http://clevelandfed.org/research/review/
Economic Review 1999 Q4

Population Aging and Fiscal Policy in Europe and the United States

by Jagadeesh Gokhale and Bernd Raffelhüschen

Jagadeesh Gokhale is an economic advisor at the Federal Reserve Bank of Cleveland; Bernd Raffelhüschen is a professor of economics at the University of Freiburg. The authors thank David Altig, Mark Sniderman, and an anonymous referee for helpful comments and Carl Gjersem for providing the calculations for Norway. Bernd Raffelhüschen thanks the Fritz Thyssen Stiftung and the Federal Reserve Bank of Cleveland for research support.

Introduction

Establishing sound and sustainable public finances is a top priority among policymakers in all Western countries. In Europe, the Maastricht Treaty's criteria for acceptance into the European Monetary Union (EMU) include substantial fiscal consolidation with respect to both public-sector budget deficits and the stock of outstanding public debt. Except under special circumstances, a prospective member country's budget deficit must be less than 3 percent of its GDP and its public debt less than 60 percent by 1997.[1]

To retain membership in the EMU, countries must conform to similarly tight constraints.[2] However, even for nonretirement spending—public-capital investments, welfare, and unemployment benefits—staying within the Maastricht fiscal limits is an uphill task for many member nations. Germany, for example, whose public debt is already at the limit, cannot borrow significant additional sums from capital markets to finance the ongoing process of unifying its Eastern and Western economies. Furthermore, pressures to exceed the limits will intensify as a ballooning number of retirees demand delivery of the generous retirement benefits promised under current pension laws. These issues motivate us to analyze the size of the true liabilities, explicit and implicit, faced by member nations and the total fiscal adjustment that may be necessary for establishing long-term fiscal sustainability.

U.S. policymakers face long-term fiscal problems that are similar to Europe's but less severe. High debt, accumulated in the 1980s and early 1990s, has increased service costs. Although prospective budget surpluses could help reduce the size of outstanding debt, political support for additional government consumption seems to be growing.

1 The former criterion was considered to be "hard"—that is, required of all countries—while the latter was considered "soft"—not essential if all other fiscal and monetary criteria were met.

2 Under the Stability and Growth Pact of the Maastricht Treaty, if a country is judged to have violated the deficit criterion in the absence of exceptional circumstances (such as a recession or a natural disaster), a four-month maximum is allowed for corrective action. Sanctions are imposed in several steps. Ultimately, in addition to certain nonpecuniary sanctions, the country may be required to make a non-interest-bearing deposit with the European Central Bank of up to 0.5 percent of its GDP each year that its deficit violates the limit. This deposit is forfeited if the country fails to conform to the deficit limit within two years. For more details, see http://europa.eu.int/euro/quest/normal/frame.htm?language_nb=5.

Despite improved budget projections, the long-term fiscal challenge in the United States remains sizable. Long-term projections based on intermediate economic and demographic assumptions indicate large revenue shortfalls for Social Security and Medicare. However, from the perspective of these programs' finances, the assumptions may prove too optimistic: The productivity growth underlying these projections seems higher than warranted by U.S. experience during recent decades, and the assumed future improvements in longevity occur more slowly than the nation's past experience suggests.[3]

In this paper, we make a transatlantic comparison of the total size of *intertemporal public liabilities* (IPLs)—the sum of the explicit and implicit liabilities embedded in the fiscal policies of several European countries and the United States. The driving force behind implicit demands on future public budgets is the demographic transition underway in Europe and the United States. Almost all developed countries have one phenomenon in common: a significant "double aging" of the population. Because of the baby boom (and the subsequent baby bust during the postwar period) and because of steadily improving longevity, these countries' populations will not only contain a greater proportion of elderly people in the future, but also a higher fraction of *older elderly* individuals. That is, aging of the population as a whole will be accompanied by aging of the elderly population itself.

Traditional fiscal indicators based on cash-flow accounting fail to address aging phenomena because the future liabilities of pay-as-you-go retirement and health care systems are absent from current fiscal flows. Hence, cash-flow deficits and the size of outstanding debt are unreliable indicators of fiscal sustainability; moreover, the debt and deficit criteria for fiscal "harmonization," such as those of the Maastricht Treaty, may prove insufficient and shortsighted.[4] This paper uses the machinery of generational accounting developed by Auerbach, Gokhale, and Kotlikoff (1991, 1992) to calculate and compare the composition of U.S. and European IPLs with regard to explicit and implicit liabilities.

Our analysis is restricted to the United States, Norway and 12 member states of the European Union—Austria, Belgium, Denmark, Finland, France, Germany, Italy, Ireland, the Netherlands, Spain, Sweden, and the United Kingdom.[5] Our findings suggest that the present fiscal policies of all these countries except Ireland have positive IPLs and hence are unsustainable over the long term. Only Ireland has a slight negative IPL, indicating a small stock of assets and, therefore, the potential to reduce taxes or increase transfers or other public expenditures in the future. Finland and Sweden have the highest IPLs, with IPL/GDP ratios exceeding 200 percent. In Austria, the United Kingdom, Spain, Germany, and Italy, the ratio ranges from 100 percent to 200 percent. Our calculations show somewhat smaller, but nonetheless high, IPLs for the United States, France, the Netherlands, and Denmark, countries whose IPL/GDP ratio lies between 70 percent and 100 percent. Finally, Norway and Belgium have very small ratios (only 10 percent and 19 percent, respectively).

This study confirms the claim, made by advocates of generational accounting, that explicit debt is a poor indicator of long-term fiscal sustainability. Among EMU members, those with the highest implicit liabilities report the lowest (but nonetheless positive) explicit debt. However, countries with the smallest (or negative) implicit liabilities have rather high explicit debt levels in 1995, the base year of the calculations. The explanation for the apparent negative correlation between explicit and implicit liabilities may be that by 1995, the future EMU countries with the highest explicit debt/GDP ratios had already begun implementing fiscal reforms to become eligible for participation in the EMU.

Section I of this paper briefly describes the method adopted for estimating IPLs. Section II reports and discusses trends in dependency ratios for the elderly and the oldest-old populations in Europe and the United States. Section III

3 Some believe that the high productivity growth witnessed in recent years is likely to be sustained; in our opinion, however, it does not as yet provide adequate reason to revise upward the long-term productivity growth rate assumed in making Social Security revenue projections.

4 Note that limits on the debt and on cash-flow deficits are sufficient for maintaining a sustainable policy. However, whether such limits, in and of themselves, are sufficient precommitment devices to move to a sustainable policy remains an empirical question—one that only the passage of time will help resolve.

5 The studies were undertaken by a team of experts at the request of the European Commission's Directorate General XXI (Task Force on Statutory Contributions) and collected in European Commission (1999). See Keuschnigg et al. for Austria, Dellis and Lüth for Belgium, Jensen and Raffelhüschen for Denmark, Feist et al. for Finland, Crettez et al. for France, Bonin et al. for Germany, McCarthy and Bonin for Ireland, Franco and Sartor for Italy, Bovenberg and ter-Rele for the Netherlands, Berenguer et al. for Spain, Lundvik et al. for Sweden, and Cardarelli and Sefton for the United Kingdom. For Norway, see Norwegian Ministry of Finance (1999). These studies are available upon request. Results for the United States are based on Gokhale et al. (1999).

reports IPLs for 13 European countries and the United States, decomposes them into explicit and implicit liabilities and, for each country, calculates the size of the immediate and permanent hike in all taxes that would reduce IPLs to zero. This section also presents country-specific IPLs, calculated under the assumption of a constant population structure to examine how population aging affects the size of implicit liabilities. Section IV summarizes the results and concludes the paper.

I. Intertemporal Public Liabilities and their Measurement

Intertemporal Public Liabilities

The point of departure for our calculations is the government's intertemporal budget constraint, which states that the government's future net taxes must be just sufficient to service or retire its net explicit debt. It can be expressed as

$$(1) \quad \sum_{s=t}^{\infty} T_s R^{-(s-t)} - B_t = 0.$$

Here, B_t stands for the public sector's net explicit debt in the base year, t; T_s represents *actual* net taxes collected in future years indexed by s; and $R = 1 + r$ represents a discount factor where the assumed interest rate is r. The term *net taxes* is shorthand for unified primary budget surpluses. It refers to aggregate public-sector taxes less expenditures on non-interest transfers and purchases of goods and services. Actual future net taxes depend on future changes in fiscal policy. Hence, actual future net taxes will generally differ from those that would be collected if the current set of fiscal policies were maintained indefinitely. We denote the latter by T^*_s. Equation (1) need not hold when T^*_s is substituted for T_s. If it does not hold, standard convention is to consider current fiscal policy as being unsustainable: If the present value of net taxes, T^*_s, exceeds B_t, fiscal policy would need to be changed to avoid a wasteful accumulation of resources within the government.[6] Alternatively, if the present value of net taxes falls short of B_t, fiscal policy would have to be altered to avoid government debt default.

We report the size of the IPL embedded in each country's existing fiscal policy.[7] This measure is defined by rewriting equation (1) as

$$(2) \quad IPL_t = B_t - \sum_{s=t}^{\infty} T^*_s R^{-(s-t)}.$$

As equation (2) shows, the value of the IPL reflects both explicit and implicit government liabilities, the latter being caused, for example, by generous pay-as-you-go retirement programs at a time of rapid population aging. The size of the IPL also indicates how much policy adjustment is needed to restore fiscal sustainability: If the value is positive, the government's total expenditure commitments (including interest payments on its explicit debt) exceed prospective revenues under status quo conditions, and net taxes must be increased in the future. If negative, the IPL indicates how far taxes should be reduced.

Measurement

B_t is easily measured as the government's financial indebtedness minus its tangible and financial assets.[8] Measuring the second term on the right-hand side of equation (2) is more difficult because it requires projections of future government taxes and expenditures under current policy. Reliable projections of taxes, transfers, and government purchases of goods and services are available for only a few of the countries analyzed here. Fortunately, generational accounts have been estimated for most European countries and for the United States. The machinery of generational accounting offers a relatively straightforward way to project future government revenues and expenditures under prevailing fiscal policies.[9]

For countries where projections of aggregate taxes, transfers, and government spending on goods and services are not available or are unreliable, we use a standard procedure to project these aggregates. For each country, relative profiles of taxes and transfers by age

■ **6** Note that the first term in equation (1) represents the present value of the stream of net taxes through the indefinite future.

■ **7** In the literature, this indicator is also called the "generational balance gap" or "true debt." See Raffelhüschen (1999a) for a broader discussion.

■ **8** The calculation does not include intra-agency debt—that is, liabilities of the government held in other government accounts.

■ **9** For a brief description of generational accounting, see Auerbach et al. (1991, 1992, 1994). The method employed in this paper follows the standards developed in the European Commission's project, *Generational Accounting in Europe* (see Raffelhüschen [1999a, 1999b]).

and sex are available for the base year (1995). These profiles are obtained from micro-data surveys, one for each tax and transfer category in each country.[10] The available tax profiles cover all forms of statutory payments to the government; transfer profiles reflect both in-cash and in-kind benefits.[11] The relative-profile values for government purchases of goods and services are assumed to equal one for each age and sex because these outlays are for providing public goods.[12] The profiles for a given country constitute a detailed representation of its fiscal policy during the base year; they reflect the age- and sex-specific distribution of taxes, transfers, and purchases of goods and services across the population.

For each country, aggregate taxes, transfers, and government purchases in the base year (at all levels of government—federal, state, and local) are distributed among individuals alive in that year according to the applicable age–sex relative profiles. This procedure yields per capita taxes, transfers, and government purchases for the base year. For future years, profiles of per capita taxes, transfers, and government purchases are obtained by applying an assumed long-run growth factor of 1.5 percent annually to the base year's per capita profiles. Thus, let $h^{*x}_{a,i,s}$ represent the ith type of tax per capita for a person of sex x aged a in year t. Then, the ith per capita tax in year $s>t$ is calculated as

$$(3) \qquad h^{*x}_{a,i,s} = h^{*x}_{a,i,s}\,(1+g)^{s-t}.$$

The same growth factor is used for every country included in this study, with appropriate modifications to future per capita values in cases where recent changes in fiscal policy imply future changes in the distribution of taxes or transfers by age and sex. Next, for each country, two profiles of per capita taxes—net of transfers and net of government purchases of goods and services—are computed (one for each sex) for each future year as

$$(4) \qquad \eta^{*x}_{a,s} = \sum_i h^{*x}_{a,i,s}.$$

Finally, aggregate taxes net of transfers and net of purchases of goods and services for future years are computed as

$$(5) \qquad T^{*}_{s} = \sum_x \sum_{a=0}^{D} \eta^{*x}_{a,s} P^{x}_{a,s}.$$

In equation (5), $P^{x}_{a,s}$ stands for the number of individuals of sex x aged a in year s. The calculations use country-specific population projections, based on assumptions for mortality, fertility, and immigration consistent with those of official medium-term estimates of future demographic trends.[13]

For countries where reliable long-term projections are not available, we use the method described above to obtain future aggregate taxes, transfers, and government spending. For others, such as the United States, where official government agencies provide reliable medium- and long-term projections, we use the method described above to extend the projections beyond the last year available. The projections are extended sufficiently far out that adding more years does not appreciably alter the second term on the right side of equation (2).

II. A Cross-Country Comparison of Demographic Trends

Figure 1 shows the elderly dependency ratio for the United States and the European countries considered here. (In all four of our figures, the countries are listed in ascending order according to their IPLs in 1995.) This is the ratio of the over-60 population to that aged 20 to 59.[14] The ratio for 1995 is based on actual population data, whereas the ratios for 2015, 2035, and 2055 are based on the previously mentioned population projections for the various countries. Among the European countries, Sweden, Italy, and Belgium have the highest elderly dependency ratios in 1995. Over the next 15 years, all countries' elderly dependency ratios are pro-

■ **10** See the works cited in footnote 5.

■ **11** All available information was used to derive age–sex profiles for the various types of taxes and transfers. Whenever information was insufficient to distinguish payments by age or sex, we distributed the base-year aggregate amount equally by age or sex.

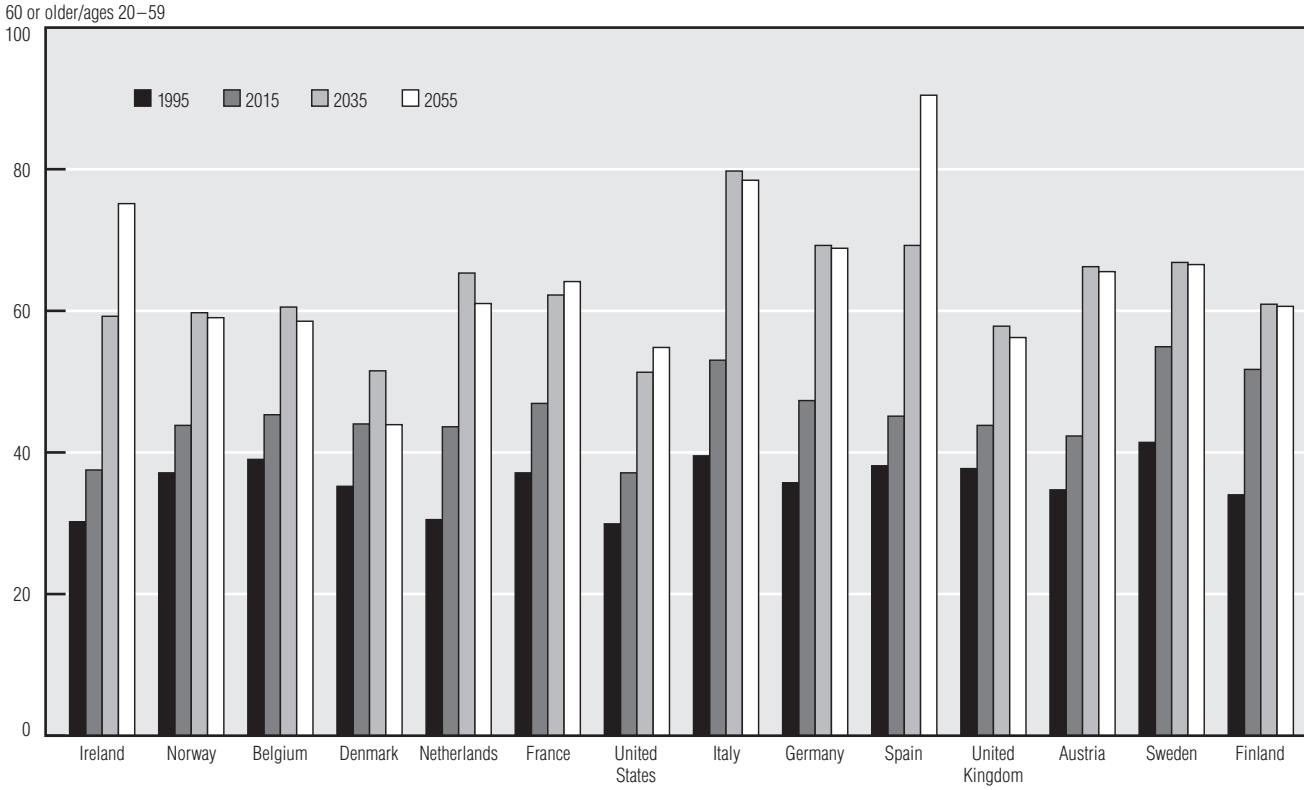
■ **12** For some countries, such as the United States, government purchases of goods and services are distributed according to a few age–sex categories. However, the portion of government spending that represents purchases of pure public goods (such as defense) is distributed uniformly across the living population.

■ **13** For country-specific data sources, see the references listed in footnote 5.

■ **14** The cutoff age was set at 60 because this is the effective retirement age in public pension systems for most of the countries considered here.

FIGURE 1

Elderly Dependency Ratio in Europe and the United States, 1995



SOURCES: Country studies in European Commission (1999); U.S. data are based on Gokhale et al. (1999).

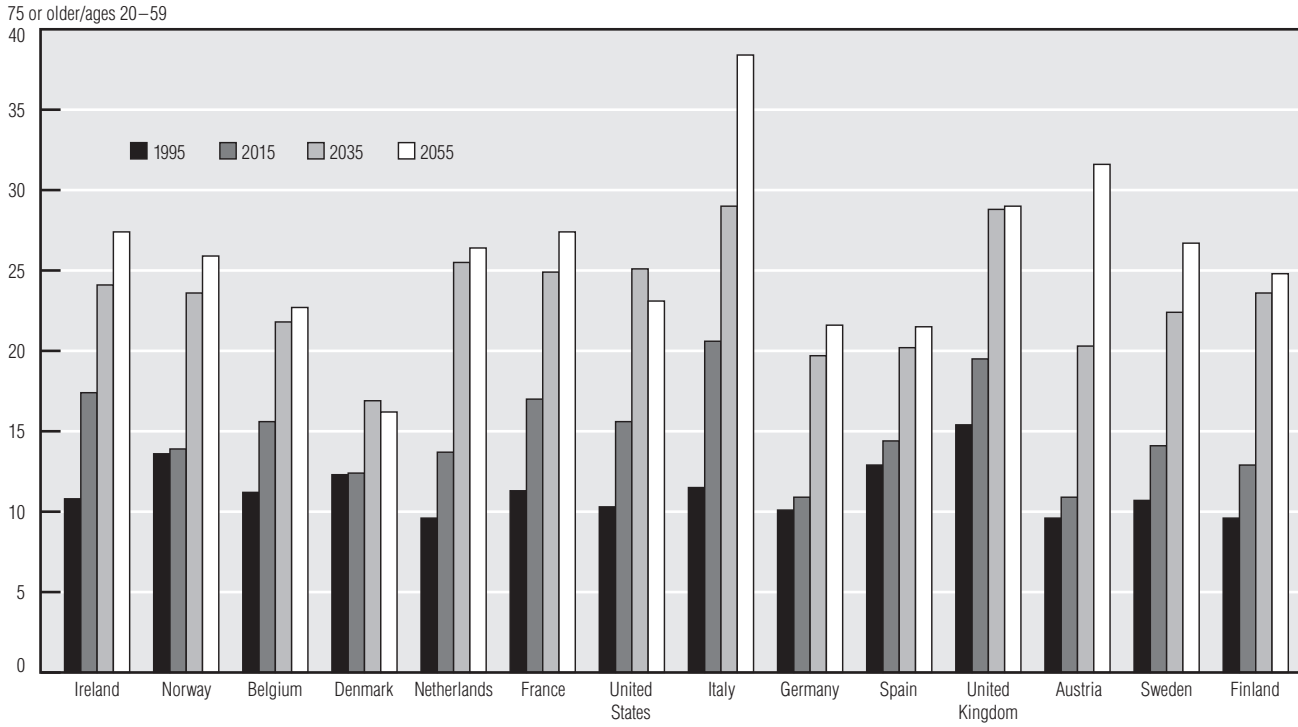
jected to increase significantly. Finland's ratio will increase the most, but Sweden and Italy are again prominent as countries that will experience the steepest increase in the size of the elderly relative to the working-age population. By 2015, more than a third of the people living in these three countries will be 60 or older. By contrast, the elderly dependency ratio in the United States will be a modest 37 percent.

Population aging in Europe will continue well beyond the first two decades of the next century. In Italy, four out of every nine persons will be 60 or older by 2035! In Sweden, Austria, and Germany, two out of every five persons will be elderly by our criterion. In comparison, the U.S. population will be much younger, with only one of every three persons falling into the elderly category. Except in Ireland and Spain, where elderly dependency ratios will continue to rise after 2035, the process of population aging will cease after about five decades.

Population aging has two dimensions: Not only will there be more elderly individuals in the future; in addition, healthier lifestyles and medical advances will create an expanding population of the oldest old. Figure 2 shows dependency ratios for the oldest old—the ratio of people aged 75 or more to those aged 20–59—for the years 1995, 2015, 2035, and 2055. This ratio is at or just over 10 percent for most of the countries considered here (the United Kingdom, at 15, is an exception). By 2035, this ratio is expected to roughly double for 10 of our 13 European countries. It more than triples for Italy: By 2055, roughly two of every five Italians will be 75 or older. In the United States, this ratio is expected to increase through 2035, but then fall back slightly by 2055. Overall, the elderly dependency ratio will almost double in another three decades and the ratio for the oldest old will nearly triple by the middle of the next century.

FIGURE 2

Oldest-Old Dependency Ratio in Europe and the United States, 1995



SOURCES: Country studies in European Commission (1999); U.S. data are based on Gokhale et al. (1999).

III. Findings

Explicit, Implicit, and Total Intertemporal Public Liabilities

Figure 3 shows the composition of the IPLs of specific countries, sorted in ascending order by their total IPL as of 1995. The figure also shows the magnitudes of explicit liabilities (the public sector's net outstanding debt in 1995) and implicit liabilities calculated according to the method described earlier. Only Ireland has a negative IPL. Despite its significant population aging and high level of explicit debt, Ireland's 1995 fiscal policies generated a surplus of future net taxes relative to non-interest expenditures. The projected surpluses are more than sufficient to repay its explicit debt, indicating the potential for somewhat lower taxes, higher transfers, or greater government purchases in the future.[15] Norway's rich petroleum reserves are valued at an amount that is almost double the country's GDP. The government controls an overwhelming share of this wealth, either directly or indirectly (through taxation). Norway's implicit liabilities slightly exceed its explicit assets, producing a small positive IPL.

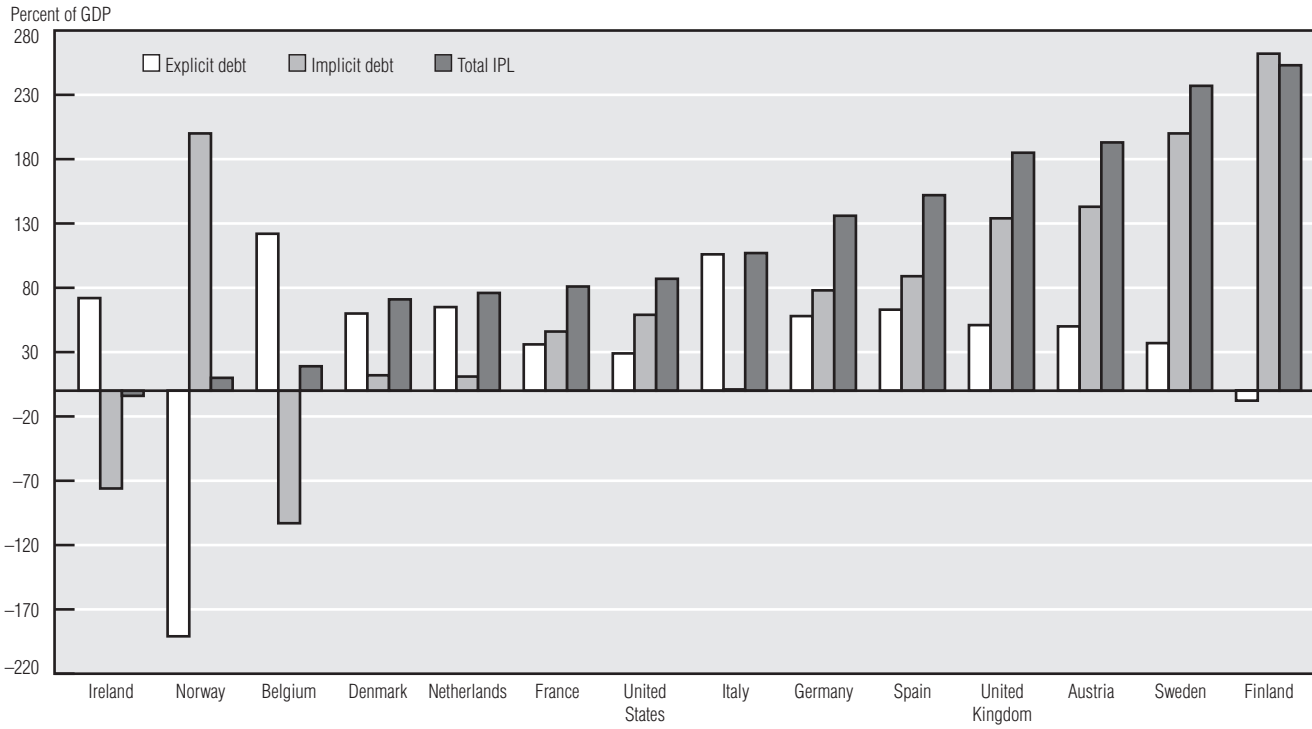
Belgium also has a low positive IPL, but for the opposite reason: Its high explicit debt slightly exceeds its negative implicit liabilities. Knowing that the Maastricht Treaty's debt/GDP criterion of 60 percent by 1997 was out of reach, the Belgian government sought to reduce the annual deficit to well below the 3 percent threshold, mainly by increasing tax revenues. Denmark, the Netherlands, France, and the United States have moderate IPL levels—less than 100 percent of GDP.

The correlation coefficient between the explicit and implicit liabilities of the 14 countries shown in figure 3 is –0.63. Had all these coun-

15 Part of the explanation for Ireland's implicit surpluses is that its population aging occurs much later.

FIGURE 3

Composition of Intertemporal Public Liabilities



SOURCES: Country studies in European Commission (1999); U.S. data are based on Gokhale et al. (1999).

tries' policies been fully sustainable, each would have had implicit assets exactly offsetting its explicit debt, and the cross-country correlation coefficient would have been –1.0. The explanation for the partial negative correlation between the implicit and explicit components may be that the Maastrich Treaty imposes immediate fiscal adjustment on countries with high explicit debt or deficit levels but not on those whose policies imply high implicit liabilities.

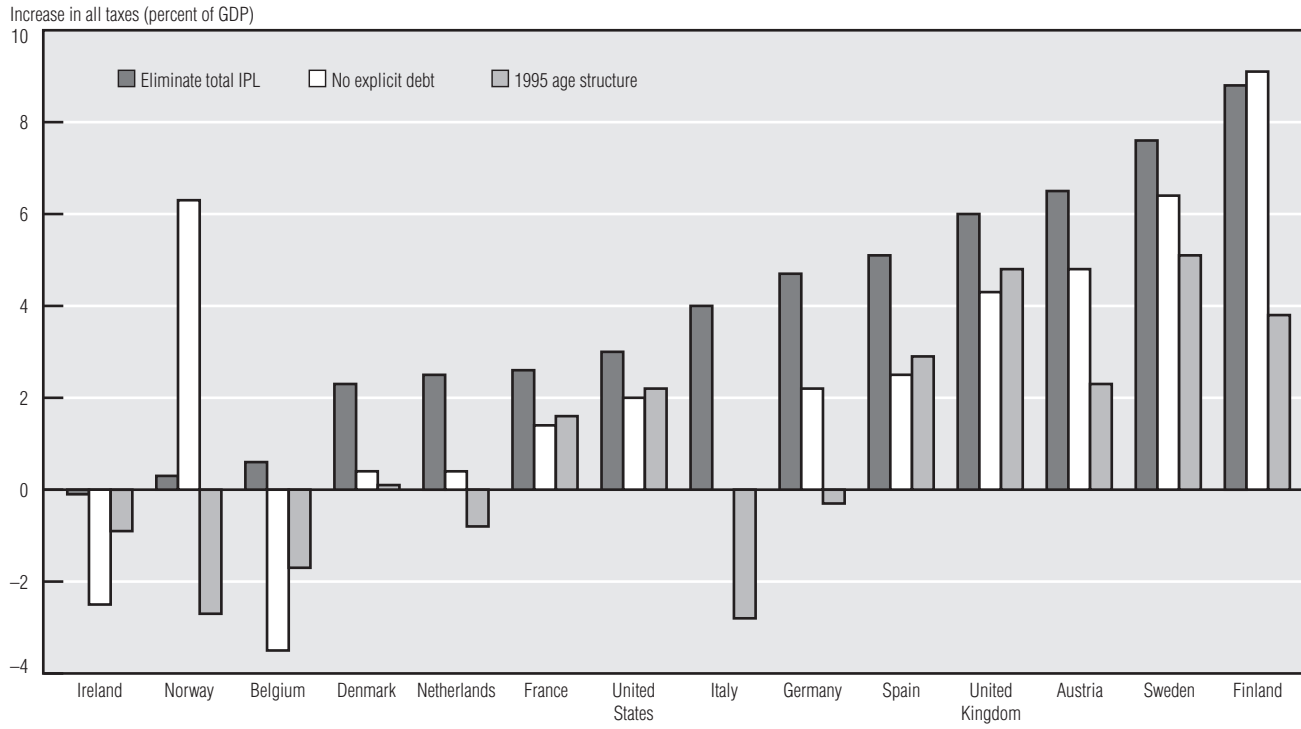
This suggests that criteria such as those of the Maastrich Treaty may allow countries with primarily implicit liabilities to postpone policy adjustments, that is, to maintain an unsustainable policy stance for some period of time. Generational accounting studies have shown that postponing adjustments to achieve fiscal sustainability generally increases the size of the required adjustments (tax increases or transfer cuts).[16] Hence, although the Maastricht criteria may ultimately force corrective action on countries with primarily implicit liabilities, postponing such action might escalate its cost to prohibitively high levels. The corollary to this, of course, is that policy choices would become more transparent and the process of adopting timely fiscal reforms would be improved were such criteria based on total IPLs, rather than on their explicit components alone. Figure 3 supports this hypothesis. It shows that countries with high IPLs, such as Sweden and Finland, had low explicit debt levels in 1995. By assessing the stance of fiscal policy only on the basis of outstanding explicit liabilities, the Maastrich Treaty may be failing to convey the appropriate degree of urgency with regard to the need for fiscal reforms in these countries.

Italy is another country with relatively high explicit liabilities. The major pension reform it adopted in 1995 produced a sizable reduction in its implicit liabilities—an amount that was more than 70 percent of GDP. As a result, Italy's overall IPL is accounted for entirely by its outstanding debt. In terms of total IPL, the United States ranks roughly in the middle of the countries shown in figure 3. Despite a low

16 For example, see Gokhale et al. (1999).

FIGURE 4

Impact of Explicit Debt and Population Aging on Intertemporal Public Liabilities



SOURCES: Country studies in European Commission (1999); U.S. data are based on Gokhale et al. (1999).

explicit debt/GDP ratio, its IPL/GDP ratio is almost 100 percent because of relatively high implicit liabilities. Germany, Spain, the United Kingdom, and Austria have IPLs that far exceed 100 percent of GDP. Again, the countries in this group with the highest implicit liabilities show the lowest explicit ones.

A noteworthy feature of figures 1 through 3 is their implication that both types of population aging seem to contribute to increasing implicit liabilities. For example, figure 1 shows that the elderly dependency ratios of the United Kingdom, Austria, Sweden, and Finland will increase less than Spain's. Figure 2 shows that these countries will experience much greater increases in their oldest-old dependency ratios than will Spain. According to figure 3, however, implicit liabilities are larger in the four countries just mentioned than in Spain, suggesting that life-span extension may be a significant contributor to long-term fiscal shortfalls.

Tax Adjustment Necessary for Achieving Fiscal Sustainability

Figure 4 shows how much additional tax revenue (as a percent of GDP) would be required annually to eliminate each country's sustainability gap. In this calculation, all taxes are increased by a scale factor, Θ, beginning in the base year and kept in place indefinitely. Thus, living and future generations' tax liability is affected for the rest of their lifetimes. To restore fiscal sustainability, all countries except Ireland need to implement tax hikes ranging from 0.3 percent of GDP in Norway to almost 9 percent in Finland. The ranking of countries' required revenue hikes corresponds to that of their sustainability gaps. Note that sustainability could also be achieved through transfer cuts that are of similar size as a percent of GDP (not shown).[17]

■ **17** Of course, transfer cuts would affect current retirees much more than would tax hikes. The burden of the latter would fall primarily on current and future workers.

To isolate the impact of explicit liabilities, figure 4 also reports the increase in all taxes as the percent of GDP that would be needed to eliminate a country's implicit liabilities alone—that is, under the assumption of zero explicit debt. The difference between the tax hike necessary under this assumption and the hike required to eliminate the total IPL indicates the role of explicit liabilities. For all countries with positive outstanding debt, assuming zero debt reduces the required revenue increase. For Finland and Norway, which have explicit assets rather than debt, eliminating the assets implies a need for larger revenue increases. For Belgium, which has a positive IPL only because its explicit debt exceeds its implicit assets, the change in taxes required (when explicit debt is assumed to be zero) is negative. In the case of Italy, where explicit debt accounts for almost the entire IPL, eliminating the debt implies a near-zero required increase in tax revenue. For both Denmark and the Netherlands, explicit debt accounts for a significant part of total IPL, so eliminating it reduces the required tax hike substantially. For France, Germany, the United States, and Spain, explicit debt accounts for between one-third and one-half of total IPL. Hence, the required tax hikes (ignoring explicit debt) are about one-half to two-thirds as large as those required to eliminate the entire sustainability gap. Assuming zero explicit debt, the required tax hikes are almost as large as those needed to eliminate entirely the IPLs of the United Kingdom, Austria, and Sweden—countries whose explicit debt accounts for a small fraction of total IPL. As we have noted, a low explicit debt/GDP ratio does not in itself convey any information about the size of the overall sustainability gap.

The Role of Population Aging

In most of the countries considered here, population aging and the generosity of promised public pension benefits are the main factors underlying large implicit liabilities. To evaluate the impact of demographic change, we recalculate the tax increases that would be necessary if the population grew as projected while its age structure was fixed as it was in 1995. Maintaining the 1995 age structure throughout the future implies that the tax-paying population continues to be large, whereas the relative size of the benefit-receiving population does not expand over time. Hence, compared to baseline projections, tax revenues would be bigger and benefit outlays smaller if the population structure were held constant.

For countries whose population aging is projected to be rapid and persistent, maintaining the 1995 structure will reduce the implicit liability and the associated tax hike required to eliminate the total IPL. However, the impact of fixing the population structure at its 1995 level also depends on such factors as the age–sex composition of per capita taxes, benefits, and government purchases of goods and services (the tax-benefit structure). If the 1995 tax-benefit structure generates a large implicit liability, it may be transformed into an implicit asset when the population structure is fixed, even if the projected population aging is not very pronounced.

Figure 4 shows that required tax hikes (as percents of GDP) are negative for Ireland, Norway, Belgium, the Netherlands, Italy, and Germany. Among these countries, Italy has the largest difference from the baseline because population aging is projected to occur immediately and is pronounced and persistent. Given its relatively modest projections of population aging, Norway's large negative required tax change under this experiment must result from a very generous initial tax-benefit structure. Belgium's tax-benefit structure generates an implicit asset, even under baseline population aging. Fixing its age structure makes the implicit asset even larger; indeed, it is higher than Belgium's explicit debt. This accounts for the negative tax change under the current experiment. Like Italy, Germany's significant population aging occurs in the immediate future, so eliminating it transforms Germany's implicit liability into an asset that exceeds its explicit debt.

Denmark and the Netherlands provide an interesting contrast. Population aging is much less severe in Denmark than in the Netherlands. Hence, although their implicit liabilities are nearly identical, eliminating population aging generates a negative required tax change for the Netherlands, but leaves Denmark with a positive required change.

Austria and Finland are projected to experience rapid population aging. Finland's elderly dependency ratio will grow significantly in the immediate future, and the mortality rate for Austria's oldest old will drop dramatically over the next few decades (see figures 1 and 2). For both countries, maintaining the 1995 population structure delivers a significant reduction in the tax hike required to restore fiscal sustainability.

The overall sustainability gap of the United States is close to that of the median European country, but its population aging is less rapid and persistent. Hence, eliminating aging results in only a modest reduction in the required tax hike compared to that necessary to eliminate the total IPL. The reduction is of the same size as those for Ireland and France.

IV. Conclusion

This paper compares population aging and fiscal policy among 13 European countries and the United States. Competition for budgetary resources will intensify in all of these countries as the baby-boom generation grows older, lives longer, and exerts political pressure to maintain the generosity of extant public retirement and welfare systems, while younger workers resist ever-heavier tax burdens. This article reports each country's total intertemporal public liability as the sum of its explicit outstanding debt and the present value of its implicit liabilities—the excess of projected transfers and government purchases over tax revenues.

The results suggest several conclusions: First, population aging is rapid and persistent in almost every European country. Aging has two dimensions: The sizes of both the elderly and the oldest-old populations will rise significantly compared to working-age populations. The aging phenomenon is much less pronounced in the United States than in Europe.

Second, explicit outstanding debt across countries can be an extremely misleading indicator of how far "out of whack" a country's fiscal policy is. Our calculations show that for European countries with the highest implicit liabilities (Germany, Spain, the United Kingdom, Austria, Sweden, and Finland), eliminating total intertemporal liabilities requires tax revenue increases exceeding 4 percent of GDP. Some European countries, such as Italy and Belgium, have already implemented far-reaching fiscal reforms, but these are the countries with the highest explicit debt levels. The motivation for such reforms arose from the Maastricht Treaty's fiscal criteria for participating in the EMU. However, because these criteria do not impose constraints on a country's implicit liabilities, they allow countries with high implicit liabilities to postpone needed reforms. This may ultimately make the cost of conforming to the Maastricht criteria prohibitive, thus posing a threat to the EMU's effectiveness and, ultimately, to its survival. Relative to Europe's population aging and fiscal problems, future fiscal challenges for the United States seem far more benign.

References

Auerbach, Alan J., Jagadeesh Gokhale, and Laurence J. Kotlikoff. "Generational Accounting: A Meaningful Alternative to Deficit Accounting," in David Bradford, ed., *Tax Policy and the Economy,* vol. 5. Cambridge, Mass.: MIT Press, 1991, pp. 55–110.

_____, _____, and _____. "Generational Accounting: A New Approach to Understand the Effects of Fiscal Policy on Saving," *Scandinavian Journal of Economics,* vol. 94, no. 2 (June 1992), pp. 303–18.

_____, _____, and _____. "Generational Accounting: A Meaningful Way to Evaluate Fiscal Policy," *Journal of Economic Perspectives,* vol. 8, no. 1 (Winter 1994), pp. 73–94.

_____, Willi Leibfritz, and Laurence J. Kotlikoff, eds. *Generational Accounting around the World.* Cambridge: Cambridge University Press, 1999.

Berenguer, Eduard, Holger Bonin, and Bernd Raffelhüschen. "The Spanish Need for a Broader Tax Base," in European Commission, ed., *Generational Accounting in Europe.* Brussels: forthcoming, 1999.

Bonin, Holger, Bernd Raffelhüschen, and Jan Walliser. "The German Squeeze: Unification and Aging," in European Commission, ed., *Generational Accounting in Europe.* Brussels: forthcoming, 1999.

Bovenberg, A. Lans, and Harry ter-Rele. "Government Finances and Aging in the Netherlands," in European Commission, ed., *Generational Accounting in Europe.* Brussels: forthcoming, 1999.

Cardarelli, Roberto, and James Sefton. "Rolling Back the U.K. Welfare State?" in European Commission, ed., *Generational Accounting in Europe.* Brussels: forthcoming, 1999.

Crettez, Bertrand, Karen Feist, and Bernd Raffelhüschen. "Generational Imbalance and Social Insurance Reform in France," in European Commission, ed., *Generational Accounting in Europe.* Brussels: forthcoming, 1999.

Dellis, Arnaud, and Erik Lüth. "Does Belgian Fiscal Policy Cope with Debt and Aging?" in European Commission, ed., *Generational Accounting in Europe.* Brussels: forthcoming, 1999.

European Commission, ed. *Generational Accounting in Europe.* Brussels: forthcoming, 1999.

Feist, Karen, Bernd Raffelhüschen, Risto Sullström, and Reijo Vanne. "Macroeconomic Turnabout and Intergenerational Redistribution in Finland," in European Commission, ed., *Generational Accounting in Europe.* Brussels: forthcoming, 1999.

Franco, Daniele, and Nicola Sartor. "Italy: High Public Debt and Population Aging," in European Commission, ed., *Generational Accounting in Europe.* Brussels: forthcoming, 1999.

Gokhale, Jagadeesh, Benjamin R. Page, and John R. Sturrock. "Generational Accounts for the United States: An Update," in Alan J. Auerbach, Willi Leibfritz, and Laurence J. Kotlikoff, eds., *Generational Accounting around the World.* Cambridge, U.K.: Cambridge University Press, 1999, pp. 489–517.

Jensen, Sven E., and Bernd Raffelhüschen. "Reconsidering the Danish Welfare State," in European Commission, ed., *Generational Accounting in Europe.* Brussels: forthcoming, 1999.

Keuschnigg, Christian, Mirella Keuschnigg, Reinhard Koman, Erik Lüth, and Bernd Raffelhüschen. "Restoring Generational Balance in Austria," in European Commission, ed., *Generational Accounting in Europe.* Brussels: forthcoming, 1999.

Lundvik, Petter, Erik Lüth, and Bernd Raffelhüschen. "The Swedish Welfare State on Trial," in European Commission, ed., *Generational Accounting in Europe.* Brussels: forthcoming, 1999.

McCarthy, Tom, and Holger Bonin. "EU Transfers and Demographic Dividends in Ireland," in European Commission, ed., *Generational Accounting in Europe.* Brussels: forthcoming, 1999.

Norwegian Ministry of Finance. "The National Budget 2000," in *The Norwegian Economy.* Oslo: 1999.

Raffelhüschen, Bernd. "Generational Accounting: Method, Data and Limitations," in European Commission, ed., *Generational Accounting in Europe.* Brussels: forthcoming, 1999a.

_____. "Generational Accounting in Europe," *American Economic Review,* vol. 89, no. 2, (May 1999b), pp. 167–70.

_____. "Aging, Fiscal Policy, and Social Insurance: A European Perspective," in Alan J. Auerbach and Ronald Lee, eds., *Demographic Change and Fiscal Policy.* Cambridge, U.K.: Cambridge University Press, forthcoming, 1999c.