDIA:** *56th Annual Report 2008–2009* (New Delhi: Employees' Provident Fund Organization, 2009); and "Special Report: India's Pensions Future," *Investment & Pensions Asia* 4, no. 1 (January-February 2010), 22–29. **FOR ITALY, THE NETHERLANDS, POLAND, SPAIN, AND SWEDEN:** "Pension Schemes and Pension Projections in the EU-27 Member States: 2008–2060," European Economy, Occasional Papers no. 56 (Brussels: European Commission, October 2009). **FOR JAPAN AND KOREA:** Willem Adema and Maxime Ladaique, "How Expensive is the Welfare State?: Gross and Net Indicators in the OECD Social Expenditure Database (SOCX)," OECD Social, Employment and Migration Working Papers no. 92 (Paris: OECD, November 2009). **FOR RUSSIA:** *Statistical Yearbook of Russia 2009* (Moscow: Federal State Statistics Service of Russia, December 2009); and Evsey Gurvich, "The Future of Russia's Pension System," *Problems of Economic Transition* 50, no. 9 (January 2008), 66–104. **FOR THE UK:** *A New Pension Settlement for the Twenty-First Century: The Second Report of the Pensions Commission* (London: Pensions Commission, November 2005). **FOR THE UNITED STATES:** *EBRI Databook on Employee Benefits*, Employee Benefit Research Institute, January 2009, http://www.ebri.org; Historical Data, State & Local Public Retirement Systems, U.S. Census Bureau, http://www.census.gov/govs/retire/historical_data.html; *Private Pension Plan Bulletin Historical Tables and Graphs* (Washington, DC: U. S. Department of Labor, March 2010); "The U.S. Retirement Market 2009," Research Fundamentals 19, no. 3 (Washington, DC: Investment Company Institute, May 2010); and Alicia H. Munnell, Jean-Pierre Aubry, and Laura Quinby, "The Funding of State and Local Pensions: 2009–2013," Issue Brief no. 10 (Chestnut Hill, MA: Center for Retirement Research at Boston College, April 2010).

TABLE 19

Public Health Benefits to the Elderly, as a Percent of GDP in 2007 and 2040: Baseline versus Alternative "Excess Cost Growth" Scenarios*

Country		**Baseline:** Convergence to Per Capita GDP + 0.5%	**Alternative 1:** Convergence to Per Capita GDP + 0%	**Alternative 2:** No Convergence
	2007	2040	2040	2040
Australia	2.7	6.1	5.6	6.6
Brazil	1.4	5.4	5.0	6.3
Canada	3.6	7.7	7.0	7.3
Chile	1.1	3.3	3.0	3.1
China	0.6	2.3	2.1	2.4
France	4.5	9.2	8.5	10.0
Germany	4.1	7.3	6.7	6.4
India	0.2	0.9	0.9	0.8
Italy	3.4	6.7	6.1	6.6
Japan	4.0	7.0	6.4	6.0
Korea	1.3	5.4	5.0	6.0
Mexico	0.7	2.8	2.6	3.2
Netherlands	3.9	8.5	7.8	8.3
Poland	1.7	3.7	3.4	3.5
Russia	1.5	3.5	3.2	3.1
Spain	3.1	6.9	6.4	7.7
Sweden	4.9	6.7	6.2	5.7
Switzerland	3.4	7.6	7.0	8.3
UK	4.0	7.5	6.9	8.4
US	4.2	9.3	8.6	11.1

*Excess cost growth equals the growth rate in age-adjusted per capita spending minus the growth rate in per capita GDP.

also makes our measure of income consistent with our GDP-based projections of government benefits, taxes, and outlays.

Most of the aggregate data on income and taxation by type come from the national accounts for each country, though for some income categories we modify national account definitions and use data from other sources to supplement or substitute for national account data. For all of the OECD-member countries except Mexico, the national accounts come from the OECD.[11] For Brazil, China,

[11] *National Accounts of OECD Countries, 1996–2007, 2009 Edition* (Paris: OECD, 2009).

Mexico, and Russia, they come from the statistical offices of the respective national governments, while for India they come from the UN Statistics Division.[12] Except for China, Chile, India, and Japan, the household income surveys used to allocate income and taxation by age come from the Luxembourg Income Study (LIS) database. For the four countries not included in the LIS database, we rely on surveys published by national governments (Chile and Japan) or academic research projects (China and India).[13] The household income surveys also supply all of our data on household size and composition by age and marital status.

Income by Type

The Index model tracks five broad categories of income: employment income, asset income other than funded pension income, funded pension income, public benefits, and family transfers. The income categories are derived as follows.

Employment income is equal to total employee compensation, including the employer share of payroll taxes and employer contributions to pension and welfare plans, plus self-employment income. The data for employee compensation come directly from the national accounts. Self-employment income, which in the national account framework is a part of mixed income—that is, the combined return to capital and labor in unincorporated businesses—had to be estimated. We base our estimates on the total number of employed and self-employed workers in each country, which in most cases is available from the national accounts, and the ratio of average wage and salary to average self-employment income, which we derive from the household income surveys.

The Index asset income category is equal to national account mixed income plus national account property income, with the following adjustments. To avoid double-counting, we naturally subtract our estimate of self-employment income from mixed income. We also adjust national account property income to reflect our different treatment of funded pension and life insurance benefits. The national accounts count the annual internal return to funded pension plans and life insurance policies as current household income, but exclude benefit payments from current income since they are a return to prior-year savings. In the Index, however, we need to measure income actually received in retirement. We therefore subtract the internal return to pensions and life insurance from property income and add an estimate of life insurance benefits.[14] We also add funded pension benefit payments to the model—but, as already explained, these are treated as a separate income category rather than as part of asset income.

The Index treats funded pensions as a special class of assets because they are explicitly designed to provide retirement income, are often intended to substitute in whole or in part for pay-as-you-go public pension benefits, and are growing in importance in many countries. The types of pension plans included in this category, as well as the data sources utilized, have already been described under "Funded Pension Projections." Here we need simply add that the model assumes that increases in funded pension savings will be partially offset

[12] **FOR BRAZIL**: System of National Accounts: Brazil 2003–2007, Brazilian Institute of Geography and Statistics, 2009, http://www.ibge.gov.br. **FOR CHINA**: *China Statistical Yearbook* (Beijing: China Statistics Press, various years). **FOR INDIA**: National Accounts Official Country Data, UN Statistics Division, http://data.un.org. **FOR MEXICO**: *System of National Accounts of Mexico, 2003–2007, 2009 Edition* (Mexico City: National Institute of Statistics and Geography, 2009). **FOR RUSSIA**: National Accounts of Russia, 2001–2008, 2009 Edition, Federal State Statistics Service, http://www.gks.ru.

[13] **FOR CHILE:** National Socio-Economic Survey (CASEN) 2006, Ministry of Planning and Cooperation of Chile, http://www.mideplan.cl/casen. **FOR CHINA:** Li Shi, Chinese Household Income Project 2002, Inter-University Consortium for Political and Social Research, August 2009, http://www.icpsr.umich.edu. **FOR INDIA:** Sonalde Desai, Reeve Vanneman, and National Council of Applied Economic Research, India Human Development Survey (IHDS) 2005, Inter-University Consortium for Political and Social Research, June 2010, http://www.icpsr.umich.edu. **FOR JAPAN:** Unpublished tabulations from the Fiscal Year 2008 Comprehensive Survey of Living Conditions made available to CSIS by the Japanese Ministry of Health, Labor, and Welfare.

[14] Life insurance benefits here refer only to payments from long-term savings products. Payments from life insurance pension products are classified as part of the funded pension income category, while death benefits are not included in the model. We began with data for total life insurance claims paid, which for most countries are available from OECD Insurance Statistics, OECD, June 2010, http://stats.oecd.org. We then estimated the long-term savings component of total claims using data on claims by type of product from national life insurance associations, national regulatory agencies, and industry reports. The data come from *Quarterly Life Insurance Performance March 2010* (Sydney: Australian Prudential Regulation Authority, June 24, 2010); *Latin America Insurance Market Review: Focus on Brazil and Mexico* (London: Benfield Industry Analysis and Research, February 2007); *The European Life Insurance Markets in 2006, CEA Statistics no. 33* (Brussels: CEA, May 2008); *Statistical Abstract India 2007* (New Delhi: Central Statistical Organization of India, March 2008); Annual Statistics, Life Insurance Association of Japan, various years, http://www.seiho.or.jp; Annual Statistics, Korea Life Insurance Association, various years, http://www.klia.or.kr; *Facts and Figures 2010* (Zurich: Swiss Insurance Association, January 2010); *UK Insurance: Key Facts* (London: Association of British Insurers, September 2009); and *2009 Life Insurers Fact Book* (Washington, DC: ACLI, 2009).

by declines in other forms of household savings. The offset is assumed to be one-third. The other two-thirds of new pension savings will result in new national savings and new GDP. Since we do not use a general equilibrium model, however, we assume no further impact on national accounts or factor prices.

The public benefit income category consists of all government cash benefits, except those from funded personal account systems and funded public employee pension plans, as well as most quasi-cash and in-kind benefits, including, most importantly, government health benefits. In deriving the totals for this category, we use the social welfare expenditure and government budget data cited under "Public Benefit Projections" rather than national account data on social transfers, because these sources include programmatic detail and are consistent with our fiscal projections.

The family transfer category includes both intra-household and inter-household transfers from the nonelderly to the elderly and vice versa. Intra-household transfers, which in most countries are the more important category, are estimated based on the income-sharing rule described in the next subsection. Inter-household transfers are estimated based directly on family transfer data reported in the household income surveys. All family transfers in the Index are measured net—that is, they are calculated for each age group as the difference between the transfers that age group receives and the transfers it gives.

Income by Age

The Index model divides the totals for income and taxation between two age groups: the elderly (aged 60 and over) and the nonelderly (under age 60). The income of each age group refers to the income of individuals within that age group, with the exception of spouses of heads of households, who are considered to belong to the same age group as the head of household. In households containing both elderly and nonelderly persons who are not spouses, income is split between members of the two age groups according to the following rule. Half of the income of each person is assigned to the age group to which the person belongs, while the other half is shared between the two age groups according to each age group's share of total household capita.

Age-group shares for the elderly and nonelderly were calculated for the base year for total income and the following components of income: wages, self-employment income, funded pensions, asset income, public pensions, and other public benefits. These shares, which were derived from household survey data, were then used to allocate our model's aggregate income totals between the two age groups. Health benefits, which are not counted in the household surveys, were allocated using the data on per capita spending by age described under "Public Benefit Projections."

Allocating asset income by age presented a special challenge. The concept of asset income used in the Index is broader than the household survey concept. In addition to interest, dividends, and rents actually received by households, it also encompasses indirect financial returns that accrue to households as well as the return to capital in unincorporated enterprises. The types of asset income counted in household surveys, moreover, are more heavily skewed toward the elderly. We therefore allocated asset income as follows. We estimated, in each country, the share of total asset income accounted for by household-survey-type asset income and allocated it according to the household survey age-group shares for asset income. We then allocated the balance according to each age group's share of total income.

We also used household survey data to calculate income by type for each quintile of the elderly and nonelderly income distribution. The household income quintile data were then normalized to our model's aggregate income totals. This quintile distribution provided the basis for our projections of the ratio of median elderly to nonelderly income.

After-Tax Income

The Index model calculates the total tax burden borne by the elderly and the nonelderly in the base

year with the same two-step methodology used for income. Aggregate data for total taxes by type were first derived from the national accounts. The totals were then allocated to the elderly and nonelderly based on household survey data. For most countries, we were able to allocate direct taxes based on income tax data from the household surveys; in countries where the surveys did not report income tax data, we allocated direct taxes based on each age group's share of total income. Payroll taxes and indirect taxes were allocated based on each age group's share of earnings and total income, respectively. Note that our model makes the standard economic assumption that all taxes are ultimately borne by households. We therefore gross up pre-tax household income by indirect taxes and corporate taxes.

Income Projections

The projections for public benefits and funded pensions have already been described above. Except for the impact of the growth in funded pension income, the model makes the simplifying assumption that the two types of factor income—asset income from capital and earnings income from labor—will remain unchanged as a share of GDP. To divide projected income from different sources between the elderly and nonelderly, we adjust the initial base-year age-allocation shares in each future year to reflect shifts in the size of the elderly and nonelderly age groups. In other words, as the number of elderly grows relative to the number of nonelderly, so does their share of each income type. In the case of public pensions and funded pensions, we also adjust the age-allocation shares to reflect projected changes in retirement ages; in the case of employment income, we adjust them to reflect changes in labor-force participation rates. Health benefits are a special case: Since the projections described under "Public Benefit Projections" already divide total spending between the elderly and nonelderly, no additional adjustments are required.

This projection framework is designed to capture the impact of current retirement policies on the relative per capita income of the elderly and nonelderly. It does not, however, factor in the impact of possible cohort shifts in wage levels or asset ownership, which may be important in some countries. We plan to explore ways of adding these shifts to the model in future editions of the Index.

GAP Index Structure

The GAP Index consists of two separate subindices—the fiscal sustainability index and the income adequacy index. The subindices in turn are based on indicators grouped into distinct categories, each dealing with a different dimension of the challenge.

Fiscal Sustainability Index

- **CATEGORY ONE: PUBLIC BURDEN.** This category contains two indictors that measure the sheer magnitude of each country's projected public old-age dependency burden. Both indicators are weighted equally.
  - **BENEFIT LEVEL:** *Total public benefits to the elderly in 2040 as a percent of GDP.*
  - **BENEFIT GROWTH:** *The growth in total public benefits to the elderly as a percent of GDP from 2007 to 2040.*
- **CATEGORY TWO: FISCAL ROOM.** This category contains three indicators that measure each country's ability to accommodate the growth in its public old-age dependency burden by raising taxes, cutting other spending, or borrowing. All three indicators are weighted equally.
  - **TAX ROOM:** *Total government revenue in 2040 as a percent of GDP.* This indicator is based on our baseline scenario, which assumes that governments raise taxes to pay for all growth in public benefits. As throughout the Index, the projections assume that every country runs a debt-neutral fiscal balance beginning in 2015.

- **BUDGET ROOM:** *Total public benefits to the elderly in 2040 as a percent of government outlays.* This indicator is based on a special scenario which assumes that governments cut other spending to pay for all growth in public benefits. As throughout the Index, the projections assume that every country runs a debt-neutral fiscal balance beginning in 2015.
- **BORROWING ROOM:** *The net public debt in 2040 as a percent of GDP.* This indicator is based on a special scenario which assumes that governments borrow to pay for all growth in public benefits. As throughout the Index, the projections assume that every country runs a debt-neutral fiscal balance beginning in 2015.

CATEGORY THREE: BENEFIT DEPENDENCE. This category contains two indicators that measure how dependent the elderly in each country are on public benefits. The first "benefit share" indicator receives a two-thirds weight and the second "benefit cut" indicator a one-third weight.

- **BENEFIT SHARE:** *Total public benefits as a percent of elderly income: Average for 2007 to 2040.* The income measure used for this indicator includes public health benefits.
- **BENEFIT CUT:** *The percent of elderly households that would be pushed into poverty today by a 10 percent cut in public benefits.* The poverty threshold is defined as 50 percent of the median income for all households. Income excludes public health benefits and is calculated on an equivalized basis—that is, it takes into account economies of scale deriving from household size. The data refer to various years between 1999 and 2007.

Income Adequacy Index

CATEGORY ONE: TOTAL INCOME. This category contains two indicators that measure the overall level of and trend in the income of the elderly relative to the nonelderly in each country. Both indicators are weighted equally.

- **TOTAL INCOME LEVEL:** *The ratio of the average after-tax income of the elderly to the average after-tax income of the nonelderly in 2040.* The income measure used for this indicator includes public health benefits. In calculating per capita income, adults (elderly and nonelderly) receive a weight of one and children a weight of 0.5.
- **TOTAL INCOME TREND:** *The percent change in the ratio of the average after-tax income of the elderly to the average after-tax income of the nonelderly from 2007 to 2040.* The income measure used for this indicator includes public health benefits. In calculating per capita income, adults (elderly and nonelderly) receive a weight of one and children a weight of 0.5.

CATEGORY TWO: INCOME VULNERABILITY. This category contains three indicators—two that measure income adequacy for "middle class" elders in each country and one that measures the extent of elderly poverty. All three indicators are weighted equally.

- **MEDIAN INCOME LEVEL:** *The ratio of the median after-tax income of the elderly to the median after-tax income of the nonelderly in 2040.* The income measure used for this indicator excludes public health benefits. Median income refers to the third quintile of the elderly and nonelderly income distribution. In calculating per capita income, adults (elderly and nonelderly) receive a weight of one and children a weight of 0.5.
- **MEDIAN INCOME TREND:** *The percent change in the ratio of the median after-tax income of the elderly to the median after-tax income of the nonelderly from 2007 to 2040.* The income measure used for this indicator excludes public health benefits. Median income refers to the third quintile of the

elderly and nonelderly income distribution. In calculating per capita income, adults (elderly and nonelderly) receive a weight of one and children a weight of 0.5.

- **POVERTY LEVEL:** *Percent of the elderly with incomes beneath 50 percent of the median income for all persons in 2007 or the most recent available year*. Income excludes public health benefits and is calculated on an equivalized basis—that is, it takes into account economies of scale deriving from household size. The data refer to various years between 1999 and 2007.

CATEGORY THREE: FAMILY SUPPORT. This category contains two indicators that measure the robustness of family support networks in each country. The first "family ties" indicator receives a two-thirds weight and the second "family size" indicator a one-third weight.

- **FAMILY TIES:** *Percent of the elderly living in households with their adult children in 2007*. The indicator refers to elderly living with their adult children aged 20 or older, whether in the household of the elderly person or the household of the child.
- **FAMILY SIZE:** *Change in the average number of surviving children of the elderly from 2007 to 2040*. The indicator refers to median-aged elders—that is, to the elderly cohort at the midpoint of the elderly age distribution in each country in each year. It was calculated based on historical and projected life-table and age-specific fertility data from the UN Population Division and the U.S. Census Bureau's International Data Base (IDB).

Category and Overall Rankings

The GAP Index results are calculated as follows. (1) We first tabulate the results for individual indicators, ranked from one (best) to twenty (worst). (2) We then transform the indicator results into index values. For each indicator, the mean result is set to an index value of 50; results that lie above and below the mean by one standard deviation are set, respectively, to index values of 100 and zero. (3) We next combine the indicator index values into category scores using the indicator weights specified above. The category scores determine the category rankings. (4) Finally we combine the category scores into overall scores and rankings for each of the two subindices. In the fiscal sustainability index, the public burden category receives a weight of 40 percent, while the fiscal room and benefit dependence categories receive weights of 30 percent each. In the income adequacy index, the total income and income vulnerability categories receive a weight of 40 percent each, while the family support category receives a weight of 20 percent. As explained in the report, we do not combine the two subindices.

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