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The
Global
Aging
Preparedness
Index

SECOND EDITION

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PRUDENTIAL

ABOUT THE GLOBAL AGING PREPAREDNESS INDEX PROJECT

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 to focus attention on the need for constructive reform in confronting one of the defining challenges of the twenty-first century. The GAP Index, now in its second edition, is the centerpiece of an ongoing collaboration between CSIS and Prudential plc that includes periodic updates of the GAP Index itself, as well as in-depth country and issue studies. Supplemental data and analysis related to the GAP Index are available on the project website at gapindex.csis.org.

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Executive Summary

Global aging will affect every dimension of economic, social, and political life, from the shape of the family to the shape of the geopolitical order. Perhaps most fatefully, it could throw into question the ability of societies to provide a decent standard of living for the old without imposing a crushing burden on the young.

The purpose of the Global Aging Preparedness Index (or GAP Index), now in its second edition, is to provide a comprehensive assessment of the progress that countries worldwide 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 economies and a selection of economically important emerging markets. Its projections extend 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: a "fiscal sustainability index" and an "income adequacy index."

The fiscal sustainability index begins by looking at projections of government old-age benefit spending, including both pensions and health benefits—but then it goes further. It takes into account the differing fiscal room that

GAP Index Country Rankings and Change from First Edition Rankings

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

Note: Countries are ranked from best to worst.

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 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.

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

This new edition of the GAP Index completely updates the first edition that was published in 2010. Among its major findings are:

◪ *Very few countries have made significant additional progress in reducing the projected magnitude of their old-age dependency burdens.* In only five of the twenty countries is the total cost of public benefits to the elderly projected to be at least 10 percent less in 2040 than it was in the first edition of the GAP Index: Australia, India, Mexico, the Netherlands, and Spain. In more than half of the countries, the total cost of public benefits to the elderly is actually projected to be greater. The lack of progress is particularly worrisome because the fiscal room that most countries have to accommodate a growing old-age dependency burden has narrowed dramatically as the global economic and financial crisis has unfolded.

◪ *Although the country rankings are broadly similar in the first and second editions of the GAP Index, there are a few striking exceptions.* Japan, whose fiscal room to confront the global

aging challenge has all but evaporated over the past few years, sinks seven places on the fiscal sustainability index, from a ranking of eight to a ranking of fifteen. Poland, which is dismantling its funded pension system even as other countries are expanding theirs, sinks seven places on the income adequacy index, from a ranking of thirteen to a last-place ranking of twenty. India, where pension coverage is both lower and more slowly growing than in the other emerging markets, drops five places on the income adequacy index. Meanwhile China rises five places, from a ranking of eighteen to a ranking of thirteen, thanks in large part to the government's ambitious efforts to expand state pension coverage to migrant and rural workers. France and Italy also rise significantly on the income adequacy index, but here the shift is due more to the relative decline of other countries in the GAP Index than to any large absolute improvement of their own.

◪ *Many countries that do well on one dimension of "aging preparedness" do poorly on the other, meaning that there is often a stark trade-off between fiscal sustainability and income adequacy.* Three of the seven highest-ranking countries on the income adequacy index (the Netherlands, Brazil, and Germany) are among the seven lowest-ranking countries on the fiscal sustainability index. Three of the seven highest-ranking countries on the fiscal sustainability index (India, Mexico, and Russia) are among the seven lowest-ranking countries on the income adequacy index. Not surprisingly, it is the developed countries, with their mature welfare states, that tend to score better on income adequacy and the developing countries that tend to score better on fiscal sustainability.

◪ *There are also a few countries that fail to score well on either dimension of aging preparedness.* France, Italy, and Spain are among the five

lowest-ranking countries on the fiscal sustainability index, yet despite their heavy projected spending on old-age benefits barely rise to the middle of the income adequacy index. Then there is Japan, which ranks toward the bottom of both subindices. What these countries have in common is that they all have enacted deep reductions in the generosity of the public pension benefits that future retirees can expect to receive without filling in the resulting gap in elderly income with adequate alternative sources of income support. Yet despite the reductions, they still have such expensive old-age benefit systems and/or such rapidly aging populations that they remain on a fiscally unsustainable course. In short, their retirement systems are fast becoming both inadequate and unaffordable.

◨ *The good news is that some countries manage to score well on both income adequacy and fiscal sustainability.* Four countries—Australia, Canada, Chile, and Sweden—rank among the top ten countries on both subindices. These high performers tend to have modest pay-as-you-go state pension systems, which helps to ensure fiscal sustainability, and large funded pension systems and high rates of elderly labor-force participation, which helps to ensure income adequacy. The exception is Sweden, which scores toward the top of both subindices despite its large pay-as-you-go state pension system. Like France, Italy, and Spain, Sweden has enacted deep reductions in the future generosity of its public pension benefits. Unlike these counties, however, it is filling in the resulting gap in elderly income by extending work lives and increasing funded pension savings.

This contrast points to a crucial lesson. Most of the world's developed economies, as well as a few of its emerging markets, will have to make substantial reductions in the generosity of state retirement provision in order to alleviate the growing burden on the young. But unless reforms also ensure income adequacy for the old, the reductions may prove to be politically unsustainable. The elderly in most developed countries, after all, are highly dependent on government benefits. Unless reductions in these benefits are accompanied by reforms that help to develop alternative sources of income support, governments may well face a backlash from aging electorates.

In short, a successful retirement policy must be a balanced retirement policy. Two strategies in particular are crucial to balancing income adequacy and fiscal sustainability: extending work lives and increasing funded pension savings. Together, they offer the best means—indeed, the only means—for the world's aging societies to maintain the living standard of the old without imposing a steeply rising burden on the young.

Here the GAP Index offers some encouraging news. Although elderly labor-force participation rates remain very low in many countries, they have begun to rise rapidly in some—a trend being propelled in part by reforms that have shut down "no penalty" early retirement options and in part by shifts in generational attitudes. At the same time, from Germany with its "Riester Renten" and the UK with its "nest pensions" to China with its "enterprise annuities" and South Korea with its "corporate pensions," governments are putting in place new incentives aimed at increasing funded pension savings. The new GAP Index projections suggest that they are enjoying at least some success. In all but four countries, funded pension benefits are now projected to be as high or higher in 2040 as a share of both GDP and elderly income than they were in the first edition of the GAP Index.

In the end, meeting the global aging challenge may require fundamentally rethinking the role of government in retirement provision. As life spans and health spans have risen in recent decades, the onset of what functionally can be termed "old age" has drifted steadily upwards, and is no longer age 60 or even 65 in most countries. Yet a large share of government old-age benefits still flow to adults in their sixties—at least one-third

of public pension benefits in every country in the GAP Index and as much as two-thirds in some. As governments seek to reduce the rising cost of their old-age benefit systems, they would do well to focus cuts in public benefits on these "young elderly," while largely shielding the "old elderly," who are more dependent on those benefits, have lower incomes, are less able to work, and are at growing risk of outliving their savings. This is not just a question of enacting modest increases in retirement ages, but of refashioning the overall role of the state in retirement provision so that it serves as a retirement income backstop rather than a retirement income floor.

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 debating—and some have enacted—major reforms. Yet despite the progress, most countries are not ready to meet what is sure to be one of the defining challenges of the twenty-first century. It is in the hope of focusing attention on the need for constructive reform that we offer this new edition of the Global Aging Preparedness Index.

Acknowledgments

The authors have accumulated many debts while working on the second edition of *The Global Aging Preparedness Index* and are pleased to be able to acknowledge the most important here.

Above all, the authors are grateful to Prudential plc for funding the project and for helping to ensure its success in countless ways. In particular, they wish to thank John Murray (Group Communications Director) and Miles Celic (Director, Group Public Affairs & Policy) for their unflagging support; and Donald P. Kanak (Chairman, Prudential Corporation Asia), Paul Hancock (Former Regional Head of Institutional Business, Prudential Corporation Asia), and Thomas Hurley (Senior Vice President, Market Research & Strategic Development, Jackson National Life) for their insightful suggestions. They are also grateful to Namali Mackay (Head of International Relations), Méliné Svadjian (Senior Analyst, Public Affairs & Policy), and Robert Campbell (Manager, International Relations) for their invaluable assistance in shepherding the report through the production process and organizing its rollout.

James H. Graham II (Creative Director, Spark Media Group) deserves credit for the design of both the report and the project website. The authors are also grateful to their colleagues in the CSIS External Relations Department for their generous assistance. In particular, they would like to single out Andrew Schwartz (Vice President, External Relations), Ryan Sickles (Deputy Director, External Relations), and Alison Bours (Creative Director).

The authors also wish to thank the CSIS Global Aging Initiative's talented interns: Nathaniel Howe, who helped model the public and private pension projections; Claire Osborn, who prepared background material on recent retirement system reforms in all twenty countries; and Adrian Rajabi, who assisted in organizing the data output for both the report and the project website.

While the authors gratefully acknowledge the assistance they have received in preparing the report, they are solely responsible for its content.

An Introduction to the GAP Index

T he world stands on the threshold of a stunning demographic transformation. For most of history until well into the nineteenth century, the elderly—defined in this report as adults aged 60 and over—comprised only a tiny fraction of the population, never more than 5 percent in any country. In the developed world today, they comprise roughly 20 percent of the population. Three decades from now in 2040, that share is on track to reach 30 percent, and that is just the average. In Japan and the fastest-aging European countries, it will be approaching or even passing 40 percent. (See figure 1.)

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 will be nearly as old as the United States and China will be older. Meanwhile, South Korea will be vying with Spain, Germany, Italy, and Japan for the title of oldest country on earth.

The demographic transformation now sweeping the world will affect every dimension of economic, social, and political life. Perhaps most fatefully, it could throw into question the ability of societies to provide a decent standard of living for the old without imposing a crushing burden on the young.

Which countries are most prepared to meet the challenge? And which countries are least prepared? The Global Aging Preparedness Index (or GAP Index), developed by the Center for Stra-

tegic and International Studies, provides the first comprehensive quantitative assessment of the progress that countries worldwide are making in preparing for global aging, and particularly the old-age dependency dimension of the challenge.

Overview of the GAP Index Design

In recent years, global aging has become the focus of growing concern among policymakers, business leaders, and the broad public. In the developed world, much of this concern has centered on reducing the rising burden that government old-age benefit systems threaten to impose on the young. Most developed countries have universal pay-as-you-go state pension systems that were put in place in the early postwar era when workers were abundant and retirees were scarce, but

FIGURE 1

Elderly (Aged 60 & Over), as a Percent of the Population in 2010 and 2040

	2010	2040
India	8	15
Mexico	9	20
Brazil	10	23
Chile	13	26
US	18	26
Australia	19	27
Russia	18	28
UK	23	29
China	12	29
Sweden	25	30
France	23	30
Canada	20	31
Poland	19	33
Netherlands	22	33
Switzerland	23	37
Spain	22	38
South Korea	16	39
Germany	26	39
Italy	26	40
Japan	30	43
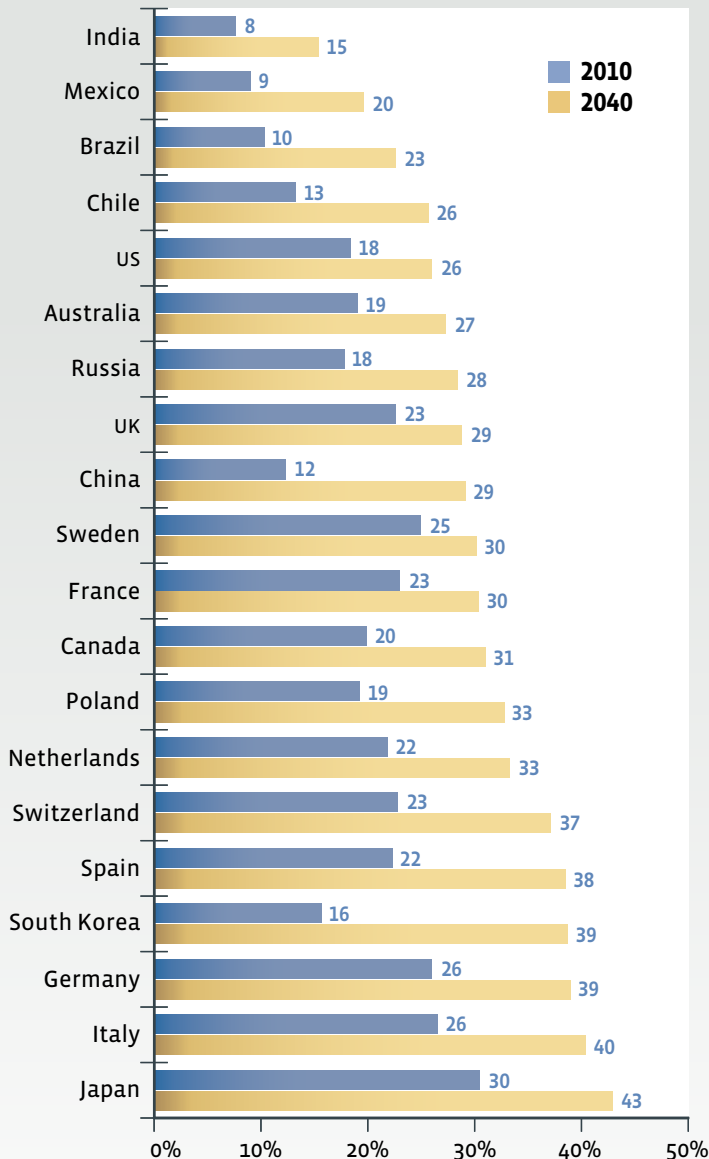
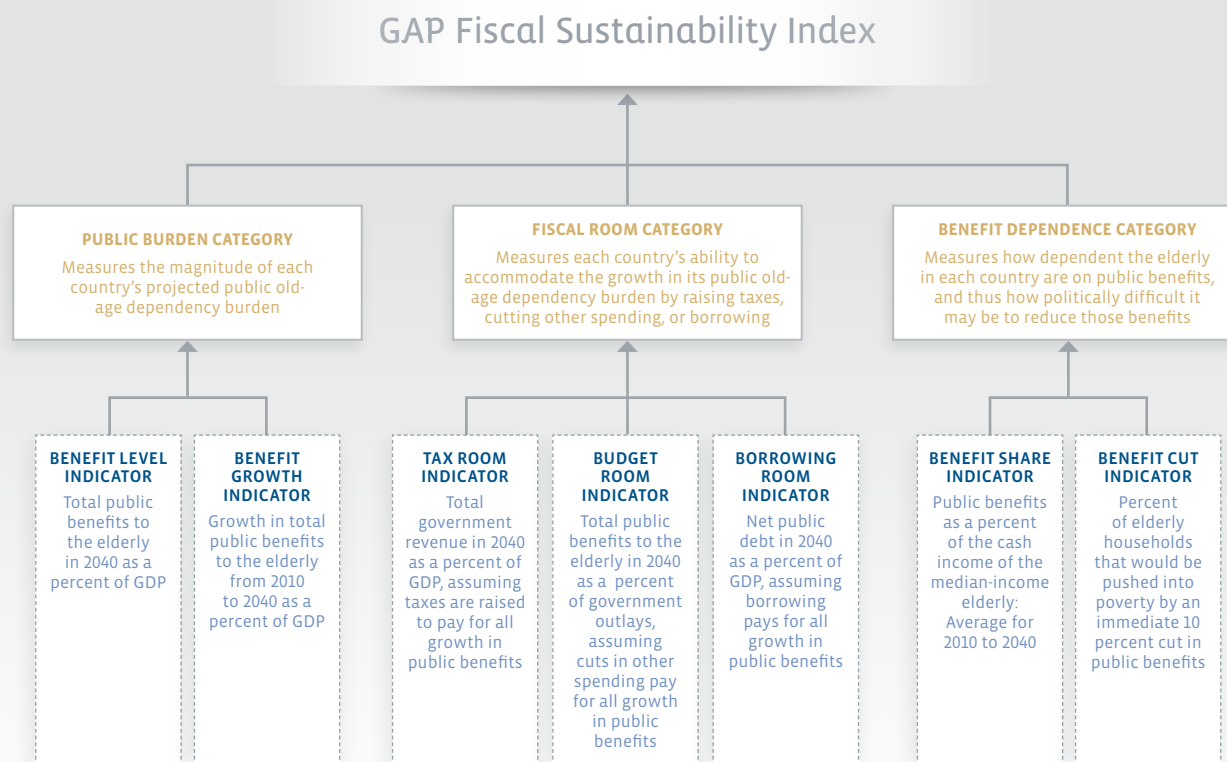which are now being rendered unsustainable by the rapid aging of their populations. Graying also means paying more for health care, because the elderly consume at least three times more per capita in acute-care services than the nonelderly and at least ten times more in long-term care services.

Faced with this daunting fiscal arithmetic, several developed countries, including France, Germany, Italy, Japan, Spain, and Sweden, have enacted deep reductions in the generosity of the public pension benefits that future retirees can expect to receive. Many are also beginning to raise retirement ages, extend work lives, and expand funded pension systems in order to take pressure off government budgets and help fill the gap in elderly income that will emerge as state retirement provision is scaled back.

The focus of concern in the developing world is often just the opposite. Although the rising cost of government old-age benefit systems poses a major challenge in a few countries, notably Brazil and South Korea, most emerging markets are aging before they have had time to put in place the full social protections of a modern welfare state. Here the central problem posed by global aging is not so much the growing burden on the young as it is the growing vulnerability of the old. In countries like China, India, and Mexico, only a fraction of the workforce is earning a benefit under any 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 family support networks on which elders depend are already under stress from the forces of modernization and will soon come under intense new demographic pressure as populations age and family size declines. In response, many countries are rushing to expand participation in formal retirement systems and to strengthen government floors of old-age poverty protection.

Yet despite the growing concern, there until recently existed no satisfactory measure of how effectively different countries are actually responding to the global aging challenge. The Global Aging Preparedness Index, now in its second edition, is

FIGURE 2

GAP Fiscal Sustainability Index

PUBLIC BURDEN CATEGORY
Measures the magnitude of each country's projected public old-age dependency burden

FISCAL ROOM CATEGORY
Measures 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 CATEGORY
Measures how dependent the elderly in each country are on public benefits, and thus how politically difficult it may be to reduce those benefits

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 2010 to 2040 as a percent of GDP

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 in 2040 as a percent of government outlays, 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

BENEFIT SHARE INDICATOR
Public benefits as a percent of the cash income of the median-income elderly: Average for 2010 to 2040

BENEFIT CUT INDICATOR
Percent of elderly households that would be pushed into poverty by an immediate 10 percent cut in public benefits
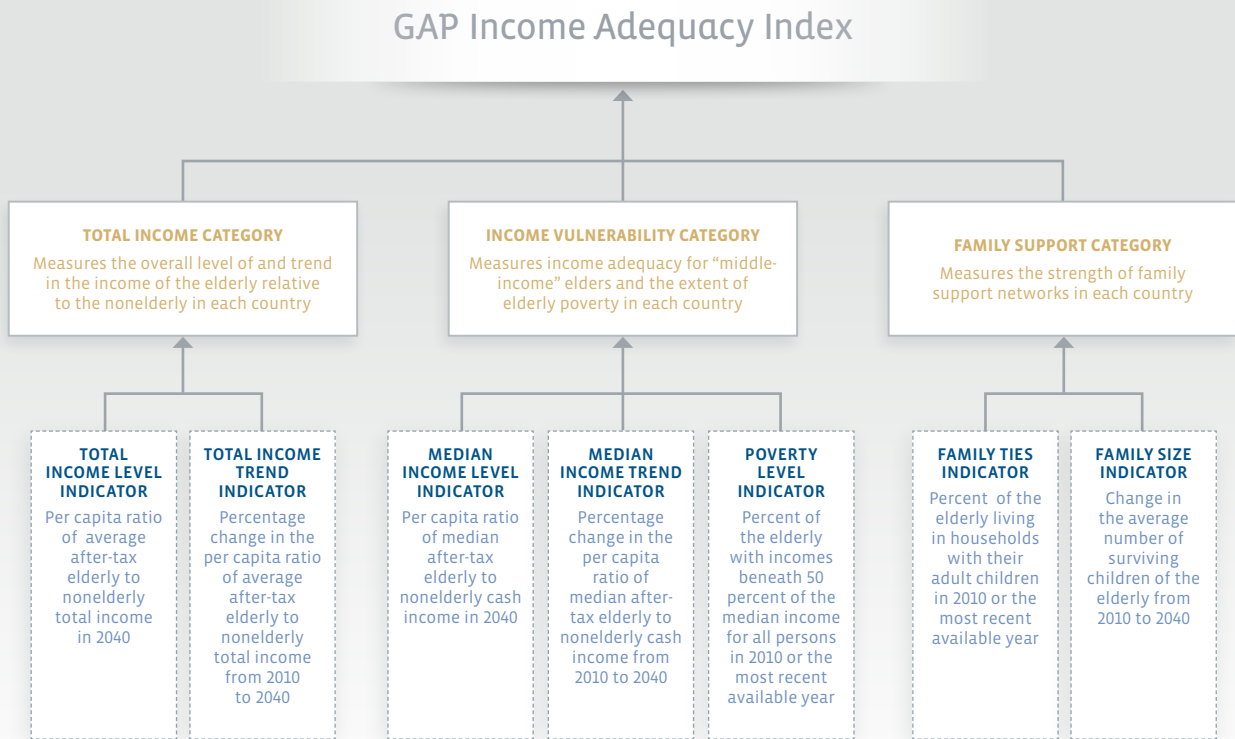
designed to fill this gap. The GAP Index is based on a long-term projection model that tracks trends in total government benefit spending and total after-tax household income by age. It covers twenty countries, including most major developed economies and a selection of economically important emerging markets for which adequate data exist. The Technical Appendix at the end of the report includes a detailed description of the GAP Index model and projection methodology, as well as a detailed explanation of how the results are calculated. Here we limit ourselves to giving a brief overview of the GAP Index design and to explaining a few critical assumptions, concepts, and definitions.

The GAP Index consists of two subindices: a fiscal sustainability index and an income adequacy index. These subindices in turn are based on indicators grouped into distinct categories, each dealing with a different aspect of the challenge. (See figures 2 and 3.)

On the fiscal side, the GAP Index includes three indicator categories: public burden, fiscal room, and benefit dependence. The public burden category measures the magnitude of each country's projected public old-age dependency burden—that is, the total cost of pay-as-you-go government benefits to the elderly, including pensions, health benefits, and other types of income

FIGURE 3

GAP Income Adequacy Index

TOTAL INCOME CATEGORY
Measures the overall level of and trend in the income of the elderly relative to the nonelderly in each country

INCOME VULNERABILITY CATEGORY
Measures income adequacy for "middle-income" elders and the extent of elderly poverty in each country

FAMILY SUPPORT CATEGORY
Measures the strength of family support networks in each country

TOTAL INCOME LEVEL INDICATOR
Per capita ratio of average after-tax elderly to nonelderly total income in 2040

TOTAL INCOME TREND INDICATOR
Percentage change in the per capita ratio of average after-tax elderly to nonelderly total income from 2010 to 2040

MEDIAN INCOME LEVEL INDICATOR
Per capita ratio of median after-tax elderly to nonelderly cash income in 2040

MEDIAN INCOME TREND INDICATOR
Percentage change in the per capita ratio of median after-tax elderly to nonelderly cash income from 2010 to 2040

POVERTY LEVEL INDICATOR
Percent of the elderly with incomes beneath 50 percent of the median income for all persons in 2010 or the most recent available year

FAMILY TIES INDICATOR
Percent of the elderly living in households with their adult children in 2010 or the most recent available year

FAMILY SIZE INDICATOR
Change in the average number of surviving children of the elderly from 2010 to 2040

support. The fiscal room category measures each country's ability to accommodate the growth in its public old-age dependency burden by raising taxes, cutting other spending, or borrowing. The benefit dependence category measures how dependent the elderly in each country are on government benefits, and thus how politically difficult it may be to enact cost-saving reforms—or indeed, to follow through on reforms that have already been enacted but not yet phased in.

On the adequacy side, there are also three indicator categories: total income, income vulnerability, and family support. The total income category measures the overall level of and trend in the living standard of the elderly relative to the nonelderly in each country based on projections that take into account changes in public benefit programs, funded pension provision, and elderly labor-force participation. The income vulnerability category measures the relative level of and trend in the living standard of "middle-income" elders, a group that will be disproportionately affected by changes in the generosity of retirement income systems, as well as the extent of elderly poverty. The family support category measures the strength of informal family support networks, which play a crucial role in retirement security in many emerging markets and some developed countries.

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 indicator index scores that preserve the indicator rankings, while also reflecting the relative distance of each ranked country, positively or negatively, from the "center of the pack." Finally, we combine the individual indicator scores into category scores and rankings and the category scores into overall scores and rankings for each of the two subindices that make up the GAP Index.[1]

It is important to understand that the GAP Index measures the performance of countries relative to each other rather than against some absolute standard of "aging preparedness." We considered establishing such a standard, but concluded that any benchmark we selected would be arbitrary. After all, 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 burden on workers is and the higher the relative living standard of retirees is, the more prepared the country is.

It is also important to understand that most of the GAP Index fiscal sustainability and income adequacy indicators are forward looking. The question that the GAP Index seeks to answer is not how large the old-age dependency burden is today in different countries, but rather how large it is likely to be tomorrow. Similarly, the question that the GAP Index seeks to answer is not how high the relative living standard of the elderly is today, but rather how high it is likely to be tomorrow. Within the GAP Index framework, it is not important that a country like France or Italy may be a retirees' paradise today. What matters is whether it will still be a retirees' paradise tomorrow.

Throughout the GAP Index, the "elderly" are defined as persons aged 60 and over and the "non-

elderly" as persons under age 60. This threshold between elderly and nonelderly may strike some readers as both arbitrary and early—and indeed it is. The threshold, however, is not meant to indicate anything about health, vigor, or capacity to work at older ages. Nor does it mean that the GAP Index assumes that all adults under age 60 work and that all adults over age 60 are retired. To the extent that the nonelderly do not work (because they are students or stay-at-home parents), the projections reflect this; to the extent that the elderly do work (because they are not retired or only semi-retired), the projections also reflect this. However, the GAP Index requires some fixed dividing line between young and old in order to compare inter-generational transfer burdens and relative income adequacy across countries and over time. Age 60 was chosen because it is close to the typical age of first entitlement to public retirement benefits in most countries in the GAP Index, and because large shares of these benefits flow to adults in their early and mid-sixties. If the threshold between young and old were set at age 65 or 70, we would seriously understate old-age dependency burdens.

The GAP Index projections extend through the year 2040. This time horizon was selected because the "demographic transition" in most 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 most rapid aging will take place between the mid-2010s and mid-2030s, as the collapse in fertility rates that has occurred over the past few decades hollows out the base of the population pyramid and the retirement of large postwar baby boom generations swells its peak. A country that can successfully navigate the demographic rapids over the next three decades will, presumably, be quite well 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.

....

[1] For further details on the calculation of the GAP Index rankings, including the weighting of indicators and indicator categories, see the Technical Appendix at the end of the report.

A special word about the GAP Index fiscal projections will be helpful in understanding the results. Our model initially follows the IMF's projections for each country, which extend through 2018. In the long term, we make two stylized assumptions whose purpose is to isolate the impact of aging on government budgets. The first is that each country will adopt a policy of "debt neutrality"—that is, each country will move 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. While unrealistic as a near-term forecast, debt neutrality is a standard assumption in long-term budget models. The second 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.

We considered making, but decided against, an exception to the debt-neutrality assumption for countries that are targeting sustained 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 general government surpluses raises serious questions about the feasibility of this strategy. Unless retirement savings is personally owned or contractually based, there is nothing to prevent governments from spending it or borrowing against it. In any case, only two of the twenty GAP Index countries—Canada and South Korea—are pursuing such a policy on a significant scale. While they may succeed where other countries have failed, the projected level of prefunding is modest compared with the projected size of their old-age dependency burdens. Even if it were factored into the projections, it would leave Canada's ranking in the fiscal sustainability index unchanged and would push up South Korea's by just three places. Naturally, it would have no impact on their rankings in the income adequacy index.

A special word about our definition of public benefits may also be helpful. The GAP Index model divides these benefits into three categories: public pensions, health benefits, and other benefits. The public pensions category includes all social insurance retirement and survivors benefits, all means-tested retirement benefits, and all government employee pension benefits—provided that the benefits are primarily financed on a pay-as-you-go basis. If public pension systems are fully funded *and* personally owned (as the personal accounts systems are in Chile, Mexico, Poland, and Sweden) or fully funded *and* contractually based (as government employee pensions are in a few countries), benefits are considered economically equivalent to funded private pension benefits and are not included in public benefits. 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 direct transfer burden on current workers. The health benefits category includes both acute-care services and long-term care services. The other benefits category includes everything else, from disability and unemployment benefits to nutritional and housing subsidies.

In calculating the GAP Index results, we assume that current retirement policy and behavior will remain unchanged. The projections fully reflect the future impact of retirement policy reforms that have already been enacted but are being phased in over time. They also incorporate predictable "cohort effects" in rates of pension receipt and labor-force participation. If coverage rates under public or private pension systems have been rising among younger workers, for instance, that increase in participation is ultimately reflected in a corresponding increase in pension receipt among the elderly. The projections, however, do not factor in additional possible policy or behavioral responses to global aging beyond those that are already in the pipeline. The GAP Index thus serves as a "stress test" of current retirement policies. Its purpose is not to forecast where countries will necessarily 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.

Overview of the GAP Index Findings

The second edition of the Global Aging Preparedness Index represents a thorough revision of the first edition. For most countries, it incorporates all important new retirement policy developments through the end of 2012. All of the demographic, economic, fiscal, and household income data that underlie the model have been updated. All of the projections, including those for public pensions, health benefits, and funded pension benefits, have also been revised. However, with a few exceptions noted in the Technical Appendix, the projection methodology and indicator definitions remain unchanged in order to ensure that the two editions are as comparable as possible.

We begin this overview of the GAP Index findings with a few broad observations about the progress that countries are making—or failing to make—in preparing for the global aging challenge. We then discuss the new GAP Index fiscal sustainability and income adequacy rankings and draw some key lessons for policymakers.

On the fiscal side, very few countries have made significant additional progress in reducing the projected magnitude of their old-age dependency burdens. In only five of the twenty countries is the total cost of public benefits to the elderly projected to be at least 10 percent less in 2040 than it was in the first edition of the GAP Index: Australia, India, Mexico, the Netherlands, and Spain. In more than half of the countries, the total cost of public benefits to the elderly is actually projected to be greater, in most cases because of more rapid expected growth in health-care spending. Moreover, in two countries—Germany and Japan—the future old-age dependency burden may turn out to be considerably larger than the latest GAP Index

projections suggest. Over the past few years, both countries have suspended the implementation of special "demographic stabilizers" in their public pension formulas that are designed to offset the impact of population aging on expenditures. Since it is not yet clear whether the suspensions are temporary or permanent, the effect of the stabilizers is still incorporated into our projections.

What makes this lack of progress particularly worrisome is that the fiscal room most countries have to accommodate a growing old-age dependency burden has narrowed dramatically as the global economic and financial crisis has unfolded. This is especially true in the developed world, where many countries have seen a huge run-up in their public debt. Between 2007 and 2012, the net public debt increased in every GAP Index country except Brazil, India, Sweden, and Switzerland. In France, it increased by 25 percent of GDP; in the United States, the UK, and Spain, by between 40 and 50 percent of GDP; and in Japan, by nearly 55 percent of GDP. A large public debt obviously limits the ability of governments to borrow to finance their rising old-age dependency burdens. To the extent that potential new revenues are precommitted to stabilizing or reducing the debt, it may also limit their ability to raise taxes for that purpose.

While very few countries have made significant progress on the fiscal sustainability front since the first edition of the GAP Index was published, there are two broadly positive trends under way that are beginning to shore up income adequacy in a growing number of countries—and that may ultimately lay the foundations for improved fiscal sustainability as well. The first trend is rising elderly labor-force participation, which is being propelled in part by reforms that have shut down "no penalty" early retirement options and in part by shifts in generational attitudes. To be sure, elderly labor-force participation remains very low in many countries—less than 15 percent as of 2010 in France, Germany, Italy, Poland, Russia, and Spain and less than 25 percent everywhere except Brazil, Chile, China, India, Japan, Mexico, South Korea, and the United States. Yet it is also

true that in many countries, especially in Europe, elderly labor-force participation rates are much higher today than they were just a decade ago. In fact, the only countries where elderly labor-force participation has not risen at all over the past decade are Italy, Poland, and Russia (where it remains very low) and Brazil, China, India, Japan, Mexico, and South Korea (where it has always been relatively high).

The second positive trend is the expansion of funded pension systems. From Germany with its "Riester Renten" and the UK with its "nest pensions" to China with its "enterprise annuities" and South Korea with its "corporate pensions," governments are putting in place new incentives aimed at increasing funded pension savings. The new GAP Index projections suggest that they are enjoying at least some success. Funded pension benefits are now projected to be as high or higher in 2040 as a share of both GDP and elderly income than they were in the first edition of the GAP Index in every country except Poland, the Netherlands, Spain, and Sweden. This may seem surprising given the enormous losses that pension funds suffered during the financial crisis. But fund balances in most countries have largely recovered from their recent lows. In any case, the long-term growth in funded pension benefits is being driven by a more fundamental development: rising participation rates among younger workers.

Table 1 presents the new GAP Index rankings for the fiscal sustainability and income adequacy indices. It also indicates the change (plus or minus) in each country's rankings from the first edition. A glance at the table reveals that the rankings of most countries are similar in the two editions—and that some have not changed at all. This is hardly surprising when one considers that large shifts in the long-term demographic and economic outlook are rare, and that major retirement policy reforms do not occur every year. Still, there are a few striking changes in the rankings that are worth noting.

Japan, whose fiscal room to confront the global aging challenge has all but evaporated over the past few years, sinks seven places on the fiscal sustainability index, from a ranking of eight to a ranking of fifteen. Poland, which is dismantling its funded pension system even as other countries are expanding theirs, sinks seven places on the income adequacy index, from a ranking of thirteen to a last-place ranking of twenty. India, where pension coverage is both lower and more slowly growing than in the other emerging markets, drops five places on the income adequacy index. Meanwhile China rises five places, from a ranking of eighteen to a ranking of thirteen, thanks in large part to the government's ambitious efforts to expand state pension coverage to migrant and rural workers. France and Italy also rise significantly on the income adequacy index, but here the shift is due more to the relative decline of other countries in the GAP Index than to any large absolute improvement of their own.

Stepping back and looking more broadly at the overall pattern of country rankings, there is some good news and some bad news for policymakers. The bad news is that many countries that do well on one dimension of aging preparedness do poorly on the other, meaning that there is often a stark trade-off between fiscal sustainability and income adequacy. Three of the seven highest-ranking countries on the income adequacy index (the Netherlands, Brazil, and Germany) are among the seven lowest-ranking countries on the fiscal sustainability index. Three of the seven highest-ranking countries on the fiscal sustainability index (India, Mexico, and Russia) are among the seven lowest-ranking countries on the income adequacy index.

Not surprisingly, it is the developing countries that tend to score better on fiscal sustainability and the developed countries that tend to score better on income adequacy. Among the seven highest-ranking countries on the fiscal sustainability index, only two—Australia and Sweden—are fully developed economies. Among the seven highest-ranking countries on the income adequacy index, only one—Brazil—is an emerging market. The poor adequacy performance of the emerging markets is explained in part by the fact that most have underdeveloped

TABLE 1

GAP Index Country Rankings and Change from First Edition Rankings

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

Note: Countries are ranked from best to worst.

welfare states. But there is also another dynamic at work in some countries. In today's developed economies, where productivity growth has been slow for decades, the old are frequently more affluent than the young. In rapidly developing economies, where large productivity gains have been pushing up wages and living standards cohort over cohort, the age tilt is often just the opposite. This is the case in most of East and South Asia, though not in Latin America, where economic growth has been slower.

There are also a few countries that fail to score well on either dimension of aging preparedness. France, Italy, and Spain are among the five lowest-ranking countries on the fiscal sustainability index, yet despite their heavy projected spending on old-age benefits barely rise to the middle of

the income adequacy index. Then there is Japan, which ranks toward the bottom of both subindices. What these countries have in common is that they all have enacted large reductions in the generosity of the public pension benefits that future retirees can expect to receive without filling in the resulting gap in elderly income with adequate alternative sources of income support. Yet despite the reductions, they still have such expensive old-age benefit systems and/or such rapidly aging populations that they remain on a fiscally unsustainable course. In short, their retirement systems are fast becoming both inadequate and unaffordable.

The good news is that some countries manage to score well on both income adequacy and fiscal sustainability. There are four countries—Australia, Canada, Chile, and Sweden—that rank among the top ten countries on both subindices. And one of them nearly makes it into the top five countries on both subindices: Australia.

These high performers tend to have modest pay-as-you-go state pension systems, which helps to ensure fiscal sustainability, and large funded pension systems and high rates of elderly labor-force participation, which helps to ensure income adequacy. Australia combines a means-tested floor of government old-age income support with a large, mandatory, and fully funded private pension system. Although some concerns about the adequacy of retirement protection for low earners remain, Australia appears to be on track to meet its aging challenge. Chile has a similar mix of retirement policies, at least since a landmark 2008 reform in which it introduced a means-tested "solidarity pension" to underpin its funded personal accounts system. Canada, with its modest state pension system and well-developed private pension system, also does a better job of balancing fiscal sustainability and income adequacy than do most countries. It is worth noting that the United States would also have ranked among the top ten countries on both subindices if its extraordinarily rapid rate of growth in health-care spending and large public debt had not dragged down its fiscal sustainability score.

The exception among the high-performing countries is Sweden, which scores toward the top of both subindices despite its large pay-as-you-go state pension system. The explanation lies partly in its relatively favorable demographics and partly in its very low projected rate of growth in health-care spending. But there is also another reason for its success. Like France, Italy, and Spain, Sweden has enacted deep reductions in the future generosity of its public pension benefits. Unlike these countries, however, it is filling in the resulting gap in elderly income by extending work lives and increasing funded pension savings. Although its projected old-age dependency burden remains high, it has been cut well beneath what it would otherwise be without undermining adequacy.

This contrast points to a crucial lesson. Most of the world's developed economies, as well as a few of its emerging markets, will have to make substantial reductions in the generosity of state retirement provision in order to alleviate the growing burden on the young. But unless reforms also ensure income adequacy for the old, the reductions may prove to be politically unsustainable. The elderly in most developed countries, after all, are highly dependent on government benefits. Even in the United States, with its traditions of limited government and financial self-reliance, roughly 40 percent of the cash income of the typical elderly household in the middle of the income distribution comes in the form of a government check. In some European countries, the share is over 70 percent. Unless reductions in state retirement provision are accompanied by reforms that at the same time help to develop alternative sources of income support, governments may well face a backlash from aging electorates, whose median age will exceed fifty by the 2030s in Japan and most European countries. In the long run, it may be no more feasible to have a retirement system that is fiscally sustainable but socially inadequate than it is to have a system that is socially adequate but fiscally unsustainable.

The example of the UK should be heeded by any country that believes the two dimensions of

aging preparedness can be divorced. In the 1980s, the UK switched the indexation of its state pension system from wages to prices, virtually flattening projected spending growth. At the time, many policy experts hailed the reform for its fiscal probity. However, as price indexing caused public pension benefits to decline steadily as a share of wages—and private pension provision failed to expand as expected—concerns about the reform grew. In 2007, amid an emerging consensus that current policy would ultimately impoverish the elderly, the government re-indexed its state pension system to wages. The UK now scores much better on income adequacy than it would have ten years ago, but it also scores much worse on fiscal sustainability.

In short, a successful retirement policy must be a balanced retirement policy. It is in the hope of focusing attention on the need for constructive reform that we offer this new edition of the Global Aging Preparedness Index. 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 distills some additional lessons for policymakers, while also deepening the analysis by examining differences in the adequacy outlook for the "young elderly" (aged 60–69) and the "old elderly" (aged 70 and over), a subject with important implications for the future direction of retirement policy.

The Fiscal Sustainability Index

The fiscal sustainability index is designed to measure the magnitude and affordability of the projected public old-age dependency burden in different countries, as well as the political risk that this burden may turn out to be larger than projected. The public burden indicators, which focus on the projected magnitude of the public 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 its current-law burden, are presented second. The benefit dependence indicators, which focus on how difficult it may be for countries to reduce that burden—or indeed, to keep it from rising even faster than current law would dictate—are presented last.

Category One: Public Burden

The public burden category includes two indicators that track the claim that government benefits to the elderly 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:** *Growth in total public benefits to the elderly from 2010 to 2040 as a percent of GDP*

As table 2 shows, the cost of public benefits to the elderly is projected to be much higher in most countries in 2040 than it is today. In 2010, just five of the twenty GAP Index countries had old-

age benefit burdens that equaled or exceeded 15 percent of GDP. By 2040, fourteen countries are projected to have burdens that large.

Not surprisingly, the emerging markets tend to score much better on this indicator than the developed countries. Most start out today with much lower public old-age benefit burdens, both because they still have relatively young populations and because coverage under their public benefit systems is far from universal. The exceptions are Poland and Russia, which have developed-world age profiles and universal, though less than generous welfare states, and Brazil, which, despite its still youthful demographics, spends more lavishly on public pensions than many developed countries. Moreover, though public benefits to the elderly are projected to grow rapidly in some emerging markets—roughly doubling as a

TABLE 2

Total Public Benefits to the Elderly, as a Percent of GDP, 2010–2040

Country Ranking		% of GDP				Country Ranking		% of GDP			
		2010	2020	2030	2040			2010	2020	2030	2040
1	India	1.9	2.4	2.5	**2.5**	11	UK	13.9	14.6	17.0	**18.9**
2	Mexico	2.9	3.5	4.1	**4.1**	12	Brazil	10.0	11.5	14.6	**19.3**
3	Chile	6.9	6.6	6.7	**7.2**	13	Sweden	15.2	16.7	18.4	**19.3**
4	Russia	8.2	9.3	10.1	**10.9**	14	Switzerland	10.4	12.4	15.9	**19.5**
5	China	3.4	5.5	8.0	**11.0**	15	Netherlands	10.2	12.9	17.0	**19.8**
6	Australia	9.1	10.3	12.0	**13.4**	16	Japan	15.1	16.6	17.9	**20.9**
7	Poland	11.7	13.5	14.7	**15.2**	17	Spain	13.9	16.1	18.9	**23.6**
8	Canada	9.3	11.8	14.2	**15.8**	18	Germany	17.0	18.4	21.9	**24.3**
9	South Korea	4.5	7.8	12.2	**16.2**	19	France	18.6	20.3	22.6	**24.3**
10	US	11.1	13.6	16.7	**18.5**	20	Italy	20.0	20.5	22.5	**25.7**

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

share of GDP in Brazil by 2040, roughly tripling in China, and nearly quadrupling in South Korea—most end up with relatively low burdens as well. In fact, only Brazil is projected to be among the ten highest-burden countries in 2040.

Although the developed countries as a whole perform worse than the emerging markets on this indicator, there is nonetheless a wide range of outcomes. Australia, Canada, and the United States, with their relatively favorable demographics and relatively modest welfare states, manage to score in the top half of the rankings, though in the case of the United States just barely. Japan, Spain, Germany, France, and Italy lie at the other end of the spectrum. Here, the combination of greater population aging and more generous welfare states is projected to push total public ben-efits to the elderly not just past 15 percent of GDP by 2040, but past 20 percent of GDP.

The composition of the projected public old-age dependency burden varies significantly across countries. In almost all countries, however, public pensions and other government cash benefits make up the lion's share of the burden. In only two countries—Canada and the United States—are health benefits projected to outweigh cash benefits in 2040. On the other hand, health benefits account for a disproportionate share of the growth in total public benefits to the elderly in most countries. And in one country—Chile—they account for more than 100 percent of the growth, since pensions and other cash benefits are actually projected to decline as a share of GDP.[2]

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[2] Tabulations of public benefit spending by type are available online at the project website: gapindex.csis.org. The website also contains additional reference data related to other indicators.

Turning to the benefit growth indicator, we can see that the country rankings are sometimes quite different than they are for the benefit level indicator. (See figure 4.) A few countries score much better on benefit level than they do on benefit growth. China ranks fifth on the benefit level indicator, but fifteenth on the benefit growth indicator. South Korea ranks ninth on the benefit level indicator, but twentieth on the benefit growth indicator. Although neither country spends heavily on old-age benefits today and neither is projected to be among the ten highest-spending countries in 2040, both will experience an explosive growth in their public old-age benefit burdens. This growth is due in part to the maturation of their state pension systems, as well as, in the case of China, to recent expansions in pension coverage. The biggest cost driver, however, is the extremely rapid aging of their populations. Between 2010 and 2040, the elderly share of the population is due to rise from 12 to 29 percent in China and from 16 to 39 percent in South Korea—larger increases than in any other GAP Index country.

Canada and the United States also score significantly better on benefit level than on benefit growth, though the difference in rankings is not as large as it is for China and South Korea. The worse performance of these two countries on the growth indicator is due in part to their comparatively high rate of growth in health-care spending. Once again, however, there is also an important demographic cost driver. Although Canada and the United States are not projected to age as much as most developed countries, their unusually large postwar baby booms mean that their aging will occur very rapidly. As these outsized generations cross the threshold of old age, they will push up public benefits to the elderly faster than in many higher-spending countries.

There are also a number of countries that score much better on benefit growth than on benefit level: Italy (eleven rankings higher), France (nine higher), Sweden (seven higher), Germany (five higher), and Japan (five higher). All of these countries have enacted major reforms of their state

FIGURE 4

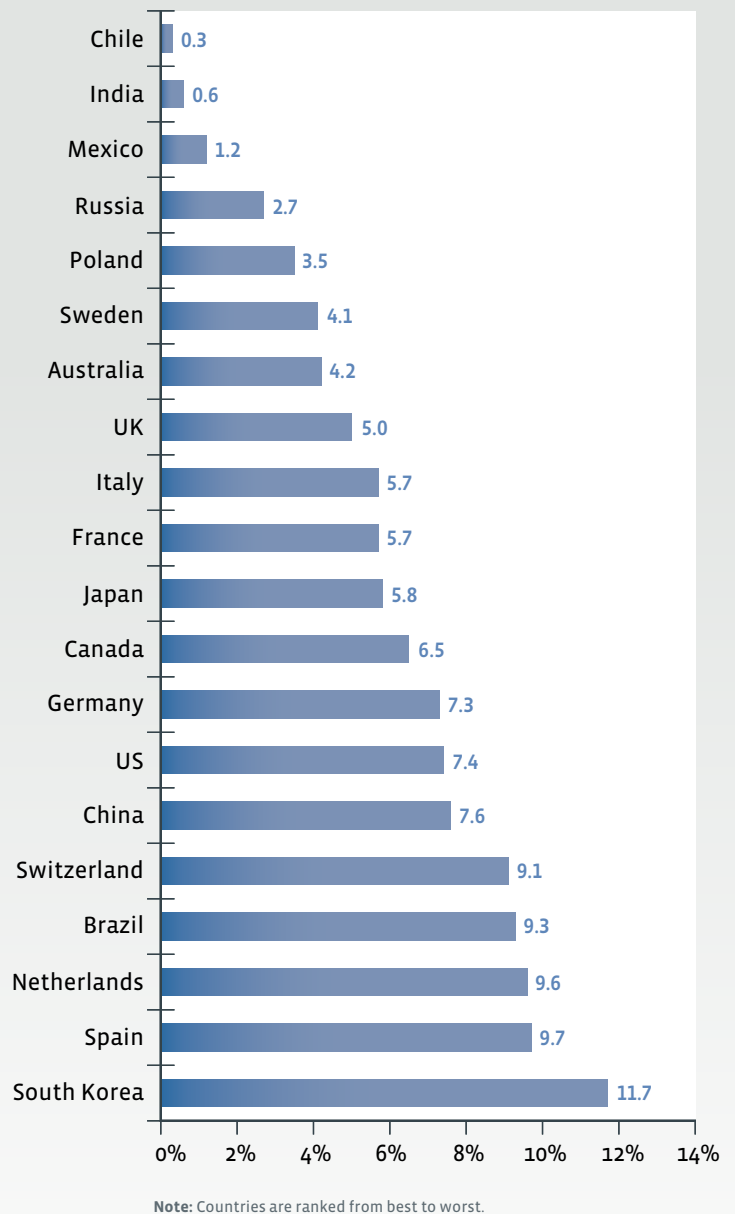## Growth in Total Public Benefits to the Elderly from 2010 to 2040 as a Percent of GDP

Country	Value
Chile	0.3
India	0.6
Mexico	1.2
Russia	2.7
Poland	3.5
Sweden	4.1
Australia	4.2
UK	5.0
Italy	5.7
France	5.7
Japan	5.8
Canada	6.5
Germany	7.3
US	7.4
China	7.6
Switzerland	9.1
Brazil	9.3
Netherlands	9.6
Spain	9.7
South Korea	11.7

Note: Countries are ranked from best to worst.

TABLE 3

Public Burden Category

Category Ranking and Score		Benefit Level Indicator (%)		Benefit Growth Indicator (%)	
1 India	144	1 India	2.5	1 Chile	0.3
2 Mexico	133	2 Mexico	4.1	2 India	0.6
3 Chile	129	3 Chile	7.2	3 Mexico	1.2
4 Russia	96	4 Russia	10.9	4 Russia	2.7
5 Australia	75	5 China	11.0	5 Poland	3.5
6 Poland	73	6 Australia	13.4	6 Sweden	4.1
7 China	57	7 Poland	15.2	7 Australia	4.2
8 Sweden	53	8 Canada	15.8	8 UK	5.0
9 UK	48	9 South Korea	16.2	9 Italy	5.7
10 Canada	47	10 US	18.5	10 France	5.7
11 Japan	33	11 UK	18.9	11 Japan	5.8
12 US	30	12 Brazil	19.3	12 Canada	6.5
13 France	22	13 Sweden	19.3	13 Germany	7.3
14 Italy	17	14 Switzerland	19.5	14 US	7.4
15 Switzerland	13	15 Netherlands	19.8	15 China	7.6
16 Brazil	13	16 Japan	20.9	16 Switzerland	9.1
17 Germany	9	17 Spain	23.6	17 Brazil	9.3
18 Netherlands	9	18 Germany	24.3	18 Netherlands	9.6
19 South Korea	5	19 France	24.3	19 Spain	9.7
20 Spain	-7	20 Italy	25.7	20 South Korea	11.7

INDICATOR KEY
Benefit Level = Total public benefits to the elderly in 2040 as a percent of GDP
Benefit Growth = Growth in total public benefits to the elderly from 2010 to 2040 as a percent of GDP

INDICATOR WEIGHTS
Benefit Level = 1/2
Benefit Growth = 1/2

Note: Countries are ranked from best to worst.

pension systems that are designed to lower future replacement rates—that is, the share of preretirement wages that benefits replace. Italy and Sweden are transforming their traditional defined-benefit systems into notional defined-contribution systems in which benefits are effectively indexed to the growth in the payroll tax base. France has re-indexed the second (ARCO and AGIRC) tier of its state pension system to prices, which will also cause average benefits to decline as share of average wages. Meanwhile, Germany and Japan have added "demographic stabilizers" to their state

pension formulas that achieve similar results by automatically adjusting annual benefit payments to partially or fully offset the annual change in the dependency ratio of retired beneficiaries to contributing workers. These countries spend a lot on old-age benefits today and will spend even more tomorrow. But total benefit spending will grow much less than the aging of their populations would otherwise require.

So which is the more important indicator—benefit level or benefit growth? In our view, both add a distinct and equally important perspective to the GAP Index. The projected level of spending on public benefits to the elderly is clearly the most direct measure of the resource burden of population aging. Yet the projected growth in old-age benefits is also important, since some societies may be institutionally and culturally better equipped to manage high levels of public benefit spending than others. From this perspective, the road ahead for South Korea or the United States may be just as bumpy as for some countries that are projected to spend much more on the elderly.

Table 3 summarizes the results for the public burden category. In calculating the category scores, both indicators were weighted equally.

Category Two: Fiscal Room

While a large and/or growing public old-age dependency burden is certainly a cause for concern, neither the projected magnitude of the old-age dependency burden nor the projected growth in that burden can alone tell us whether the burden is sustainable. For a more complete picture, it is also necessary to take into account the fiscal room that different countries have to accommodate their old-age dependency burdens. There are three ways in which countries can accommodate growth in public benefits to the elderly: pay for the growth by raising taxes, pay for the growth by cutting other government spending, or pay for the growth by borrowing from the public. The fiscal

room category includes three indicators that evaluate the feasibility of each of these options:

- ◹ **TAX ROOM:** *Total government revenue in 2040 as a percent of GDP* (This indicator assumes that all growth in public benefits 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 growth in public benefits is paid for by cuts in other spending.)
- ◹ **BORROWING ROOM:** *Net public debt in 2040 as a percent of GDP* (This indicator assumes that all growth in public benefits is paid for by borrowing.)

As table 4 shows, the tax option would in most countries lead to total tax burdens that are considerably higher than today's. In 2010, only six of the GAP 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, fourteen countries would have a total tax burden of more than 40 percent of GDP, including such traditionally low-tax countries as South Korea, Switzerland, the United States, and Japan. Five countries, all in Europe, would have a total tax burden of more than 50 percent of GDP.

Not surprisingly, the countries with the largest projected old-age dependency burdens tend to end up with the largest tax burdens. Since the total tax burden also depends on the overall size of the public sector, however, there are some exceptions. A few countries with large public sectors—Canada, the Netherlands, and Sweden—score significantly worse on the tax room indicator than they do on the benefit level indicator. For a few other countries with large old-age dependency burdens but relatively small public sectors, the reverse is true. Switzerland ranks ninth on tax room but fourteenth on benefit level, while Japan ranks eleventh on tax room but sixteenth on benefit level.

Some developed countries may find it economically impossible to raise taxes enough to pay

TABLE 4

Total Government Revenue as a Percent of GDP, Assuming Taxes Are Raised to Pay for All Growth in Public Benefits, 2010–2040*

Country Ranking		% of GDP				Country Ranking		% of GDP			
		2010	2020	2030	2040			2010	2020	2030	2040
1	India	19	19	20	20	11	Japan	32	37	38	42
2	Mexico	23	21	21	21	12	Canada	38	39	41	43
3	Chile	24	23	23	23	13	UK	40	39	41	43
4	China	21	23	25	29	14	Brazil	37	37	39	44
5	Russia	35	33	33	34	15	Spain	37	39	42	46
6	Australia	32	35	36	38	16	Germany	44	45	48	50
7	Poland	38	39	40	40	17	Sweden	52	49	50	51
8	South Korea	31	32	37	41	18	Italy	46	48	50	53
9	Switzerland	34	34	37	41	19	Netherlands	46	47	51	54
10	US	31	35	39	41	20	France	49	52	54	56

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

*The projections assume that, beginning in 2019, each country moves to a debt-neutral fiscal balance in its "rest of government" budget.

for the full cost of their age waves. At some point, rather than generate new revenue, higher tax rates may simply slow economic growth, increase unemployment, and push more workers into a growing gray economy. The tax option may also prove unsustainable in some emerging markets with rapidly growing old-age dependency burdens. To be sure, most emerging markets start out today 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 that by definition cannot be taxed. While the developed countries may have difficulty pushing their total tax bur-

dens much above 50 percent of GDP, emerging markets like Brazil and South Korea may have difficulty pushing them much above 40 percent of GDP.

To the extent that taxes cannot be raised, countries may be able to accommodate their growing old-age dependency burdens by reducing other categories of government spending. The budget room indicator looks at what would happen if, instead of raising taxes, governments allowed spending on old-age benefits to crowd out other spending "dollar for dollar." By 2040, public benefits to the elderly would account for at least 40 percent of total government outlays in thirteen
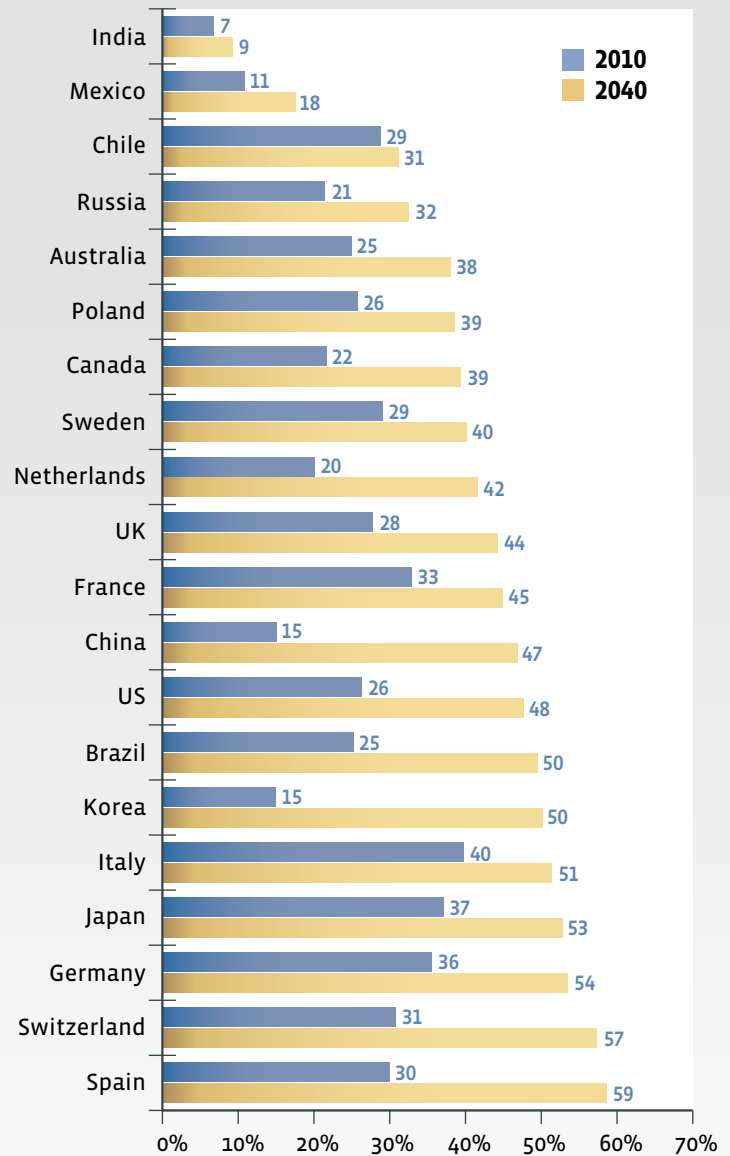
of the twenty GAP Index countries and at least 50 percent in six: South Korea, Italy, Japan, Germany, Switzerland, and Spain. (See figure 5.) Today, there is no country where public benefits to the elderly exceed 50 percent of total government outlays and only country—Italy—where they reach 40 percent.

The budget room indicator points to some useful policy lessons. On the one hand, countries with large public sectors may have much more budget room than tax room. Sweden ranks eighth on budget room but seventeenth on tax room, while the Netherlands ranks ninth on budget room but nineteenth on 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 benefits, since presumably there is a lot of lower-priority government spending that could be cut without much cost to society. On the other hand, countries with small public sectors and rapidly growing old-age dependency burdens may be able to accommodate relatively little of the projected growth in benefits to the elderly without crowding out vital public services. China, South Korea, Switzerland, the United States, and Japan, all of which score significantly better on tax room than budget room, belong to this group.

The final option, at least in theory, is to pay for rising old-age benefit costs by borrowing. As table 5 shows, this option is only likely to prove practical for a handful of countries. Australia, Chile, Mexico, Russia, and Sweden, which start out with very low levels of public indebtedness and are projected to experience relatively little growth in their old-age dependency burdens, could borrow to pay for the full cost of their age waves without pushing their net public debt to worrisome levels. So could China, where rapid economic growth would keep its public debt from exploding as a share of GDP despite rapid growth in its old-age dependency burden. For many if not most countries, however, the borrowing option would prove ruinous. By 2040, twelve of the twenty GAP Index countries would have a net public debt of more than 75 percent of GDP, compared with just five today. In the

FIGURE 5

Total Public Benefits to the Elderly as a Percent of Government Outlays in 2010 and 2040*
(Assuming Cuts in Other Spending Pay for All Growth in Public Benefits)

Country	2010	2040
India	7	9
Mexico	11	18
Chile	29	31
Russia	21	32
Australia	25	38
Poland	26	39
Canada	22	39
Sweden	29	40
Netherlands	20	42
UK	28	44
France	33	45
China	15	47
US	26	48
Brazil	25	50
Korea	15	50
Italy	40	51
Japan	37	53
Germany	36	54
Switzerland	31	57
Spain	30	59

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

*The projections assume that, beginning in 2019, 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 Borrowing Pays for All Growth in Public Benefits, 2012–2040*

Country Ranking		% of GDP				Country Ranking		% of GDP			
		2012	2020	2030	2040			2012	2020	2030	2040
1	Sweden	-18	-22	-26	**-19**	11	Switzerland	28	19	26	**81**
2	Chile	-8	-4	-5	**-5**	12	France	84	78	68	**82**
3	Australia	12	3	0	**11**	13	Poland	27	25	47	**82**
4	Mexico	38	37	33	**33**	14	UK	83	82	73	**91**
5	Russia†	11	15	24	**38**	15	Germany	57	50	58	**104**
6	China†	23	8	7	**40**	16	Italy	103	100	105	**140**
7	South Korea	32	11	16	**68**	17	Netherlands	33	46	84	**176**
8	Brazil	35	26	31	**74**	18	US	88	87	114	**177**
9	Canada	35	34	44	**76**	19	Japan	134	165	218	**325**
10	India†	67	64	67	**80**	20	Spain	72	107	183	**331**

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

*The projections assume that, beginning in 2019, government revenues and expenditures other than benefit spending and net interest remain constant as a share of GDP.
† Data for Russia, China, and India refer to gross debt.

Netherlands and the United States, borrowing to pay for rising old-age benefit costs would push the net public debt above 150 percent of GDP and in Japan and Spain it would push it above 300 percent of GDP.[3] Long before public indebtedness reached these levels, the financial markets would bring the experiment to a sudden halt.

Table 6 summarizes the results for the fiscal room category. In calculating the category scores, all three indicators were weighted equally.

....

[3] The GAP Index model follows the IMF's near-term fiscal projections through 2018, after which it assumes a long-term policy of "debt neutrality." In calculating the borrowing room indicator, however, we relax the debt-neutrality assumption and instead assume that government revenues and expenditures other than benefit spending and net interest remain constant as a share of GDP.

Category Three: Benefit Dependence

How big is the risk that countries facing large and growing old-age dependency burdens will be unable to enact timely reforms? Just as important, how big is the risk that countries that have already made significant progress in reducing the future growth in their old-age dependency burdens will have to roll back the reforms? Clearly, one factor that will 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

TABLE 6

Fiscal Room Category

Category Ranking and Score			Tax Room Indicator (%)*			Budget Room Indicator (%)*			Borrowing Room Indicator (%)*	
1	India	129	1	India	20	1	India	9	1	Sweden	-19
2	Mexico	126	2	Mexico	21	2	Mexico	18	2	Chile	-5
3	Chile	111	3	Chile	23	3	Chile	31	3	Australia	11
4	Russia	85	4	China	29	4	Russia	33	4	Mexico	33
5	Australia	76	5	Russia	34	5	Australia	38	5	Russia†	38
6	China	73	6	Australia	38	6	Poland	39	6	China†	40
7	Poland	58	7	Poland	40	7	Canada	39	7	South Korea	68
8	Sweden	57	8	South Korea	41	8	Sweden	40	8	Brazil	74
9	Canada	54	9	Switzerland	41	9	Netherlands	42	9	Canada	76
10	South Korea	45	10	US	41	10	UK	44	10	India†	80
11	UK	44	11	Japan	42	11	France	45	11	Switzerland	81
12	Brazil	39	12	Canada	43	12	China	47	12	France	82
13	Switzerland	33	13	UK	43	13	US	48	13	Poland	82
14	US	28	14	Brazil	44	14	Brazil	49	14	UK	91
15	France	25	15	Spain	46	15	South Korea	50	15	Germany	104
16	Germany	19	16	Germany	50	16	Italy	51	16	Italy	140
17	Netherlands	16	17	Sweden	51	17	Japan	53	17	Netherlands	176
18	Italy	11	18	Italy	53	18	Germany	54	18	US	177
19	Japan	-6	19	Netherlands	54	19	Switzerland	57	19	Japan	325
20	Spain	-22	20	France	56	20	Spain	59	20	Spain	331

INDICATOR KEY
Tax Room = Total government revenue in 2040 as a percent of GDP, assuming taxes are raised to pay for all growth in public benefits
Budget Room = Total public benefits to the elderly in 2040 as a percent of government outlays, assuming cuts in other spending pay for all growth in public benefits
Borrowing Room = Net public debt in 2040 as a percent of GDP, assuming borrowing pays for all growth in public benefits

INDICATOR WEIGHTS
Tax Room = 1/3
Budget Room = 1/3
Borrowing Room = 1/3

Note: Countries are ranked from best to worst.
*The tax room and budget room indicators assume that, beginning in 2019, each country moves to a debt-neutral fiscal balance in its "rest of government" budget; the borrowing room indicator assumes that, beginning in 2019, government revenues and expenditures other than benefit spending and net interest remain constant as a share of GDP.
† Data for Russia, China, and India refer to gross debt.

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

TABLE 7

Public Benefits as a Percent of the Cash Income of the Median-Income Elderly, 2010–2040*

Country Ranking		% of Income					Country Ranking		% of Income				
		2010	2020	2030	2040	2010–40 Avg.			2010	2020	2030	2040	2010–40 Avg.
1	India	25	25	22	19	23	11	Japan	60	57	54	54	56
2	Mexico	32	30	28	23	29	12	Sweden	63	62	59	58	60
3	Switzerland	33	32	30	32	32	13	UK	66	62	61	62	62
4	South Korea	26	30	35	40	33	14	Russia	69	66	63	55	63
5	US	39	35	36	37	37	15	Germany	73	66	60	60	64
6	Chile	55	39	30	26	37	16	Brazil	75	65	62	63	65
7	China	34	37	37	41	37	17	France	73	71	70	71	71
8	Canada	39	39	39	39	39	18	Italy	78	74	70	68	72
9	Netherlands	50	50	50	51	50	19	Spain	79	75	71	71	74
10	Australia	64	56	50	46	54	20	Poland	94	89	85	79	87

Note: Countries are ranked from best to worst according to the projected averages for 2010 to 2040.

*Data refer to the third quintile of the elderly income distribution.

which most societies are quite sensitive. The benefit dependence category therefore includes two indicators:

- ◪ **BENEFIT SHARE:** *Public benefits as a percent of the cash income of the median-income elderly: Average for 2010 to 2040*
- ◪ **BENEFIT CUT:** *Percent of elderly households that would be pushed into poverty by an immediate 10 percent cut in public benefits*

In assessing the dependence of the elderly on public benefits, we look at the level of dependence of "median" or "middle-income" elders in the third quintile of the elderly income distribution—the group most likely to be a bellwether of potential political resistance to reform. We consid-

ered using the average level of dependence across all income groups as an indicator, but decided against it because the average level of dependence for all elders greatly understates the actual level of dependence of most elders in almost all of the GAP Index countries. After all, the average level is pulled down by the affluent elderly, for whom public benefits are often a trivial share of income.

As table 7 shows, there are considerable differences today in the degree of elderly dependence on public benefits across the GAP Index countries. Among the developed countries, Switzerland, the United States, and Canada, where public benefits now account for between 30 and 40 percent of the cash income of middle-income elders, are at the low end of the spectrum. Dependence on public benefits is much higher elsewhere, rising to 50

percent in the Netherlands, to between 60 and 70 percent in Japan, Sweden, Australia, and the UK, and to between 70 and 80 percent in Germany, France, Italy, and Spain. Not surprisingly, many of the countries with the greatest need to reduce the projected growth in old-age benefits also have the highest levels of elderly dependence on those benefits. The differences among countries are if anything even greater in the developing world. Here India, South Korea, Mexico, and China are at the low end of the spectrum, with between one-quarter and one-third of the income of middle-income elders coming in the form of a government check. In Chile, the share exceeds 50 percent, in Russia it approaches 70 percent, in Brazil it reaches 75 percent, and in Poland it passes 90 percent. Naturally, all of these figures—especially those for the developed countries—would be even higher if we were to include government health benefits as part of income.

Table 7 also shows that the level of dependence of middle-income elders on public benefits is in some cases projected to change significantly over the next few decades. In most countries, public benefits will decline at least slightly as a share of income as the generosity of state pension systems is reduced and/or funded pension benefits and employment income grow—and in some countries, public benefits will decline steeply as a share of income. In Mexico, Italy, Brazil, Germany, Russia, Poland, and Australia, the public benefit share of total income is projected to decline by between 10 and 20 percentage points by 2040. In Chile, which is entirely replacing its pay-as-you-go state pension system with a funded personal accounts system, the share is projected to decline by nearly 30 percentage points. In contrast, public benefits in China and South Korea are projected to rise steadily as a share of income as state pension systems mature. To better capture these dynamics, we base our benefit share indicator on the average projected level of dependence of middle-income elders between 2010 and 2040.

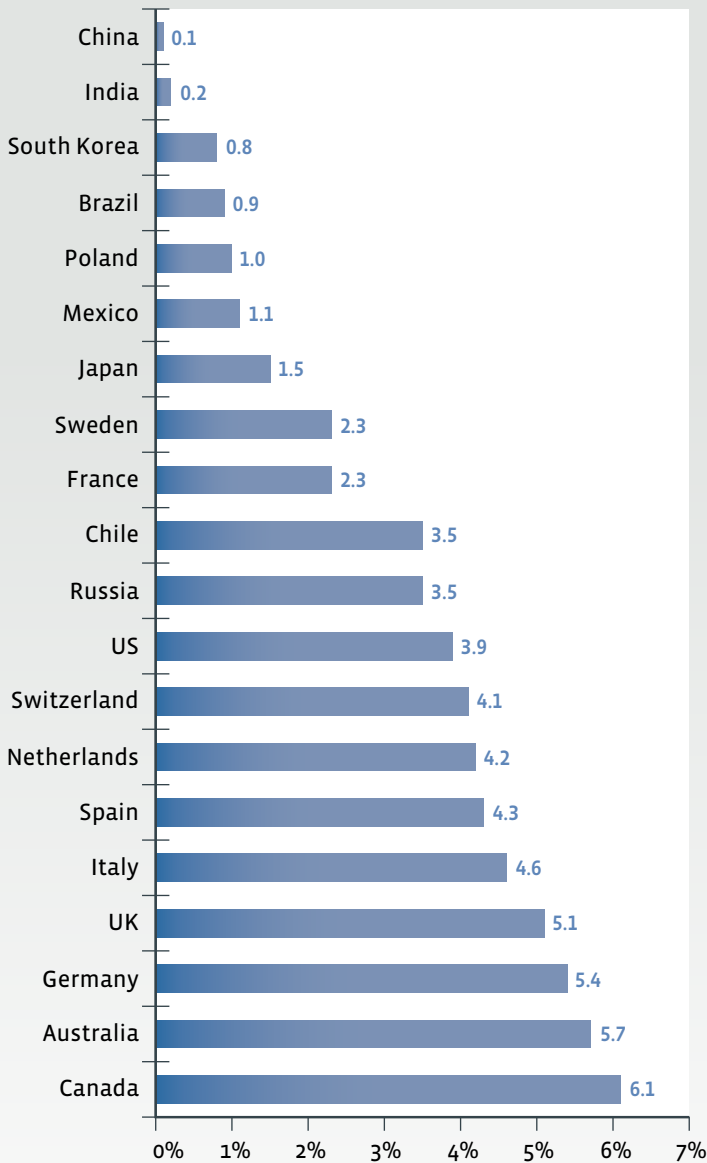Along with the dependence of middle-income elders on public benefits, the vulnerability of low-income elders to cuts in those benefits may be an important independent factor affecting the political prospects for reform. The benefit cut indicator measures the percentage of elderly households that would 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, 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.

In most cases, the country rankings for the benefit cut indicator follow the pattern one might expect. (See figure 6.) The countries that do well are generally those in which welfare states are still underdeveloped. In China, India, South Korea, and Mexico, with their low levels of benefit dependence, it would be possible to make even large across-the-board cuts in public benefits to the elderly without significantly increasing elderly poverty. The countries that do poorly generally have large and mature welfare states. In Spain, Italy, and Germany, with their high levels of benefit dependence, any given percentage reduction in public benefits to the elderly would translate into a proportionally larger reduction in total elderly income, and thus a greater increase in elderly poverty.

There are, however, some instructive exceptions. Brazil, Poland, Sweden, and France are among the ten highest-ranking countries on this indicator despite their high levels of benefit dependence. Apparently, their public benefits are generous enough to lift most elders far enough above the poverty threshold that a 10 percent cut in their benefits would push relatively few back beneath it. On the other hand, the United States, Switzerland, and Canada are among the ten lowest-ranking countries despite their low levels of benefit dependence. Apparently, their modest public benefits leave a large share of elders clustered just above the poverty threshold, and thus vulnerable

FIGURE 6

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

Country	Value
China	0.1
India	0.2
South Korea	0.8
Brazil	0.9
Poland	1.0
Mexico	1.1
Japan	1.5
Sweden	2.3
France	2.3
Chile	3.5
Russia	3.5
US	3.9
Switzerland	4.1
Netherlands	4.2
Spain	4.3
Italy	4.6
UK	5.1
Germany	5.4
Australia	5.7
Canada	6.1

Note: Countries are ranked from best to worst.

*Data refer to 2010 or the most recent available year. Poor households are households with incomes beneath 50 percent of the median income for all households.

to any benefit cut at all. Australia's very low ranking merits a special explanation. Its means-tested state pension system leaves elders with incomes of around 50 percent of the median income for all households highly dependent on public benefits. If the relative poverty threshold were set at a somewhat higher level, however, Australia would shoot up in the rankings.

Table 8 summarizes the results for the benefit dependence category. In calculating the category scores, the more important benefit share indicator received a two-thirds weight and the benefit cut indicator a one-third weight.

Fiscal Sustainability Index Results

The GAP fiscal sustainability index combines the results for the three indicator categories into a single overall index score and ranking for each of the twenty countries. In calculating the overall index scores, the central public burden category received a weight of 40 percent, while the fiscal room and benefit dependence categories received weights of 30 percent each. Table 9 presents the final results.

In interpreting the results, it is important to note that the general location of countries within the fiscal sustainability index is more meaningful than their precise rankings. Large changes in the results for several indicators would be required to move a country from the middle to the top or the bottom of the fiscal sustainability index—and a policy revolution would be required to move a country from the bottom to the top or vice versa. Even minor changes in the results for one or two indicators, however, could cause countries whose index scores are tightly clustered to exchange places. The rankings for Sweden, Poland, Canada, and South Korea could easily shift, since their scores are very similar. The same is true of the United States, Switzerland, and the UK; of Brazil and Japan; of France and the Netherlands; and of Germany and Italy.

TABLE 8

Benefit Dependence Category

Category Ranking and Score			Benefit Share Indicator (%)			Benefit Cut Indicator (%)		
1	India	129	1	India	23	1	China	0.1
2	Mexico	110	2	Mexico	29	2	India	0.2
3	South Korea	105	3	Switzerland	32	3	South Korea	0.8
4	China	103	4	South Korea	33	4	Brazil	0.9
5	Switzerland	78	5	US	37	5	Poland	1.0
6	Chile	75	6	Chile	37	6	Mexico	1.1
7	US	72	7	China	37	7	Japan	1.5
8	Japan	56	8	Canada	39	8	Sweden	2.3
9	Canada	49	9	Netherlands	50	9	France	2.3
10	Netherlands	44	10	Australia	54	10	Chile	3.5
11	Brazil	44	11	Japan	56	11	Russia	3.5
12	Sweden	41	12	Sweden	60	12	US	3.9
13	Russia	25	13	UK	62	13	Switzerland	4.1
14	Australia	25	14	Russia	63	14	Netherlands	4.2
15	France	21	15	Germany	64	15	Spain	4.3
16	UK	14	16	Brazil	65	16	Italy	4.6
17	Germany	8	17	France	71	17	UK	5.1
18	Poland	3	18	Italy	72	18	Germany	5.4
19	Spain	-1	19	Spain	74	19	Australia	5.7
20	Italy	-1	20	Poland	87	20	Canada	6.1

INDICATOR KEY
Benefit Share = Public benefits as a percent of the cash income of the median-income elderly: Average for 2010 to 2040
Benefit Cut = Percent of elderly households that would be pushed into poverty by an immediate 10 percent cut in public benefits

INDICATOR WEIGHTS
Benefit Share = 2/3
Benefit Cut = 1/3

Note: Countries are ranked from best to worst.

A glance at table 9 reveals that there are three countries, all of them emerging markets, for which the fiscal sustainability of old-age benefit systems is simply not an important policy concern: India, Mexico, and Chile. These countries not only receive the top three rankings on the overall fiscal sustainability index, but also receive the top three rankings in the public burden and fiscal room categories. Moreover, two of the three—India and Mexico—are among the three highest-ranking countries in the benefit dependence category as well. Given the large gap that separates their overall fiscal sustainability scores from the score of China, the next highest-ranking country, they

TABLE 9

GAP Fiscal Sustainability Index

Overall Index			Public Burden Category			Fiscal Room Category			Benefit Dependence Category		
1	India	135	1	India	144	1	India	129	1	India	129
2	Mexico	124	2	Mexico	133	2	Mexico	126	2	Mexico	110
3	Chile	107	3	Chile	129	3	Chile	111	3	South Korea	105
4	China	76	4	Russia	96	4	Russia	85	4	China	103
5	Russia	71	5	Australia	75	5	Australia	76	5	Switzerland	78
6	Australia	60	6	Poland	73	6	China	73	6	Chile	75
7	Sweden	51	7	China	57	7	Poland	58	7	US	72
8	Canada	50	8	Sweden	53	8	Sweden	57	8	Japan	56
9	Poland	47	9	UK	48	9	Canada	54	9	Canada	49
10	South Korea	47	10	Canada	47	10	South Korea	45	10	Netherlands	44
11	US	42	11	Japan	33	11	UK	44	11	Brazil	44
12	Switzerland	39	12	US	30	12	Brazil	39	12	Sweden	41
13	UK	37	13	France	22	13	Switzerland	33	13	Russia	25
14	Brazil	30	14	Italy	17	14	US	28	14	Australia	25
15	Japan	28	15	Switzerland	13	15	France	25	15	France	21
16	France	23	16	Brazil	13	16	Germany	19	16	UK	14
17	Netherlands	22	17	Germany	9	17	Netherlands	16	17	Germany	8
18	Germany	12	18	Netherlands	9	18	Italy	11	18	Poland	3
19	Italy	10	19	South Korea	5	19	Japan	-6	19	Spain	-1
20	Spain	-9	20	Spain	-7	20	Spain	-22	20	Italy	-1

CATEGORY WEIGHTS
Public Burden = 40%
Fiscal Room = 30%
Benefit Dependence = 30%
Note: Countries are ranked from best to worst.

clearly constitute a "high preparedness," or perhaps better, "low vulnerability" group.

It is less clear that there is a distinct "high vulnerability" group at the bottom of the fiscal sustainability index. To be sure, there are a number of possible candidates, including Brazil, Japan, France, the Netherlands, Germany, Italy, and Spain. Yet only one of these countries—Spain—ranks among the bottom three countries in all three of the indicator categories. This suggests that even some of the poorest performers on the fiscal sustainability index enjoy at least some compensating advantages. Moreover, there is no large gap in index scores between the lowest-ranking

countries and those that rank a bit higher. Rather, from Spain with its twentieth-place ranking to China with its fourth-place ranking, the fiscal sustainability index scores rise in a fairly smooth progression. There is certainly a very large distance between one end of this continuum and the other. But it is nonetheless a continuum along which countries, to a greater or lesser extent, face most of the same fiscal pressures, risks, and challenges.

The Income Adequacy Index

The fiscal sustainability index assesses whether countries will be able to afford their projected old-age dependency burdens—and if they cannot, how difficult it might be to reduce them. The income adequacy index addresses the other basic question facing aging societies: whether their current retirement policies are likely to be effective in maintaining or improving the living standard of the elderly.

The GAP Index perspective on income adequacy is a broad one. While most attempts to evaluate the future adequacy of elderly income are based on stylized projections of retirement system parameters like pension replacement rates, the GAP Index bases its main adequacy indicators on projections of the overall income of the elderly, including earnings, asset income, and assistance from younger family members. The GAP Index perspective is also an intergenerational one. The living standard of the elderly is measured relative to the living standard of the nonelderly in each country. When one country ranks higher than another on one of the income indicators, it thus means that the elderly in the higher-ranking country are doing better relative to the young than the elderly in the lower-ranking country are. It does not necessarily mean that they have higher incomes than the elderly in the lower-ranking country do.

The total income indicators, which provide the broadest measure of how well the old are faring relative to the young, are presented first. The income vulnerability indicators, which focus on the adequacy outlook for the middle- and lower-income elderly, are presented second. The family support indicators, which assess the strength of informal family support networks, are presented last.

Category One: Total Income

The total income category includes two indicators that measure the overall level of and trend in the living standard of the old relative to that of the young:

> ◹ **TOTAL INCOME LEVEL:** *Per capita ratio of average after-tax elderly to nonelderly total income in 2040*

TABLE 10

Per Capita Ratio of Average After-Tax Elderly to Nonelderly Total Income, 2010–2040*

Country Ranking		Income Ratio				Country Ranking		Income Ratio			
		2010	2020	2030	2040			2010	2020	2030	2040
1	US	1.58	1.71	1.75	1.78	11	Sweden	1.12	1.09	1.12	1.12
2	Brazil	1.41	1.35	1.37	1.48	12	Japan	1.03	1.01	0.98	1.02
3	Germany	1.30	1.33	1.44	1.44	13	Switzerland	1.05	1.01	1.02	1.01
4	Netherlands	1.19	1.24	1.33	1.41	14	Spain	0.95	1.02	0.99	0.99
5	Australia	1.22	1.34	1.38	1.40	15	Mexico	1.06	1.06	1.03	0.95
6	France	1.28	1.24	1.24	1.25	16	South Korea	0.92	0.88	0.89	0.89
7	Canada	1.26	1.29	1.26	1.24	17	India	0.76	0.79	0.78	0.75
8	UK	1.20	1.16	1.22	1.24	18	Russia	0.83	0.77	0.73	0.74
9	Italy	1.25	1.21	1.19	1.20	19	China	0.57	0.61	0.62	0.65
10	Chile	1.23	1.26	1.22	1.17	20	Poland	0.72	0.63	0.64	0.58

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

*Total income includes government health benefits.

◩ **TOTAL INCOME TREND:** *Percentage change in the per capita ratio of average after-tax elderly to nonelderly total income from 2010 to 2040*

The total income 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 to some absolute purchasing-power metric that translates into equivalent size of home, model of car, or length of vacation. On the other hand, the trend indicator may be more important if one assumes that societies evaluate the relative income of the old and the young against some customary standard of generational fairness that may have nothing to do with purchasing-power 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 developed country except Spain, the per capita ratio of total elderly to nonelderly income is now at least 1.0 and is projected to still be at least 1.0 in 2040. In Italy, the UK, Canada, France, Australia, the Netherlands, and Germany, the ratio is projected to be between 1.2 and 1.5 in 2040 and in the United States it is projected to be nearly 1.8. While the income of the elderly in today's developed countries would compare favorably with that of the nonelderly by almost any measure, these ratios are especially high for three reasons. First, they are averages for all elders, including the affluent. Second, they refer to after-tax income, and in most developed countries (Switzerland, France, and Sweden are exceptions) the nonelderly bear
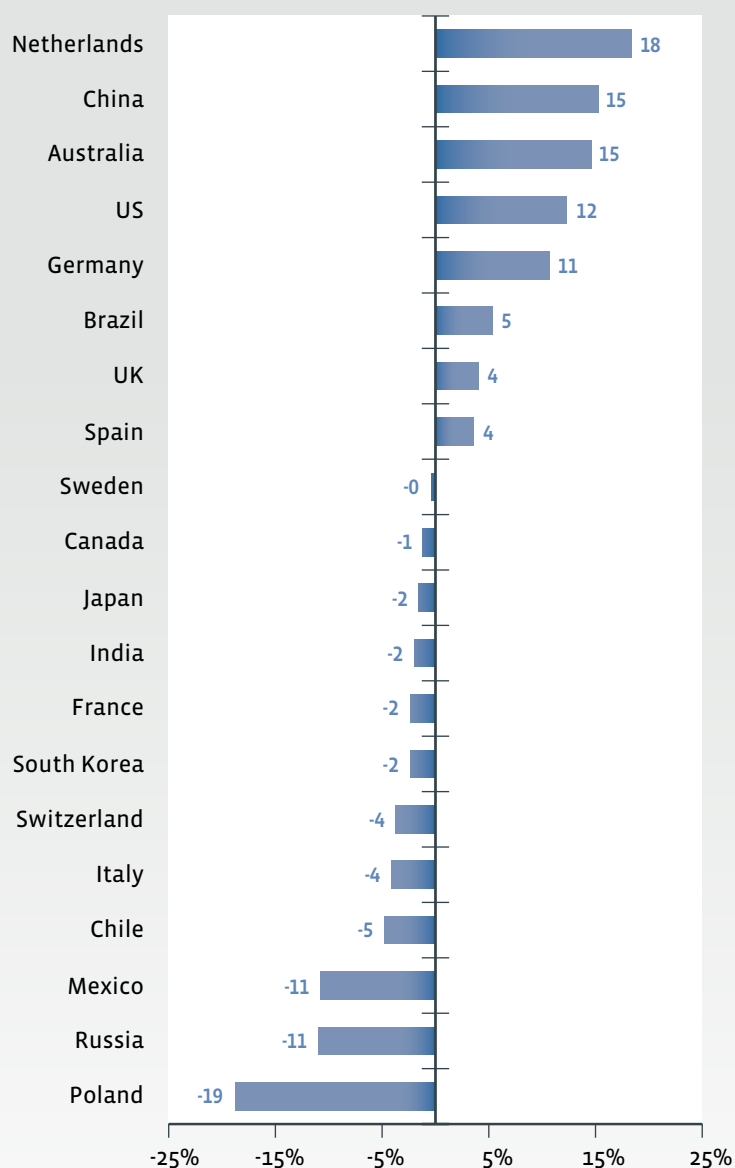
a disproportionate share of the total tax burden, both because payroll taxes fall much more heavily on the young than the old and because public pension benefits frequently enjoy favorable tax treatment. Finally, the measure of total income that is used in the GAP Index includes the cash value of government health benefits, and per capita the elderly consume much more in health-care services than the nonelderly.

The relative living standard of the elderly is considerably lower in most emerging markets. In only two—Chile and Brazil—is the per capita ratio of total elderly to nonelderly income projected to exceed 1.0 in 2040. In four—India, Russia, China, and Poland—it is projected to be 0.75 or less. The low total income of the elderly in most emerging markets is due in large part to the limited reach and/or low replacement rates of their formal retirement systems. Economic development itself also plays a role, since the rapid wage growth that accompanies it boosts the economic fortunes of the young relative to those of the old. It is no accident that the two emerging markets that score well on the total income indicator are both in Latin America, where slow growth and entrenched inequality tend to tilt income and wealth the other way. In the case of Brazil, the relative living standard of the elderly is also buoyed up by a large pay-as-you-go state pension system, whose benefits are exceptionally generous even by developed-world standards. Although the cost of this system threatens to impose a heavy burden on future workers and taxpayers, it helps to earn Brazil a second-place ranking on the total income level indicator, just ahead of Germany and just behind the United States.

Turning to the total income trend indicator, it is apparent that there is considerable overlap with the rankings for the total income level indicator. In other words, the countries where the elderly are projected to be relatively well off in 2040 are often the countries where elderly income is trending upwards, and vice versa. (See figure 7.) Five of the six highest-ranking countries on the total income level indicator—Australia, Brazil, Germany,

FIGURE 7

Percentage Change in the Per Capita Ratio of Average After-Tax Elderly to Nonelderly Total Income from 2010 to 2040*

Note: Countries are ranked from best to worst.

*Total income includes government health benefits.

TABLE 11

Total Income Category

Category Ranking and Score			Total Income Level Indicator (Ratio)			Total Income Trend Indicator (% Change)		
1	US	133	1	US	1.78	1	Netherlands	18
2	Netherlands	119	2	Brazil	1.48	2	China	15
3	Australia	108	3	Germany	1.44	3	Australia	15
4	Germany	101	4	Netherlands	1.41	4	US	12
5	Brazil	91	5	Australia	1.40	5	Germany	11
6	UK	68	6	France	1.25	6	Brazil	5
7	Canada	54	7	Canada	1.24	7	UK	4
8	France	52	8	UK	1.24	8	Spain	4
9	China	49	9	Italy	1.20	9	Sweden	0
10	Sweden	46	10	Chile	1.17	10	Canada	-1
11	Spain	46	11	Sweden	1.12	11	Japan	-2
12	Italy	43	12	Japan	1.02	12	India	-2
13	Chile	39	13	Switzerland	1.01	13	France	-2
14	Japan	35	14	Spain	0.99	14	South Korea	-2
15	Switzerland	29	15	Mexico	0.95	15	Switzerland	-4
16	South Korea	23	16	South Korea	0.89	16	Italy	-4
17	India	12	17	India	0.75	17	Chile	-5
18	Mexico	6	18	Russia	0.74	18	Mexico	-11
19	Russia	-12	19	China	0.65	19	Russia	-11
20	Poland	-45	20	Poland	0.58	20	Poland	-19

INDICATOR KEY
Total Income Level = Per capita ratio of average after-tax elderly to nonelderly total income in 2040
Total Income Trend = Percentage change in the per capita ratio of average after-tax elderly to nonelderly total income from 2010 to 2040

INDICATOR WEIGHTS
Total Income Level = 1/2
Total Income Trend = 1/2

Note: Countries are ranked from best to worst.

the Netherlands, and the United States—are also among the six highest-ranking countries on the total income trend indicator. In all five countries, the elderly start out well off relative to the nonelderly today and keep getting better off. The main reasons for the upward trend: rising rates of elderly labor-force participation (Germany and the Netherlands), strong growth in funded pension benefits (Australia, Brazil, and Germany), and large increases in per capita health benefits (all five countries). Meanwhile, three of the six lowest-ranking countries on the total income level

indicator—Mexico, Poland, and Russia—are also among the six lowest-ranking countries on the total income trend indicator. Here the elderly start out poorly off relative to the nonelderly today and keep getting worse off. The main reason for the downward trend: large reductions in the generosity of state retirement provision without adequate compensating increases in alternative sources of income support.

The rankings of some countries, however, differ significantly. France ranks sixth on total income level but thirteenth on total income trend, while Italy ranks ninth on level but sixteenth on trend. Although the relative living standard of the elderly in both countries is high today, it will be eroded in the future by large reductions in the generosity of state retirement provision. Chile also scores much better on total income level (a ranking of ten) than on total income trend (a ranking of seventeen)—an outcome attributable to declining replacement rates under its funded personal accounts system, which historically has benefited from unusually high real rates of return. Meanwhile, there are a few countries that score better on total income trend than on total income level. China, which ranks nineteenth on level but second on trend, is the most striking example. Although the relative living standard of the average Chinese elder is projected to remain very low by developed-world standards, it is nonetheless being pushed steadily upward by higher participation in public and private pension systems and rapid growth in government health benefits.

Table 11 summarizes the results for the total income category. In calculating the category scores, both indicators were weighted equally.

Category Two: Income Vulnerability

The indicators in the total income category provide an important "macro-level" perspective on the overall division of society's economic resources between older and younger generations. In the in- come vulnerability category, we focus instead on the adequacy of retirement income provision for particularly vulnerable segments of the elderly population, a perspective that may be more socially and politically relevant. We begin by looking at the relative living standard of "middle-income" elders, a group that will be disproportionately affected (either positively or negatively) by changes in the generosity of retirement income systems. We then consider the degree of elderly poverty in each country. There are three indicators in the category:

- **MEDIAN INCOME LEVEL:** *Per capita ratio of median after-tax elderly to nonelderly cash income in 2040*
- **MEDIAN INCOME TREND:** *Percentage change in the per capita ratio of median after-tax elderly to nonelderly cash income from 2010 to 2040*
- **POVERTY LEVEL:** *Percent of the elderly with incomes beneath 50 percent of the median income for all persons in 2010 or the most recent available year*

Like the total income indicators, the median income indicators measure the level of and trend in the after-tax income of the elderly relative to the after-tax income of the nonelderly. Instead of the average income of the elderly, however, they track the income of middle-income elders—that is, of elders in the third quintile of the elderly income distribution. Naturally, the income of the third-quintile elderly is measured relative to the income of the third-quintile nonelderly. The measure of median income used in the GAP Index, moreover, is a pure cash measure and excludes government health benefits. The median income indicators thus comport more closely with what most noneconomists would think of as their "living standard."

As table 12 shows, the per capita ratios of median after-tax elderly to nonelderly cash income are lower than the corresponding ratios for total income in virtually every country—and in many countries they are much lower. Nonetheless, the living standard of the middle-income elderly still

TABLE 12

Per Capita Ratio of Median After-Tax Elderly to Nonelderly Cash Income, 2010–2040*

Country Ranking		Income Ratio				Country Ranking		Income Ratio			
		2010	2020	2030	2040			2010	2020	2030	2040
1	Brazil	1.29	1.25	1.28	**1.40**	11	France	0.93	0.85	0.82	**0.81**
2	US	1.34	1.40	1.41	**1.39**	12	Sweden	0.78	0.80	0.80	**0.79**
3	Australia	0.97	1.06	1.17	**1.28**	13	Switzerland	0.86	0.80	0.79	**0.78**
4	Chile	1.40	1.37	1.29	**1.25**	14	Japan	0.88	0.82	0.75	**0.78**
5	Germany	1.08	1.08	1.15	**1.18**	15	Spain	0.79	0.80	0.74	**0.72**
6	Netherlands	0.96	0.97	1.07	**1.15**	16	India	0.73	0.73	0.72	**0.70**
7	UK	1.08	0.98	1.00	**1.01**	17	South Korea	0.74	0.65	0.64	**0.65**
8	Italy	1.12	1.05	0.97	**0.96**	18	Russia	0.83	0.71	0.65	**0.65**
9	Canada	1.06	1.06	1.00	**0.94**	19	Poland	0.75	0.63	0.64	**0.56**
10	Mexico	0.94	0.93	0.92	**0.85**	20	China	0.50	0.51	0.50	**0.50**

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

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

compares quite favorably with that of the non-elderly in most countries. In sixteen of the twenty countries, the ratio of median elderly to nonelderly income is projected to be at least 0.7 in 2040, the minimum replacement rate recommended by many retirement planners. In seven of the countries—the UK, the Netherlands, Germany, Chile, Australia, the United States, and Brazil—the ratio is projected to be 1.0 or higher. In only four counties are the middle-income elderly projected to have incomes that seem unusually low relative to the nonelderly: South Korea, Russia, Poland, and China.

The more important story, however, may be told by the median income trend indicator. (See figure 8.) The per capita ratio of median elderly to nonelderly income is projected to grow less or decline more than the total income ratio in fifteen of the

twenty countries. In nine countries—Spain, Chile, South Korea, Canada, Japan, France, Italy, Russia, and Poland—the median income ratio is projected to fall by 10 percent or more by 2040, whereas the total income ratio is projected to fall that much in just three countries. In two of those countries—Russia and Poland—the decline is projected to be more than 20 percent, a startling deterioration in the relative living standard of the elderly that is attributable to unusually deep cuts in per capita public pension benefits, slow growth in funded pension benefits, and low elderly labor-force participation.

Part of the explanation for the more worrisome median income trend is that the trend for total income is buoyed up by rapid growth in government health benefits. But part is also that the relative living standard of middle-income elders suffers more than that of the average elder when
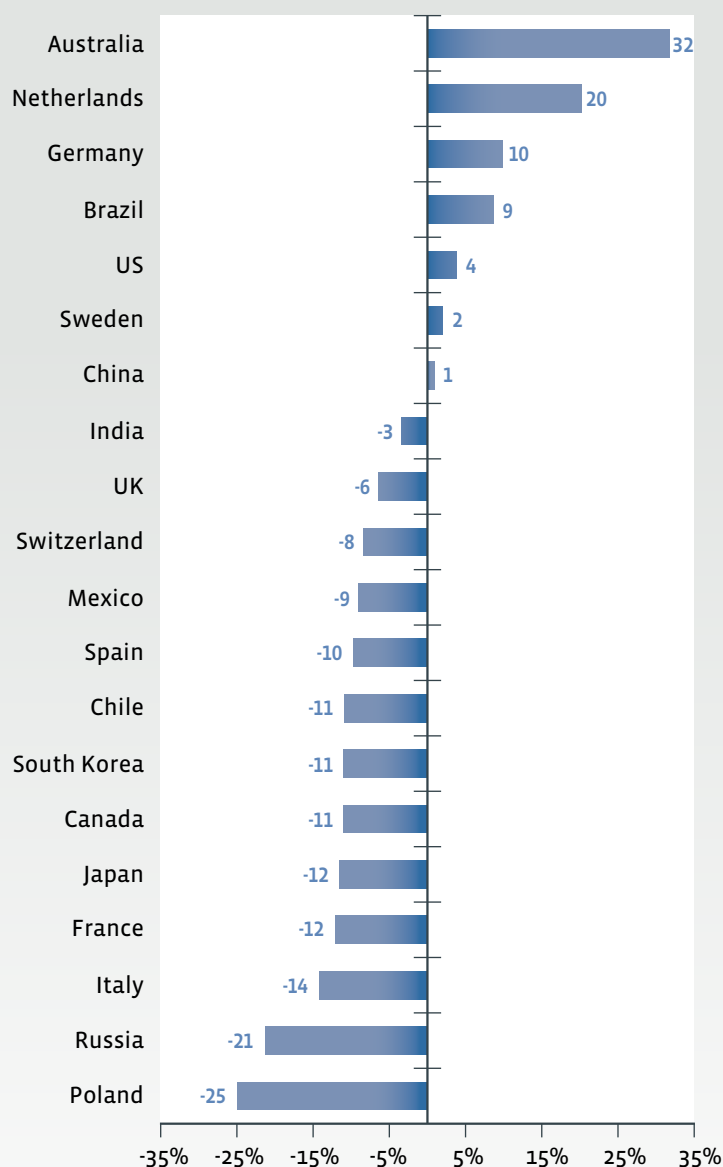
the growth in per capita pension benefits fails to keep pace with the growth in per capita wages. The middle-income elderly are also more vulnerable to the decline in intrafamily income transfers that is projected to occur as family size shrinks, a particularly important concern in countries like China, Mexico, and South Korea, where the old still depend heavily on their grown children.

Although most countries face a flat or declining trend in the relative living standard of the middle-income elderly, there are a few success stories where their living standard is projected to rise significantly. In Australia, the dramatic improvement in the per capita ratio of median elderly to nonelderly income (plus 32 percent) is due to the maturation of "Super," the country's large funded pension system, as well as to scheduled increases in the system's minimum contribution rate. In the Netherlands, the improvement (plus 20 percent) is due to a unique combination of rapid growth in public pension benefits, rapid growth in private pension benefits, and rapid growth in elderly labor-force participation. In Germany, the improvement (plus 10 percent) is due to rapid growth in private pension benefits and elderly labor-force participation, which together more than offset scheduled cuts in public pension benefits. In Brazil, the improvement (plus 9 percent) is due mainly to strong growth in private pension benefits.

It is also worth noting that the outlook in some countries where the median income trend is flat or declining would be even bleaker were it not for recent policy reforms. Like Germany, Sweden is offsetting scheduled cuts in public pension benefits by increasing funded pension savings and elderly labor-force participation, though in its case just enough to keep the relative living standard of middle-income elders from falling. In China, the recent expansions in pension coverage are projected to help the median elder much less than the average elder, but at least the relative living standard of median elders is no longer projected to fall steeply, as it was in the first edition of the GAP Index. The UK's newly introduced nest pensions are projected to help blunt what would

FIGURE 8

Percentage Change in the Per Capita Ratio of Median After-Tax Elderly to Nonelderly Cash Income from 2010 to 2040*

Country	Value
Australia	32
Netherlands	20
Germany	10
Brazil	9
US	4
Sweden	2
China	1
India	-3
UK	-6
Switzerland	-8
Mexico	-9
Spain	-10
Chile	-11
South Korea	-11
Canada	-11
Japan	-12
France	-12
Italy	-14
Russia	-21
Poland	-25

Note: Countries are ranked from best to worst.

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

FIGURE 9

Percent of the Elderly with Incomes beneath 50 Percent of the Median Income for All Persons in 2010 or the Most Recent Available Year

Country	Percent
Sweden	2.9
Poland	3.2
France	5.2
Brazil	5.7
Netherlands	6.0
Switzerland	7.2
Russia	9.7
Canada	10.6
Italy	11.0
Germany	12.1
Spain	13.0
UK	15.2
US	18.4
Australia	20.9
Japan	21.0
India	22.1
Mexico	22.7
Chile	22.8
China	23.9
South Korea	33.9

Note: Countries are ranked from best to worst.
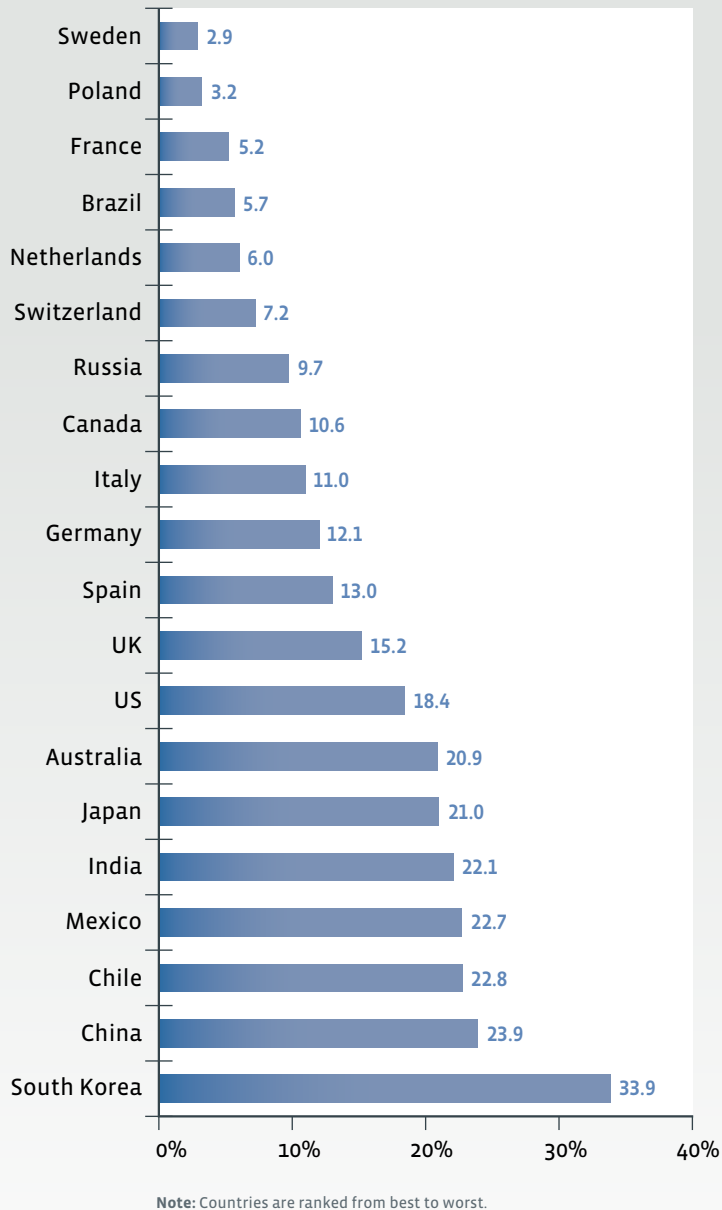
otherwise be a much larger deterioration in the relative living standard of middle-income elders as the country's corporate pension system continues to unravel. South Korea's transformation of its traditional severance pay system into a genuinely funded private pension system is also helping to blunt the projected deterioration in the relative living standard of middle-income elders—though not nearly enough to keep it from sliding in the face of deep reductions in intrafamily transfers and deep reductions in the generosity of its pay-as-you-go public pension system, whose replacement rate has already been slashed twice since it was established in 1988.

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 who now have a cash income beneath 50 percent of the median income for all persons in that country. Although we are not able to project how poverty rates may change in the future, the poverty level indicator provides a valuable additional perspective.

The share of the elderly living in poverty differs enormously across the twenty GAP Index countries. (See figure 9.) Among the fully developed economies, the continental European countries have the lowest elderly poverty rates: under 5 percent in Sweden; between 5 and 10 percent in France, the Netherlands, and Switzerland; and between 10 and 15 percent in Italy, Germany, and Spain. Their low poverty rates reflect their overall low levels of income inequality, as well as the generosity of their minimum public pension guarantees and other cash benefits for the low-income elderly. Canada, with a poverty rate of just over 10 percent, also does well on this indicator. Elderly poverty rates are much higher in the other Anglo-Saxon countries and Japan: between 15 and 20 percent in the UK and the United States and just over 20 percent in Australia and Japan. The high poverty rates of these countries reflect their higher degree of income inequality and their less generous public floors of old-age poverty protection.

TABLE 13

Income Vulnerability Category

Category Ranking and Score			Median Income Level Indicator (Ratio)*			Median Income Trend Indicator (% Change)*			Poverty Level Indicator (%)		
1	Brazil	112	1	Brazil	1.40	1	Australia	32	1	Sweden	2.9
2	Netherlands	110	2	US	1.39	2	Netherlands	20	2	Poland	3.2
3	Australia	103	3	Australia	1.28	3	Germany	10	3	France	5.2
4	Germany	87	4	Chile	1.25	4	Brazil	9	4	Brazil	5.7
5	US	80	5	Germany	1.18	5	US	4	5	Netherlands	6.0
6	Sweden	72	6	Netherlands	1.15	6	Sweden	2	6	Switzerland	7.2
7	France	52	7	UK	1.01	7	China	1	7	Russia	9.7
8	UK	51	8	Italy	0.96	8	India	-3	8	Canada	10.6
9	Switzerland	50	9	Canada	0.94	9	UK	-6	9	Italy	11.0
10	Canada	50	10	Mexico	0.85	10	Switzerland	-8	10	Germany	12.1
11	Italy	47	11	France	0.81	11	Mexico	-9	11	Spain	13.0
12	Chile	45	12	Sweden	0.79	12	Spain	-10	12	UK	15.2
13	Spain	33	13	Switzerland	0.78	13	Chile	-11	13	US	18.4
14	Poland	25	14	Japan	0.78	14	South Korea	-11	14	Australia	20.9
15	Mexico	23	15	Spain	0.72	15	Canada	-11	15	Japan	21.0
16	India	22	16	India	0.70	16	Japan	-12	16	India	22.1
17	Russia	22	17	South Korea	0.65	17	France	-12	17	Mexico	22.7
18	Japan	19	18	Russia	0.65	18	Italy	-14	18	Chile	22.8
19	China	12	19	Poland	0.56	19	Russia	-21	19	China	23.9
20	South Korea	-13	20	China	0.50	20	Poland	-25	20	South Korea	33.9

INDICATOR KEY
Median Income Level = Per capita ratio of median after-tax elderly to nonelderly cash income in 2040
Median Income Trend = Percentage change in the per capita ratio of median after-tax elderly to nonelderly cash income from 2010 to 2040
Poverty Level = Percent of the elderly with incomes beneath 50 percent of the median income for all persons in 2010 or the most recent available year

INDICATOR WEIGHTS
Median Income Level = 1/3
Median Income Trend = 1/3
Poverty Level = 1/3

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

Most of the emerging markets have very high elderly poverty rates: between 20 and 25 percent in India, Mexico, Chile, and China and nearly 35 percent in South Korea. There are, however, three notable exceptions: Brazil, Poland, and Russia. Brazil's low elderly poverty rate of 6 percent is a

FIGURE 10

Percent of the Elderly Living in Households with Their Adult Children in 2010 or the Most Recent Available Year

Country	Percent
India	82
China	69
Mexico	61
Chile	57
Brazil	53
Japan	44
South Korea	39
Spain	37
Russia	35
Poland	33
Italy	28
Canada	22
US	20
Australia	18
France	10
UK	10
Switzerland	7
Germany	7
Netherlands	6
Sweden	5
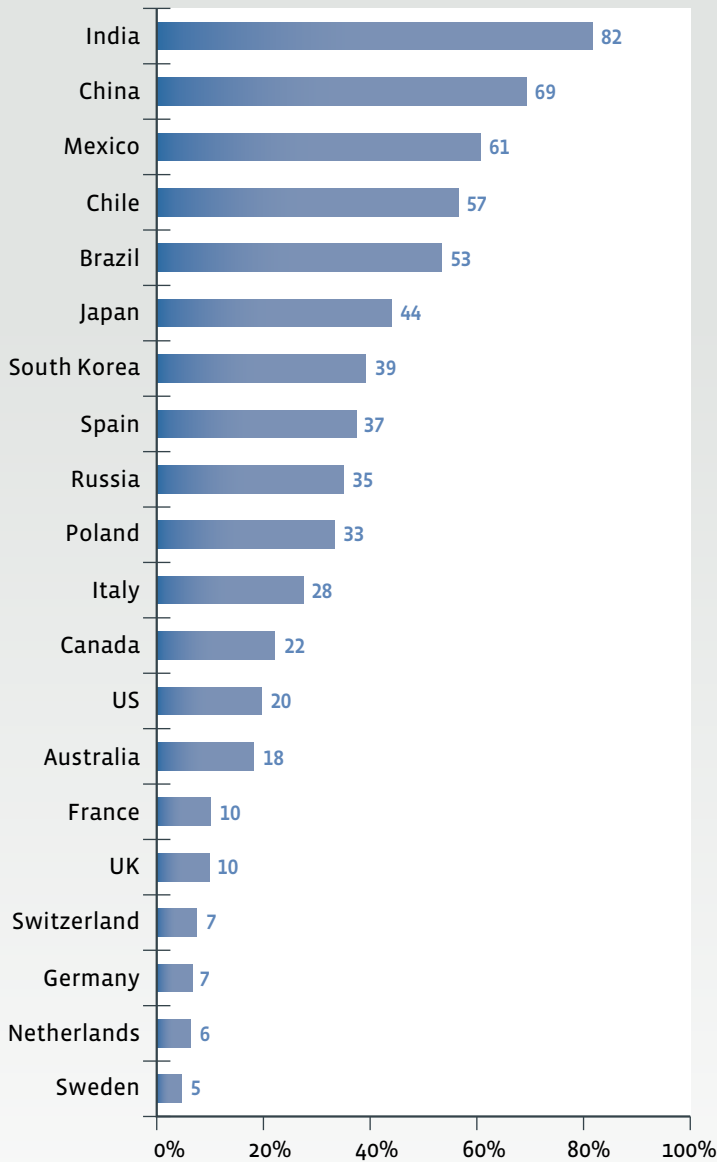
Note: Countries are ranked from best to worst.

testament not just to the high overall living standard of its elderly, but also to the success of its generous noncontributory "social pension" benefits in alleviating economic hardship among the low-income elderly. Poland's and Russia's low elderly poverty rates of 3 percent and 10 percent are more surprising, given their very low overall ratios of per capita elderly to nonelderly income. Yet apparently their broad-based (though less than generous) public pension systems, together with their strong family support networks, do an exemplary job of lifting elders out of poverty.

Table 13 summarizes the results for the income vulnerability category. In calculating the category scores, all three indicators were weighted equally.

Category Three: Family Support

The third indicator category considers the extent to which the elderly may be able to rely on their extended families for support, an important dimension of old-age security often overlooked in retirement policy discussions. Since the GAP Index total and median income projections already incorporate estimates of intrafamily income transfers, we focus here on other factors that reflect the relative strength and affect the future resiliency of family support networks. There are two indicators in the category:

- ◩ **FAMILY TIES:** *Percent of the elderly living in households with their adult children in 2010 or the most recent available year*
- ◩ **FAMILY SIZE:** *Change in the average number of surviving children of the elderly from 2010 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. Such mul-

TABLE 14

Average Number of Surviving Children of the Elderly: 2010, 2040, and Change from 2010 to 2040

Country Ranking		Persons		
		2010	2040	Change
1	Sweden	2.0	2.0	-0.1
2	Poland	2.3	2.0	-0.3
3	Russia	1.9	1.5	-0.4
4	UK	2.3	1.9	-0.4
5	France	2.4	1.9	-0.4
6	Japan	2.0	1.5	-0.5
7	Germany	1.9	1.4	-0.5
8	Switzerland	2.0	1.6	-0.5
9	US	2.5	1.9	-0.6
10	Netherlands	2.3	1.6	-0.6

Country Ranking		Persons		
		2010	2040	Change
11	Australia	2.7	2.0	-0.8
12	Italy	2.2	1.4	-0.9
13	Canada	2.6	1.7	-0.9
14	Chile	3.4	2.4	-1.0
15	India	3.8	2.6	-1.1
16	Spain	2.7	1.4	-1.2
17	South Korea	3.6	1.8	-1.7
18	Brazil	3.9	2.1	-1.7
19	China	4.3	2.0	-2.3
20	Mexico	5.0	2.6	-2.4

Note: Countires are ranked from best to worst according to the projected change from 2010 to 2040.

tigenerational 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, but also allows relatively poor young adults to live with their more affluent parents. It thus mitigates the old-age dependency burden not just by providing an extra source of support for the old, but also by providing a form of "trickle down" support for the young.

As figure 10 shows, the incidence of multigenerational living is quite high in all of the emerging markets in the GAP Index. Between 30 and 40 percent of the elderly now live with their grown children in Poland, Russia, and South Korea. In Brazil and Chile, the share is between 50 and 60 percent. In Mexico it is just over 60 percent, in China it is nearly 70 percent, and in India it passes 80 percent. Among the fully developed economies,

there are just three where more than 25 percent of elders live with their grown children: Italy (28 percent), Spain (37 percent), and Japan (44 percent). In Australia, Canada, and the United States, the share is around 20 percent. In France and the UK, it is 10 percent—and in Switzerland, Germany, the Netherlands, and Sweden it is even lower.

While a high level of multigenerational living can be an advantage in confronting the aging challenge, overreliance on family support networks can also become a liability as societies age and family size declines. The fewer children the elderly have, the lower are the odds that they will be able to live with a grown child, even if the cultural propensity for multigenerational living remains unchanged. Whether or not parents and children live together, smaller family size also makes it more difficult for the young to support the old in other ways. Most

TABLE 15

Family Support Category

Category Ranking and Score			Family Ties Indicator (%)			Family Size Indicator (Persons)		
1	India	117	1	India	82	1	Sweden	-0.1
2	Chile	84	2	China	69	2	Poland	-0.3
3	Japan	79	3	Mexico	61	3	Russia	-0.4
4	China	69	4	Chile	57	4	UK	-0.4
5	Poland	68	5	Brazil	53	5	France	-0.4
6	Russia	66	6	Japan	44	6	Japan	-0.5
7	Brazil	60	7	South Korea	39	7	Germany	-0.5
8	Mexico	54	8	Spain	37	8	Switzerland	-0.5
9	Spain	51	9	Russia	35	9	US	-0.6
10	Italy	44	10	Poland	33	10	Netherlands	-0.6
11	South Korea	40	11	Italy	28	11	Australia	-0.8
12	US	40	12	Canada	22	12	Italy	-0.9
13	Canada	35	13	US	20	13	Canada	-0.9
14	Australia	33	14	Australia	18	14	Chile	-1.0
15	Sweden	32	15	France	10	15	India	-1.1
16	France	30	16	UK	10	16	Spain	-1.2
17	UK	29	17	Switzerland	7	17	South Korea	-1.7
18	Switzerland	25	18	Germany	7	18	Brazil	-1.7
19	Germany	24	19	Netherlands	6	19	China	-2.3
20	Netherlands	19	20	Sweden	5	20	Mexico	-2.4

INDICATOR KEY
Family Ties = Percent of the elderly living in households with their adult children in 2010 or the most recent available year
Family Size = Change in the average number of surviving children of the elderly from 2010 to 2040

INDICATOR WEIGHTS
Family Ties = 2/3
Family Size = 1/3

Note: Countries are ranked from best to worst.

critically, it means fewer potential family caregivers to share the responsibility of looking after the frail and disabled elderly. The family support category's second indicator—the change from 2010 to 2040 in the average number of surviving children of the elderly—captures these risks.

As table 14 shows, the size of families is due to shrink dramatically in many of the emerging markets that now rely most heavily on the family for support in old age. Between 2010 and 2040, the average number of surviving children of the elderly is projected to decline by 1.0 in Chile and by 1.1 in India. In Brazil and South Korea, it is

TABLE 16

GAP Income Adequacy Index

Overall Index			Total Income Category			Income Vulnerability Category			Family Support Category		
1	Netherlands	95	1	US	133	1	Brazil	112	1	India	117
2	US	93	2	Netherlands	119	2	Netherlands	110	2	Chile	84
3	Brazil	93	3	Australia	108	3	Australia	103	3	Japan	79
4	Australia	91	4	Germany	101	4	Germany	87	4	China	69
5	Germany	80	5	Brazil	91	5	US	80	5	Poland	68
6	Sweden	54	6	UK	68	6	Sweden	72	6	Russia	66
7	UK	53	7	Canada	54	7	France	52	7	Brazil	60
8	Chile	50	8	France	52	8	UK	51	8	Mexico	54
9	Canada	49	9	China	49	9	Switzerland	50	9	Spain	51
10	France	47	10	Sweden	46	10	Canada	50	10	Italy	44
11	Italy	45	11	Spain	46	11	Italy	47	11	South Korea	40
12	Spain	42	12	Italy	43	12	Chile	45	12	US	40
13	China	38	13	Chile	39	13	Spain	33	13	Canada	35
14	Japan	37	14	Japan	35	14	Poland	25	14	Australia	33
15	India	37	15	Switzerland	29	15	Mexico	23	15	Sweden	32
16	Switzerland	37	16	South Korea	23	16	India	22	16	France	30
17	Mexico	22	17	India	12	17	Russia	22	17	UK	29
18	Russia	17	18	Mexico	6	18	Japan	19	18	Switzerland	25
19	South Korea	12	19	Russia	-12	19	China	12	19	Germany	24
20	Poland	5	20	Poland	-45	20	South Korea	-13	20	Netherlands	19

CATEGORY WEIGHTS
Total Income = 40 percent
Income Vulnerability = 40 percent
Family Support = 20 percent
Note: Countries are ranked from best to worst.

projected to decline by 1.7, in China by 2.3, and in Mexico by 2.4. In Eastern Europe, fertility rates fell much earlier than in the rest of the developing world, which means that today's elders already have relatively small families. The same is true in the developed world. Nonetheless, a few developed countries where the fall in fertility rates began somewhat later than elsewhere (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 the average number of surviving children per elder.

Table 15 summarizes the results for the family support category. In calculating the category scores, the more important family ties indicator

received a two-thirds weight and the family size indicator a one-third weight.

Income Adequacy Index Results

The income adequacy index, like the fiscal sustainability index, combines the results for its three indicator categories into a single overall index score and ranking for each of the twenty countries. In calculating the overall index scores, the more important total income and income vulnerability categories each received a weight of 40 percent, while the family support category received a weight of 20 percent. Table 16 presents the final results.

Once again, it is important to keep in mind that the general location of a country in the overall index rankings is more meaningful than its precise ranking. Indeed, this is even truer for the income adequacy index than for the fiscal sustainability index, since the scores of many countries are even more tightly clustered.

A glance at table 16 reveals that there is a large gap in scores between the five highest-ranking countries on the income adequacy index—the Netherlands, the United States, Brazil, Australia, and Germany—and the other fifteen. These five countries also rank among the top five countries in both the total income category and the income vulnerability category, though they do considerably less well in the family support category. With income adequacy, just as with fiscal sustainability, there is thus a "high preparedness" or "low vulnerability" group. Meanwhile, toward the bottom of the income adequacy index, there is also a significant gap in scores between the four lowest-ranking countries—Mexico, Russia, South Korea, and Poland—and those with somewhat higher rankings. All four of these countries score poorly in both the total income category (within the bottom five rankings) and the income vulnerability category (within the bottom seven rankings), though they do considerably better in the family support category. Together, they constitute a "low preparedness" or "high vulnerability" group.

Lessons for Retirement Policy

T hus far in the report, we have focused on where countries are heading if their current retirement policies remain unchanged. How high will the old-age dependency burden rise and will tomorrow's workers and taxpayers be able to afford it? Are current policies on track to maintain the living standard of the elderly in countries where it is now relatively high or to raise it in countries where it is now relatively low?

The GAP Index results reveal that there is considerable room for improvement in most countries. Many score much better on one dimension of aging preparedness than the other, meaning that fiscal sustainability is being achieved at the expense of income adequacy or vice versa. There are also some countries that score poorly on both dimensions of aging preparedness, meaning that current policies are failing to achieve even this lopsided result. Only four countries rank in the top half of both the fiscal sustainability and income adequacy indices: Australia, Chile, Canada, and Sweden.

In the final chapter, we shift our focus to what countries can do to steer a surer course into their graying futures. Most of our conclusions flow directly from the GAP Index results that we have already presented. But we also deepen the analysis by comparing the economic circumstances of the "young elderly" and the "old elderly," a subject with important implications for the future direction of retirement policy.

Balancing Adequacy and Sustainability

When societies age, the share of their overall economic resources that must be transferred from working-age adults to the nonworking elderly inevitably increases. The relevant policy question is not how to keep the old-age dependency burden from rising at all as a share of GDP, but how to minimize the extra burden on the young while maintaining or even improving the living standard of the old.

As we have seen, many countries have already enacted major reforms of their public pension sys-

tems that are projected to reduce future spending well beneath the levels to which the aging of their populations would otherwise drive it. As we have also seen, this retrenchment in the generosity of state retirement provision is projected to lead to an erosion in the relative living standard of the elderly in many of these same countries, and especially the living standard of middle-income elders, who typically depend heavily on public benefits. This in turn could mean that much of the progress that countries have made in improving the fiscal sustainability of their public pension systems will turn out to be illusory. Unless cost-saving reforms are accompanied by other policy measures that help to ensure the overall adequacy of retirement income, governments may face increasing pressure from aging electorates to roll back the reforms.

Two strategies in particular are crucial if countries are to escape or at least mitigate what is too often a zero-sum trade-off between fiscal sustainability and income adequacy: extending work lives and increasing funded pension savings. Together, they provide the best means—indeed, the only means—to maintain or improve the living standard of the old without imposing a direct new fiscal or family burden on the young.

The good news is that many countries are beginning to make progress on both fronts. Elderly labor-force participation rates have risen substantially in a number of developed economies over the past decade, with some of the largest increases in European countries that have long had very early retirement ages. Meanwhile, from China and Germany to South Korea and the UK, governments are putting in place new incentives designed to increase funded pension savings. According to the GAP Index projections, benefit payouts from funded pension plans are now on track to grow at least somewhat as both a share of GDP and a share of elderly income in every country between 2010 and 2040—and to grow very substantially in some. (See table 17.)

The bad news is that most countries still need to do much more. Despite the recent increases, elderly labor-force participation rates remain very low in many countries—less than 25 percent as of 2010 everywhere except Brazil, Chile, China, India, Japan, Mexico, South Korea, and the United States. Moreover, without new reforms that raise minimum eligibility ages for public pension benefits, participation is unlikely to increase much above today's levels in most countries, the notable exceptions being Australia, Chile, Germany, Italy, the Netherlands, and Poland, where existing reforms or ongoing cohort shifts are projected to have a significant impact. And though funded pension benefits are due to grow rapidly in many more countries, the five countries where they are projected to constitute the largest component of elderly income in 2040—Australia, Canada, Switzerland, the Netherlands, and the United States—are the same five countries where they constitute the largest component today.

The economic and social benefits of extending work lives would of course reach well beyond their impact on income adequacy. To the extent that higher elderly labor-force participation also means higher eligibility ages for public pension benefits, government budgets would realize a twofold savings. Unlike cuts in benefit levels, higher eligibility ages not only lower benefit costs by reducing the number of years in which benefits are collected, but also boost tax revenues by increasing the number of years in which contributions are made. Higher elderly labor-force participation, whether on a full-time or part-time basis, could also help to ease potential labor shortages in fast-aging countries where the number of adults in the traditional working years is projected to stagnate or contract in decades to come. Remaining productively engaged, moreover, is not only good for the health of the budget and the economy, but according to most gerontologists it is also good for the health of the elderly themselves.

Depending on how pension plans are structured and financed, there might also be important broader economic and social benefits to increasing funded pension savings. To the extent that pension savings represents new net national savings, it will raise the growth path of the economy—meaning,

TABLE 17

Funded Pension Benefits as a Percent of GDP and Elderly Income in 2010 and 2040*

Percent of GDP				Percent of Income			
Country Ranking		2010	2040	Country Ranking		2010	2040
1	Australia	4.5	9.8	1	Australia	18	31
2	Switzerland	5.1	9.8	2	Canada	27	29
3	US	5.9	8.1	3	Switzerland	22	28
4	Canada	5.6	7.9	4	Netherlands	23	24
5	Netherlands	4.9	7.5	5	US	21	23
6	Chile	2.1	5.9	6	Chile	11	20
7	UK	3.9	5.4	7	UK	16	20
8	Sweden	1.9	4.8	8	Sweden	7	16
9	Brazil	0.9	3.4	9	China	0	14
10	Japan	2.6	3.3	10	South Korea	6	11
11	Germany	0.8	3.3	11	India	4	11
12	South Korea	0.7	3.0	12	Poland	0	11
13	Italy	1.1	2.8	13	Japan	10	10
14	China	0.0	2.5	14	Russia	0	9
15	Poland	0.0	1.6	15	Germany	3	8
16	Russia	0.0	1.6	16	Brazil	2	8
17	India	0.3	1.5	17	Mexico	3	7
18	Mexico	0.3	1.4	18	Italy	4	7
19	Spain	0.6	1.2	19	Spain	3	3
20	France	0.3	0.4	20	France	1	1

Note: Countries are ranked from best to worst according to the projection results for 2040.
*Income refers to average cash income.

in effect, that benefits will ultimately be paid out of new wealth that would not otherwise have existed. As a general rule, mandatory or quasi-mandatory systems like those in Australia, Chile, the Netherlands, and Switzerland are more likely to result in net new savings than are voluntary systems that rely on tax incentives to encourage participation. Needless to say, they are also more likely to benefit middle earners and low earners than are voluntary plans. Funded pension plans will also bring larger economic and social benefits if regulations permit workers' savings to be invested in globally diversified portfolios. As societies age and the rate of economic growth declines, so will the long-term rate of return to capital. 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 be sure, the twin strategies of extending work lives and increasing funded pension savings do not alone constitute a complete solution to the income adequacy challenge. As we have seen, many emerging markets have very high elderly poverty rates. Because they also have large informal sectors, higher participation in contributory pension systems, whether financed on a pay-as-you-go or funded basis, may not do much to improve the situation. What is needed are non-contributory "social pensions" like the one Brazil has long had or the ones Chile and South Korea have recently put in place. Even in some fully developed economies with high overall elderly living standards—the United States leaps to mind—the share of the elderly living in relative poverty remains high. As benefit levels under public pension systems are cut and retirement ages are raised in the future, the urgency of strengthening old-age safety nets will grow.

Nor, of course, does reducing the rising pay-as-you-go burden of public pension systems constitute a complete solution to the fiscal sustainability challenge. Much of the projected growth in the overall old-age dependency burden, after all, is due to the growth in health-care spending on the elderly. Whether many countries will be successful in controlling this explosive dimension of old-age dependency is unclear. The emerging markets cannot hope to achieve much savings in elderly health benefits—and indeed may end up spending even more than projected as they grow more affluent, coverage is expanded, and standards of care converge with those in the developed world. In contrast, achieving savings in elderly health benefits must be a high priority in most developed countries. No one should delude themselves, however, that the task will be easy. If the history of past cost control efforts is any guide, advances in medical technology and rising public expectations about care and cure will interact with population aging to put relentless upward pressure on costs.

To the extent that health-care spending on the elderly proves difficult to control, reducing pension spending becomes all the more important.

The Young Elderly and Old Elderly

As life spans and health spans have risen in recent decades, the onset of what functionally can be termed "old age" has drifted steadily upwards, and is no longer age 60 or even 65 in most countries. Yet a large share of government old-age benefits still flow to people who, in effect, are middle-aged by today's standards. Adults aged 60–69 now receive at least one-third of public pension benefits in every GAP Index country, and in some emerging markets the share approaches two-thirds. The share of public pension benefits received by adults in their sixties is projected to decline in the future, both because adults in their sixties will be a smaller proportion of all elders and because many countries have begun to raise retirement ages. Nonetheless, the share will still be substantial in 2040—at least one-quarter in every developed country except Australia, Canada, and Germany and nearly one-half in some emerging markets.

In the end, most countries will find it impossible to balance fiscal sustainability and income adequacy so long as they continue to subsidize premature retirement. As governments look for ways to reduce the rising fiscal burden of their old-age benefit systems, there are compelling economic and social reasons to focus cuts in public benefits on the "young elderly," while largely shielding the "old elderly," who are more dependent on those benefits, have lower incomes, are less able to work, and, as life spans increase, often find themselves at growing risk of outliving their savings.

As figure 11 shows, the living standard of the old elderly is significantly lower than that of the young elderly in most countries—and in many countries, it is much lower. There are only two countries in the GAP Index where the income of adults aged 70 and over comfortably exceeds that of adults

aged 60–69: Brazil and Chile. In thirteen of the countries, the average per capita after-tax cash income of the old elderly is less than 90 percent of that of the young elderly. In eight of the countries it is less than 80 percent and in five it is less than 70 percent, with the worst performers including both fully developed economies and emerging markets. The reasons why elderly income falls with advancing age vary from country to country. But the most important reason in almost all countries is that the old elderly have fewer alternative income sources to supplement public benefits. This is especially true for employment income, which makes up a far larger share of the income of adults in their sixties, whether or not they are formally "retired," than it does of adults in their seventies. It is no accident that many of the countries where the old elderly have the lowest relative living standard are also countries where the young elderly have high labor-force participation rates—with Japan, where elderly income plunges after age 70, being the most striking example.

The degree of dependence of the old elderly on public benefits is nothing less than startling. (See figure 12.) In every country in the GAP Index, public benefits now make up a larger share of the cash income of middle-income adults aged 70 and over than of middle-income adults aged 60–69—and in most countries, a much larger share. In Australia, Canada, Germany, Mexico, Sweden, Switzerland, and the United States, the level of benefit dependence is nearly twice as high among the old elderly as the young elderly. There are fifteen countries where at least half of the income of the middle-income old elderly comes in the form of a government check, compared with just nine where this is true for the young elderly. In eleven countries, at least two-thirds of their income consists of public benefits, whereas for the young elderly there are only two countries—Russia and Poland—where dependence on public benefits is this high.

The higher level of dependence of the old elderly on public benefits in turn means that reductions in the generosity of state retirement provision

FIGURE 11

Per Capita Ratio of Average After-Tax Old Elderly (Aged 70 & Over) to Young Elderly (Aged 60–69) Cash Income in 2010

Country	Ratio
Chile	1.14
Brazil	1.09
UK	1.01
Poland	0.98
Russia	0.98
France	0.93
Canada	0.92
Italy	0.89
Germany	0.88
Australia	0.86
India	0.82
Korea	0.82
US	0.79
Switzerland	0.76
Spain	0.71
China	0.69
Sweden	0.65
Netherlands	0.62
Mexico	0.61
Japan	0.52

Note: Countries are ranked from best to worst.

FIGURE 12

Public Benefits as a Percent of the Cash Income of the Median-Income Young Elderly (Aged 60–69) and Median-Income Old Elderly (Aged 70 & Over) in 2010*

Young Elderly
Old Elderly

Country	Young Elderly	Old Elderly
India	24	27
South Korea	24	30
Mexico	24	42
China	32	44
Canada	27	49
Switzerland	28	50
US	27	52
Netherlands	49	53
Chile	44	63
Australia	39	68
Japan	52	69
Russia	68	72
UK	46	72
France	64	77
Sweden	41	81
Germany	49	83
Italy	59	84
Brazil	65	88
Spain	60	91
Poland	90	98
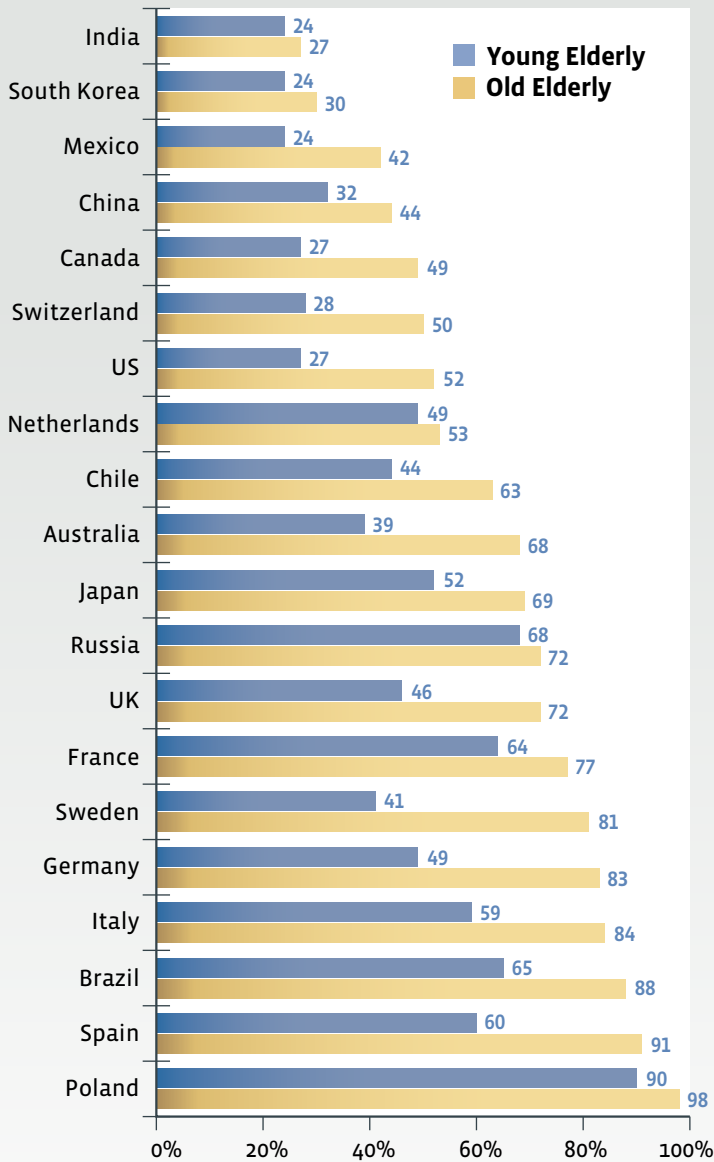
Note: Countries are ranked from best to worst according to the public benefit share of the old elderly.

*Data refer to the third quintile of the elderly income distribution.

hurt them more than they hurt the young elderly. As table 18 shows, the average per capita income of the old elderly is projected to grow less or, what is much more common, to decline more than the income of the young elderly in virtually every country between now and 2040. The only significant exceptions are Australia, the Netherlands, and Poland. In the first two countries, the income trend is strongly positive for both elderly age groups, though the old elderly fare even better than the young elderly. For Australia, the explanation is that the maturation of Super, the country's funded pension system, will push up the income of the old elderly faster than that of the young elderly as retirees who have participated in the system for a full career begin to age into the oldest elderly age brackets. For the Netherlands, the explanation is that the rollback in early retirement benefits slows the upward trend in the income of the young elderly relative to that of the old elderly. The dynamic in Poland is similar, except that here the incomes of the young elderly are sinking faster than those of the old elderly rather than rising more slowly.

All of this suggests that a successful response to the challenge of global aging may require a bolder approach than most governments have yet been prepared to consider. Rather than enact across-the-board benefit cuts that end up falling most heavily on those who are least able to bear them, perhaps it is time to more fundamentally rethink the overall role of the state in retirement provision. Our aging societies no longer need—and can no longer afford—to have government subsidize retirements that begin in late middle age and may last a third or more of our adult lives. What they do need is a more robust and secure guarantee of state support in true old age, when ability to work declines and savings dwindle. In short, we may need to refashion state retirement systems as retirement income backstops rather than retirement income floors.

TABLE 18

Percentage Change in the Per Capita Ratio of Average After-Tax Elderly to Nonelderly Cash Income, by Elderly Age Group, from 2010 to 2040

Country	% Change in Income		Country	% Change in Income	
	Young Elderly	Old Elderly		Young Elderly	Old Elderly
Australia	8.2	23.5	Mexico	-2.9	-19.9
Brazil	11.5	2.2	Netherlands	12.7	23.8
Canada	-1.1	-14.5	Poland	-31.5	-19.7
Chile	3.5	-14.6	Russia	-16.4	-18.3
China	17.2	18.7	South Korea	0.5	-12.9
France	-5.6	-12.9	Spain	2.2	-8.7
Germany	31.1	0.2	Sweden	2.9	0.0
India	3.5	-6.8	Switzerland	-1.1	-12.6
Italy	-0.2	-13.9	UK	-1.8	-6.4
Japan	-5.1	0.6	US	3.9	6.5

Note: Countries are unranked.

Conclusion

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 among policymakers, business leaders, and the broad public. Many countries are debating—and some have enacted—major reforms. Yet despite the progress, most countries are not ready to meet what is sure to be one of the defining challenges of the twenty-first century.

Clearly, global aging poses many daunting economic and social challenges. Many fast-aging countries, especially in the developed world, seem to face a difficult choice between relieving the growing fiscal burden on the young and maintaining adequate incomes for the old. Meanwhile, in many emerging markets, the choice sometimes 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. With farsighted policy choices, it will indeed be possible to provide the old the security that they have earned while ensuring the young the future of expanding economic opportunity that they deserve.

Technical Appendix

The Technical Appendix provides a detailed description of the GAP Index model and projection methodology, as well as a detailed explanation of how the results are calculated.

Projection Horizon

The base year for the GAP Index projections is 2010, the most recent year for which many data series were available. To the extent feasible, however, actual data for 2011 and 2012 are incorporated into the projection model. The projections extend through the year 2040. We selected 2040 as the model's projection horizon because the "demographic transition" in most of the GAP Index countries will by then be largely complete. If we cut off the projections much before 2040, the GAP Index would fail to capture the full impact of population aging. If we extended the projections much beyond 2040, we would gain few new analytical insights—but would greatly increase the uncertainty of the projection results. Most indicators are calculated based on their projected values in 2040 or on the projected change in their values between 2010 and 2040.

Demographic Scenario

The demographic projections used in the GAP Index come from the 2010 Revision of the UN Population Division's *World Population Prospects.* For all countries except India, we follow 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 projection to the UN's "medium variant" projection, which arbitrarily assumes that fertility rates in all countries will eventually converge at the 2.1 replacement rate. There is little theoretical or empirical support for this assumption, and in fact fertility rates in most of the GAP 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 its fertility rate has been falling rapidly. Here we follow the UN's medium variant projection, which allows for a further decline. Both UN projection scenarios assume that life expectancy will continue to improve in the future, though at a slower rate than in the recent past. Both also assume that net immigration will continue at close to its recent historical average in most countries.

Economic Scenario

The economic projections used in the GAP Index initially follow the IMF's April 2013 economic projections, which extend through 2018 and are published in its World Economic Outlook Database. Beyond 2018, we use a standard long-term

global GDP model developed by CSIS. The long-term model projects GDP based on two critical assumptions. First, 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 55 and over, whose participation rates are projected to rise in some countries due both to cohort effects and to policy reforms that are scheduled to increase retirement ages. Second, 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. Specifically, the growth rate in real GDP per employed person in each country is 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. The convergence is achieved by halving the gap between each country's initial productivity growth rate and the developed-country historical average every ten years.

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 GAP Index results.

Fiscal Scenario

The fiscal projections used in the GAP Index initially follow the IMF's April 2013 fiscal projections, which also extend through 2018 and are published in its World Economic Outlook Database.[4] Beyond 2018, we make two stylized assumptions whose purpose is to isolate the impact

of aging on government budgets. The first is that each country will adopt a policy of "debt neutrality"—that is, each country will move 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. The second 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. The tax-hike 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. For the "borrowing room" indicator, the debt-neutrality assumption is relaxed as well.

The GAP Index model includes three basic types of taxes: payroll taxes, direct taxes, and indirect taxes. In apportioning future tax changes between the three types, we follow two stylized rules. First, we assume that payroll taxes will be raised such that they pay for the same proportion of total public benefits in the future that they pay for today. Second, we then divide any remaining tax change between direct and indirect taxes in proportion to the share of each in total taxation today.

Public Benefits

The GAP 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, all means-tested retirement benefits, and all government employee pension benefits—provided that the benefits are primarily financed on a pay-as-you-go basis. If public pension systems are fully funded *and* personally owned or fully funded *and* contractually based, benefits are considered economically equivalent to funded private pension benefits and are not included in public benefits. The health benefits category includes both acute-care services and

long-term care services. The other benefits category includes everything else, from disability and unemployment benefits to nutritional and housing subsidies.

For OECD member countries, the base-year data for the public pensions and other benefits categories come from the OECD's Social Expenditure Database, while the data for health benefits come from OECD Health Data 2012. For non-OECD countries, the base-year data for the public pensions and other benefits categories come mostly from national government sources, while the data for the health benefits category come from the World Health Organization's World Health Statistics.

Wherever possible, the GAP Index projections of public pension benefits follow official government projections, 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. For the EU member countries (France, Germany, Italy, the Netherlands, Poland, Sweden, Spain, and the UK), we use the latest projections published by the European Commission in its *2012 Ageing Report*. For Australia, Canada, Chile, Japan, Russia, South Korea, Switzerland, and the United States, we use the latest national government projections. For Brazil, we use projections prepared by Standard & Poor's; for Mexico, we base our projections on an analysis by BBVA.[5] For China and India, 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.

The GAP Index projections for government health benefits were made by CSIS using the following methodology. First, we assume that current per capita age-bracket differentials in health-care spending will remain unchanged in the future. This 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. Second, we assume that the growth rate in real age-adjusted per capita health-care spending will tend to converge across countries. Specifically, we assume that the initial growth rate in each country will converge (up or down) by 2040 to the rate of growth in real GDP per capita plus 0.5 percent, which is roughly the twenty-five-year historical average for all developed countries.[6] 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 emerging markets. This level convergence affects eight countries: Brazil, Chile, China, India, Mexico, Poland, Russia, and South Korea.

For the other benefits category, where most spending programs are not directly affected by population aging, the GAP Index model makes the simplifying assumption that total spending will remain unchanged as a share of GDP in the future.

Funded Pension Benefits

The GAP Index definition of funded pensions is quite broad. It includes public plans and private plans, employer pensions and personal pensions, and defined-benefit and defined-contribution schemes. Most of our base-year data for funded pension benefits come from OECD sources, especially the Social Expenditure Database and

[5] *Global Ageing 2010: An Irreversible Truth* (Standard & Poor's, 2010); and Adolfo Albo et al., *Toward the Strengthening of the Pension Systems in Mexico: Vision and Reform Proposals* (BBVA, 2008).

[6] For the developed countries, the initial growth rate in real age-adjusted per capita spending is assumed to equal each country's twenty-five-year (1985–2010) average; for the developing countries, it is assumed to equal each country's ten-year (2000–2010) average.

OECD Pensions Outlook 2012. For those countries where OECD provides only partial data or does not provide any data at all, we also rely on data compiled by national governments.

In a few cases, the GAP Index uses official projections of funded pension benefits. For the Netherlands, Poland, Spain, and Sweden, we use the latest projections in the European Commission's *2012 Ageing Report*, adjusted in the case of defined-contribution plans to conform to our rate of return assumptions. For the UK, we start with the projections prepared by the government's 2005 Pensions Commission, but update them to reflect recent reforms and adjust them to conform to our rate of return assumptions. For the other countries, we made our own projections, since there exist no official projections—and in most cases, no projections at all.

Our projections of funded pension benefits are constructed using the following methodology. (1) We make a "cohort adjustment" to future benefit payouts in some countries to reflect the fact that, even apart from policy changes, rates of participation are rising among younger workers. (2) We make an "earnings maturation adjustment" to future benefit payouts in some countries 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. (3) We make a "DB unwinding adjustment" to future benefit payouts in some countries to take into account ongoing shifts in funded pension coverage from defined-benefit to defined-contribution plans. (4) We make a "policy adjustment" to future benefit payouts to take into account recent reforms in some countries, including Australia (higher mandatory contributions to Super); Chile (the extension of mandatory personal accounts coverage to the self-employed); India (additional incentives to participate in the New Pension Scheme); Poland (lower mandatory contributions to the personal accounts tier of its state pension system); South Korea (additional incentives to participate in cor-

porate pensions); and the UK (auto-enrollment in employer pension schemes or the new state nest pensions. (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.

For defined-contribution schemes, projecting future benefit payouts also requires projecting average replacement rates. Our calculations assume that all contributions are invested in a globally diversified portfolio of stocks and bonds that earns a 4.5 percent real annual rate of return and that administrative charges are equal to 0.5 percent of assets. Although our stylized assumptions for real rates of return and administrative charges are the same for all countries, our replacement rate calculations reflect projected differences in real wage growth and life expectancy across countries.

Household Income

The GAP Index model uses a two-step approach to calculate the income of the elderly and nonelderly. We first derive totals for broad categories of income from aggregate data for each country's household and government sector. We then allocate these totals to the elderly and nonelderly based on age distributions for each category of income obtained from household income surveys. This two-step approach allows us to correct for the income underreporting typical of most household income surveys. It also ensures that our income measures are consistent with our GDP-based projections of government revenues, expenditures, and public benefits. Most of the aggregate income data come from the national accounts for each country, though for some types of income we use data from other sources to supplement or substitute for the national accounts data. For all of the OECD-member countries, as well as for Russia, we use the national accounts published by the OECD; for Brazil and India, we use the national accounts published by the UN; for China, we use the national accounts

published by the government's statistical office. All of the household income surveys that we use are included in the Luxembourg Income Study (LIS) database, except for Chile's, which is available from the government's Ministry of Planning and Cooperation.

Income by Type

The GAP Index model divides all income into five broad categories: employment income, asset income other than funded pension benefits, funded pension benefits, 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 each country's national accounts. Self-employment income had to be estimated, since in the national accounts framework it is a part of mixed income—that is, the combined return to capital and labor in unincorporated businesses. 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.

Asset income is equal to mixed income plus property income as defined in the national accounts, with the following adjustments. To avoid double-counting, we naturally subtract our estimate of self-employment income from mixed income. We also adjust national accounts property income to reflect our different treatment of funded pension and life insurance benefits. The national accounts include the annual internal return to funded pension plans and life insurance policies in current household income, but exclude benefit payments from current income since they are a return to prior-year savings. In the GAP Index, however, we want 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.[7] We also add funded pension benefits to the model—but, as already explained, these are classified as a separate income category rather than included in asset income.

The GAP Index tracks funded pension benefits separately from other types of asset income 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 plans included in the funded pension benefits income category have already been described above. Here we need simply add that the GAP Index model assumes that increases in funded pension savings will be partially offset by declines in other forms of household savings. The offset is assumed to be one-third. The other two-thirds of new pension savings would presumably result in new national savings and new GDP. Since we do not use a general equilibrium model, however, we do not estimate the impact on factor prices or economic output.

The public benefits income category consists of all pay-as-you-go government cash benefits, as well as most government quasi-cash and in-kind benefits, including, most importantly, health benefits. In deriving the totals for this income category, we use budgetary data on social welfare expenditures rather than the national accounts data on social transfers, because the budgetary data include important programmatic detail and are consistent with the GAP Index fiscal projection scenario.

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 type, are estimated based on

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[7] 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 benefits income category, while death benefits are not included in the model. To develop our estimates, we began with data for gross life insurance claims paid, which for most countries are available from OECD Insurance Statistics. We then calculated the long-term savings component of gross claims paid using data on claims and premiums by type of product from national life insurance associations, national regulatory agencies, and industry reports.

the income-sharing rule described below. Inter-household transfers are estimated based directly on family transfer data reported in the household income surveys. All family transfers are measured net—that is, they are calculated for each age group as the difference between the income support that the age group receives and the income support that it provides.

Income by Age

The GAP Index model divides all income between two age groups: the elderly (aged 60 and over) and the nonelderly (under age 60). It also further divides elderly income between the young elderly (aged 60–69) and the old elderly (aged 70 and over). The income of each age group refers to the income of individuals within that age group, with the exception of the 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 non-elderly persons who are not spouses, income is shared 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.

To distribute our national-accounts-based income totals between age groups in the base year, we first use household income survey data to calculate separate age-group allocation shares for the following broad components of income: wages, self-employment income, asset income, funded pension benefits, public pension benefits, and other public benefits. For government health benefits, which are not included in the household income surveys, we calculate age-group allocation shares based on per capita age-bracket differentials in health-care spending. We then use the age-group allocation shares to distribute the totals for each type of income between the elderly and nonelderly.

Allocating asset income by age presented a special challenge, since the concept of asset income used in the GAP Index is broader than the household income survey concept. In addition to interest, dividends, and rental income actually received by households, it encompasses certain indirect financial returns that accrue to households, as well as the return to capital in unincorporated businesses. The types of asset income counted in household income 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 income 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 income survey data to calculate income by type for each quintile of the elderly and nonelderly income distribution. The quintile data were then normalized to our model's income totals. These quintile distributions provided the basis for our projections of the ratio of median elderly to nonelderly income.

After-Tax Income

The GAP 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 to calculate income. Aggregate data for total taxes by type are first derived from the national accounts. These totals are then allocated to the elderly and nonelderly based on household income survey data. For most countries, we were able to allocate direct taxes based on income tax data from the household income 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 the GAP Index model makes the standard economic assumption that all taxes are ultimately borne by households. We therefore gross up pretax household income by indirect taxes and corporate taxes.

Income Projections

The GAP Index model projects the income of the elderly and nonelderly as follows. We begin by projecting the totals for each type of income as a share of GDP. The totals for funded pension benefits and for the different categories of public benefits are projected according to the methodologies described above. The totals for asset income and employment income are assumed to remain constant as a share of GDP, except to the extent that the growth in funded pension savings is partially offset by a decline in other forms of household savings. To divide the projected totals for each type of income between the elderly and nonelderly, we then adjust the initial base year age-group allocation shares in each future year to reflect projected shifts in the relative number of elderly and nonelderly. In the case of public pension benefits and funded pension benefits, we further adjust the allocation shares to reflect projected changes in eligibility ages; in the case of employment income, we further adjust them to reflect projected changes in elderly labor-force participation rates. Health benefits are a special case. Since our basic projection methodology already generates totals for different age groups, we can incorporate these directly into our projections of elderly and nonelderly income.

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 on per capita earnings or asset ownership by age, which may be important in some countries. We plan to explore ways of adding these shifts to the model in future editions of the GAP Index.

Gap Index Structure

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

The *GAP Fiscal Sustainability Index* is structured as follows:

◹ **Category One: Public Burden.** This category contains two indicators that measure the magnitude of each country's projected public old-age dependency burden—that is, the total cost of pay-as-you-go government benefits to the elderly. Both indicators are weighted equally.

▶ **BENEFIT LEVEL:** *Total public benefits to the elderly in 2040 as a percent of GDP*
▶ **BENEFIT GROWTH:** *Growth in total public benefits to the elderly from 2010 to 2040 as a percent of GDP*

◹ **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*
▶ **BUDGET ROOM:** *Total public benefits to the elderly in 2040 as a percent of government outlays*
▶ **BORROWING ROOM:** *Net public debt in 2040 as a percent of GDP*

◹ **Category Three: Benefit Dependence.** This category contains two indicators that measure how dependent the elderly in each country are on government benefits, and thus how politically difficult it may be to enact cost-saving reforms. The first indicator receives a two-thirds weight and the second indicator a one-third weight.

▶ **BENEFIT SHARE:** *Public benefits as a percent of the cash income of the median-income elderly: Average for 2010 to 2040*

▶ **BENEFIT CUT:** *Percent of elderly households that would be pushed into poverty by an immediate 10 percent cut in public benefits*

The *GAP Income Adequacy Index* is structured as follows:

▨ **Category One: Total Income.** This category contains two indicators that measure the overall level of and trend in the living standard of the elderly relative to the nonelderly in each country. Both indicators are weighted equally.

   ▶ **TOTAL INCOME LEVEL:** *Per capita ratio of average after-tax elderly to nonelderly total income in 2040*
   ▶ **TOTAL INCOME TREND:** *Percentage change in the per capita ratio of average after-tax elderly to nonelderly total income from 2010 to 2040*

▨ **Category Two: Income Vulnerability.** This category contains three indicators—two that measure the relative level of and trend in the living standard of "middle-income" elders and one that measures the extent of elderly poverty. All three indicators are weighted equally.

   ▶ **MEDIAN INCOME LEVEL:** *Per capita ratio of median after-tax elderly to nonelderly cash income in 2040*
   ▶ **MEDIAN INCOME TREND:** *Percentage change in the per capita ratio of median after-tax elderly to nonelderly cash income from 2010 to 2040*
   ▶ **POVERTY LEVEL:** *Percent of the elderly with incomes beneath 50 percent of the median income for all persons in 2010 or the most recent available year*

▨ **Category Three: Family Support.** This category contains two indicators that measure the strength of informal family support networks. The first indicator receives a two-thirds weight and the second indicator a one-third weight.

▶ **FAMILY TIES:** *Percent of the elderly living in households with their adult children in 2010 or the most recent available year*
▶ **FAMILY SIZE:** *Change in the average number of surviving children of the elderly from 2010 to 2040*

For each of the subindices, the country rankings 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 indicator index scores that preserve the indicator rankings while also reflecting the relative distance of each ranked country, positively or negatively, from the "center of the pack." For each indicator, the mean result is set to an index score of 50; results that lie above and below the mean by one standard deviation are set, respectively, to index scores of 100 and zero. (3) Next, we combine the individual indicator scores 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 that make up the GAP Index. 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.

Key Definitions

ELDERLY AND NONELDERLY: The elderly are persons aged 60 and over and the nonelderly are persons under age 60, except that spouses are considered to belong to the age group of the household head regardless of their own age.
YOUNG ELDERLY AND OLD ELDERLY: The young elderly are persons aged 60–69 and the old elderly are persons aged 70 and over, except that spouses are considered to belong to the

age group of the household head regardless of their own age.

ADULT CHILDREN: Adult children are children aged 20 and over.

CASH INCOME AND TOTAL INCOME: Cash income includes all cash and quasi-cash income; total income is equal to cash income plus the cash value of government health benefits.

AVERAGE INCOME AND MEDIAN INCOME: Average income refers to the average income of all persons in an age group; median income refers to the average income of persons in the third quintile of the income distribution.

POVERTY RATES: A poor person is defined as a person with an income beneath 50 percent of the median income for all persons. In calculating poverty rates, income is measured on an equivalized basis, meaning that it takes into account economies of scale deriving from household size.

PUBLIC BENEFITS: Public benefits include all cash, quasi-cash, and in-kind government benefits paid to or on behalf of individuals—provided that the benefits are primarily financed on a pay-as-you-go basis.

FUNDED PENSION BENEFITS: Funded pension benefits include benefits from all types of funded pension plans, whether they are constituted as public or private programs.

First and Second Editions

In preparing the second edition of the GAP Index, we wished to make it as comparable to the first edition as possible. The projection methodology and specification of indicators therefore remain largely unchanged, and the weighting of indicators and indicator categories is identical. Nonetheless, a few changes seemed desirable:

◺ *Benefit Share Indicator:* In the first edition of the GAP Index, the benefit share indicator measured public benefits as a share of the average total income of the elderly. In the second edition, it measures public benefits as a share of the cash income of the median-income elderly. This change is designed to better capture the political risks of resistance to cost-saving reform.

◺ *Borrowing Room Indicator:* In the first edition of the GAP Index, the borrowing room indicator assumed that countries would adopt a policy of debt neutrality in their "rest-of-government" budgets. It thus measured only the incremental impact of government borrowing to pay for rising old-age benefit costs. In the second edition, we relax the debt-neutrality assumption. As respecified, the borrowing room indicator better captures the ability of governments to borrow given their overall fiscal stance.

◺ *Home Health Benefits:* In the first edition of the GAP Index, certain types of home health benefits were misclassified as pension benefits. We have corrected this mistake in the second edition. The result, however, is that the public pension projections for several countries where these benefits are important are not comparable between the two editions. The countries most affected are Australia, Japan, the Netherlands, and Sweden.

◺ *Health-Care Projections:* In the first edition of the GAP Index, our projections of government health benefits were modeled based on assumed rates of "excess cost growth"—that is, on the differential between the rate of growth in real age-adjusted per capita spending and the rate of growth in real per capita GDP in each country. Although this is a standard methodology, it works better for developed countries with relatively stable long-term rates of economic growth than it does for emerging markets. In the second edition, we model our projections based directly on rates of growth in real age-adjusted per capita spending.

About the Authors

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