Unfunded Obligation Measures for EU Countries

by

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1. Introduction

Europe is undergoing two major transitions – demographic and economic. First, the populations of many European economies are aging rapidly as their baby-boom generations approach and enter retirement, human longevity continues to increase, and fertility rates remain well below replacement. Second, twelve European countries have joined in a monetary union (EMU) by adopting the Euro as a common currency and more countries are to join the EMU during the next few years. The objective of monetary union is to eliminate exchange rate risks and streamline product pricing and price comparisons across similar goods and services across member nations to induce greater competitive efficiencies. Entering a monetary union implies surrendering control over monetary policymaking but all current and prospective EMU nations would retain sovereignty in setting fiscal policies.

Both transitions will place tremendous but conflicting pressures on member nations' domestic national budgets. Decision makers will face growing demands to increase public expenditures and fulfill promises of retirement and health care benefits to retirees precisely when growth in labor forces and tax bases slows. That points toward larger future fiscal deficits and growing debt levels. At the same time, fiscal policymakers will face strong pressures from the "EMU club" to maintain low deficits to prevent increases in interest rates and maintain European investment levels. Exercising proper economic stewardship during these twin transitions will become more difficult if policymakers remain poorly informed about the likely consequences of making alternative policy choices.

To streamline the process of monetary union, prospective EMU member countries adopted the Stability and Growth Pact in 1997 (SGP-97). Along with the Treaty of the European Union, SGP-97 provided the framework of rules for coordinating fiscal policies across EMU members – both current and prospective ones. It was presumed that without such coordination, member states would have stronger incentives to follow "short-sighted" fiscal policies causing chronic budget deficits and higher debt-to-GDP ratios. If carried too far, such policies would erode European Central Bank's ability to maintain the Euro's purchasing power and neutralize the advantages of establishing a monetary union.

Beginning in 2002, however, the SGP-97's deficit and debt constraints and its preventive and corrective mechanisms proved unacceptable.[1] SGP-97 called for corrective fiscal policies to be adopted if a breach of deficits or debt limits appeared imminent regardless of the member nation's position in the business cycle and potential for GDP growth. A revised Stability and Growth Pact is now in effect since March 2005 (SGP-05) incorporating constraints and objectives (time paths of future deficits and debt) tailored to the economic conditions that each member country is faced with.

The revised agreement introduces greater flexibility in implementing the SGP's constraints and allows implementation of preventive and corrective mechanisms to be deferred in case a member country faces temporary economic difficulties. Some observers contend, however, that although SGP-05 continues to define constraints in terms of traditional deficit and debt-to-GDP levels, it really represents an abandonment of those constraints [Feldstein (2006) and Wierts et al (2006)]. If their view is correct, it would constitute good news. This paper's thesis is that traditional fiscal measures –

[1] The deficit constraint requires each member state to maintain annual deficits at 3 percent of GDP or less. Each member state is also required to maintain a total debt-to-GDP ratio of 60 percent or less. These constraints were specified in the original Maastricht treaty of the European Union.

annual deficits and debt-to-GDP levels – are both potentially misleading indicators of a country's fiscal stance.

The SGP also calls for the development of long-term fiscal indicators for policy surveillance of member countries. This effort should consider recently developed fiscal measures that are theoretically sound and policy-relevant. They would better inform EU policymakers of the condition of each member country's current fiscal stance and provide a basis for an apples-to-apples comparison of the policy options and trade-offs that each country faces.

This paper first addresses issues relating to the proper accounting and reporting of the government's net prospective payment obligations. It compares alternative long-term measures of a country's fiscal stance and discusses their theoretical soundness, applicability to budget reporting, and ability to reveal information relevant to the true economic choices that policymakers face. Four types of measures are considered -- traditional deficit and debt measures, accrual accounting measures, and two measures based on actuarial accounting. The latter include Generational Accounting and Fiscal and Generational Imbalance measures.

The paper argues for the adoption of Fiscal and Generational Imbalances by integrating these measures into existing country budget reports. The paper provides brief examples of how Fiscal- and Generational-Imbalance measures could help policymakers to define the feasible set of policy choices and the trade-offs involved in selecting from among them.

This paper also attempts to quantify the size of the long-term fiscal challenges confronting EU countries by reporting estimates of Fiscal Imbalances for 23 EU countries. The FI estimates suggest sizable gap between the fiscal shortfalls reported under traditional backward-looking debt and deficit measures and those implied by forward-looking Fiscal Imbalance measures.

The paper concludes by suggesting that European countries need to undertake a third transition – to step back from the current broad provision of social insurances and allow greater scope for individual determination and private provision of these services. Introducing this important element in structural reforms by encouraging significant reductions in public spending commitments appears to be the only economically feasible way of addressing future fiscal challenges. The alternative of further increasing taxes and imposing additional regulatory restrictions on member countries to preserve the status quo in social protection programs likely to prove counterproductive.

2. Unfunded Obligation Measures

Concern about fiscal sustainability arising out of the current demographic structure among developed countries has spurred interest in developing forward-looking measures of fiscal policy. Several alternatives exist for depicting the future course of federal budget balances. The first and most obvious measure is a projection of future total government revenues, expenditures, and the annual gap between the two. Although future projections of this type are reported in the official budgets of many countries, the projections are usually limited to the next 5 or 10 years. For example, the annual budget reports of the UK Treasury report (HM Treasury, 2006) adopt a 5-year time horizon –

with the horizon advancing by 1 year every year. The same is true of the official budget reports of many other EU countries.[2]

Given the obvious inadequacy of such short-term budget projections for designing long-term policy reforms, several measures have been proposed by budget practitioners and academic economists. They include (1) simply extending the time horizon of traditional deficit and debt measures, (2) accrual accounting, (3) generational accounting, and (4) fiscal and generational imbalances. This section provides a discussion of their strengths and weaknesses.

A. Traditional Measures – Government Deficits and Debt

Traditional short-term deficit and debt measures of the national fiscal stance are grounded in Keynesian macroeconomic theory that considers the gap between revenues and expenditures as providing a fiscal impulse that could be calibrated for macro-economic stabilization over business cycle time horizons. Given the nature of welfare programs and the wide prevalence of progressive income taxation, annual budget deficits naturally move counter-cyclically. Discretionary elements of revenues and expenditures could be used, however, to enhance these counter-cyclical movements to yield even larger macroeconomic impulses to dampen business cycles and stabilize the pace economic activity and growth. A large and growing literature has attempted to measure the economic impulses from discretionary fiscal policy using annual deficits as the key measure of fiscal impulses provided by government policies [Gali and Perotti (2003), Alesina and Perotti (1995)].

[2] See federal budget reports, for example, Danmark National Bank (2005), General Administration of the Treasury, Kingdom of Belgium (2005), Ministry of Finance, Sweden (2005) and of several other EU countries.

Fiscal policymakers and budget practitioners have an abiding interest in maintaining these definitions and tools for exercising short-term operational control over government budgets. Hence, if short-horizon fiscal measures prove inadequate for analyzing long-term fiscal sustainability and structural reform issues, the simplest solution is to extend the time horizon over which traditional deficits and debt are projected. Thus, one proposal is to project and report government revenues, expenditures, and surplus/deficits over the next 50 or 75 years under alternative economic and demographic assumptions. These measures can be calculated for both the general government as a whole and for sub-programs that are financed out of dedicated revenues—such as retirement and health programs.

B. Accrual Accounting Measures

For most EU countries, the future outlay increases on retirement and health benefits that will put upward pressure on deficits are already built into fiscal systems. Hence, current evaluations of the fiscal stance should explicitly recognize those costs -- as additional debt. One way of doing so is to adopt accrual accounting to add up future obligations net of assets to calculate "unfunded accrued obligations." Accrual accounting considers the government's financial obligations and assets that have been "earned" or "booked" based on events that have occurred through the current period whether or not the funds associated with those events have as yet been paid or received.

In the context of government finances, there could be considerable uncertainty (and controversy) about what constitutes an obligation-triggering event. A common example is that of public pension programs that link benefits payable in the future to current or past labor-force participation, earnings, or tax payments. However, when social transfers scheduled under today's laws may be changed by changing those laws in the future, it remains unclear whether past employment, tax payments etc. are by themselves sufficient to trigger future benefits and, therefore, whether those past events justify including current-law obligations as "unfunded accrued obligations."

This problem could be resolved by distinguishing between the information-provision role of budget measures from the liability recognition function usually associated with budget accounting and reporting. Fulfilling the former need not imply the latter and this difference could be clearly communicated as well. The objective under the former would be to characterize the stance of *current* fiscal policy without implying any additional recognition of liabilities that are on par with outstanding explicit debt.

Hence, as a "budget measures," the inclusion of accrued obligations in accounting for the government's financial condition would reflect the implications of existing policies. Under this assumption, if maintaining current policies would result in future benefit payments given past triggering-events, those accruals should be included in measuring the government's total obligations. Similarly, events that would trigger larger future government receipts under today's policies would increase the government's total assets.

Some government programs may already be using accrual accounting – to evaluate the budget costs of loans and loan-guarantees, insurance and underwriting costs etc. And several developed countries have adopted accrual accounting for their government budgets although only a couple of countries have adopted it in a comprehensive manner (New Zealand and Sweden).[3] Accrual accounting could be broadly applied to public pension and other programs that cause larger government obligations but are excluded from traditional debt and deficit measures.

C. Generational Accounting

Generational accounting uses actuarial calculations and reorganizes government budget information to reveal the implications of current fiscal policies along generational lines (Auerbach, Gokhale, and Kotlikoff (1991, 1994). Generational accounting is motivated by the life-cycle economic paradigm which posits that rational agents' current economic decisions (consumption and labor-supply) are based on a forward looking evaluation of their lifetime resources. Those resources are influenced by many factors including agents' positions in their life cycles and their current and expected future financial transactions with government. That makes it important to measure the extent and direction of fiscally engineered redistribution of resources across agents situated in different life-cycle stages, and generational accounting implements such a measurement.[4]

Generational accounting also analyzes the long-term sustainability of current fiscal policy by considering the government's intertemporal budget constraint from an

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[3] For example, New Zealand applies accrual accounting to its budget process and fiscal management, adhering to the standard principles of generally accepted accounting practice (Richardson, 1996); Canadian provincial governments shifted from cash to accrual accounting methods during the 1980s (Hiller 1996); Germany's Länder have instituted pilot programs to explore new budget accounting conventions including accrual based budgeting (Lüder, 2002); Sweden has introduced accrual accounting and reporting without extending the same to its appropriations process (Swedish National Financial Authority, 2001); the United Kingdom adopts accrual accounting for government agencies and is extending such accounting to broader government operations in stages (International Federation of Accountants, 1995). Recent changes introduced by the Government Accounting Standards Board (GASB) require state governments in the United States to report "other post-employment benefits" (which include health care benefits) under accrual accounting.

[4] Ricardian motives that effectively extend the time horizon beyond one's own lifetime are found to be empirically inoperative—at least in the case of the United States. Little research exists on this issue in the European context.

ex-post perspective. Allowing PV_P_c to represent the present value of total government purchases of future public goods under current policies (subscripted by *c*), PV_L_c to represent the total present value of prospective *lifetime net tax payments* (tax payments minus transfer receipts) by living generations under current policies, PV_F_h to represent the total lifetime net taxes of future-born generations under a *hypothetical* policy (subscripted by *h*) for achieving budget balance, and NW_c to represent the government's current financial net wealth, the government's ex-post intertemporal budget constraint can be specified as:

$$(1) \qquad PV\_P_c \equiv NW_c + PV\_L_c + PV\_F_h$$

Equation (1) says that ex-post – that is, considering all payments under concurrent policies – current ones (denoted by *c*) for living generations and future hypothetical ones (denoted by *h*) for future generations – the government's intertemporal budget constraint must be balanced -- by construction. Here, this approach is called "ex-post" because the constraint is "closed" by imposing *the* particular (hypothetical) fiscal treatment of future generations that delivers a balanced intertemporal government budget.

It should be noted that the objective of this exercise is to discover which hypothetical policies must be imposed on future generations to deliver ex-post budget balance. Present values are calculated by using an interest rate reflecting private agents' (average) opportunity cost of investment.

The present value of all future government purchases, PV_P_c, minus the present value of future net tax payments by living generations, PV_L_c and minus the government's current financial net wealth, NW_c, yields a residual "unfunded obligation" that future generations must pay. Current policies imply a lifetime net tax rate on current newborns given their projected lifetime (present valued) earnings. Earnings projections are made using an assumed rate of labor-productivity growth. If the residual unfunded obligation is imposed exclusively on future generations, they imply a per-capita lifetime net tax rate assuming the same labor-productivity and earnings growth continues throughout the future.

Current fiscal policy is considered to be balanced and sustainable if, given (1) government spending projections, (2) government financial assets, and (3) lifetime net tax *rates* estimated under current fiscal policies for today's newborns, the government's intertemporal budget constraint can be balanced using a hypothetical fiscal policy for future generations that implies the *same* lifetime net tax rates for future generations. The appendix provides a description of generational accounting methodology in greater detail

D. Fiscal and Generational Imbalances

Fiscal and generational imbalance measures are an offshoot of generational accounting. They are designed to parsimoniously capture the most important elements of generational accounting with an eye toward simplicity and policy relevance. The Fiscal Imbalance (FI) measure is the present value of government financial shortfalls projected to occur throughout the future under the assumption that current policies remain unchanged. However, unlike generational accounting's distinction between the fiscal treatment of living and future-born generations, the FI measure calculates all (including future) generations' taxes and transfers under current policies. In other words, it views the government's intertemporal budget constraint from an exclusively "current policy" (ex-ante rather than ex post) perspective. Note, that (1) the government budget remains unbalanced under this fiscal treatment of future generations and (2) that the point of the exercise is to measure the size of the total imbalance built into current fiscal policies.

The FI measure equals the present value of prospective *lifetime net benefits* of all living and future generations plus the present value of projected government purchases and minus the government's current net financial assets. Thus,

(2) $$FI = PV\_P_c + PV\_L_c + PV\_F_c - NW_c$$

Since it is the government's budget choices that are being evaluated, present values are calculated using the government's opportunity cost of funds – the interest rate expected to prevail on the longest-term government bonds.

Because PV_P_c represents future purchases of public goods, this item cannot (without making strong assumptions) be decomposed according to the generations that benefit from such spending. However, those government programs that exclusively provide transfers to private individuals (old-age retirement benefits, for example) and are financed out of dedicated revenues (a payroll tax, for example) do not involve any direct purchases of durable public goods. The taxes and expenditures of such programs are attributable to particular generations.

(3) $$FI_{ss} = PV\_L_{ss,c} - PV\_F_{ss,c} - NW_{ss,c}$$

Here, the subscript *ss* refers to a generic "Social Security" program that conforms to the financing conditions described above.

The motivation for the Generational Imbalance (GI) measure is the same as that of generational accounting—to analyze the generational redistribution of resources implied under current fiscal policies. GI represents the simplest decomposition of FI – the collective contribution to FI by past and living generations. The GI measure is alternatively known as the "closed group" unfunded obligation where the closed group includes past and living generations and excludes those to be born in the future.[5]

The significance and policy-relevance of the generational imbalance is not widely understood among budget practitioners. Many believe that it is similar to unfunded accrued obligation concept and is relevant only in the context of "fully funded" pension programs – such as those offered by private companies.[6]

However, the GI measure is also relevant and useful within the context of a "pay-as-you-go" public pension system. It indicates the amount of total outstanding obligations that arise on account of past and living generations. Those arising from past generations' transactions with the government (those already dead) and from past transactions of living generations are incorporated in the government's accumulated net financial assets. Future payment obligations under current policies triggered by past events involving living generations and future payment obligations that would be triggered by future events involving living generations are also included in the GI imbalance measure.

The size of GI reveals the amount of benefits living generations may expect to receive from the government under current policies in excess of their past and future expected taxes or contributions toward funding them. This measure remains policy-relevant because it represents a net (expected) wealth gain for living generations. As such, has the

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[5] The "fiscal imbalance" and "generational imbalance" concepts correspond to the accounting concepts of open group and closed group unfunded obligations respectively. The open-group unfunded obligation refers to government obligations to all individuals regardless of their cohort affiliation (that is, their dates birth) – whether in the past or in the (infinite) future. Limited horizon open-group obligations are also calculated by excluding the net obligations arising after a specific (future) date. Closed group obligation measures include the net obligations to a subset of individuals – for example, those born before a certain date. However all past net payments and future net obligations to such individuals are included in the calculation

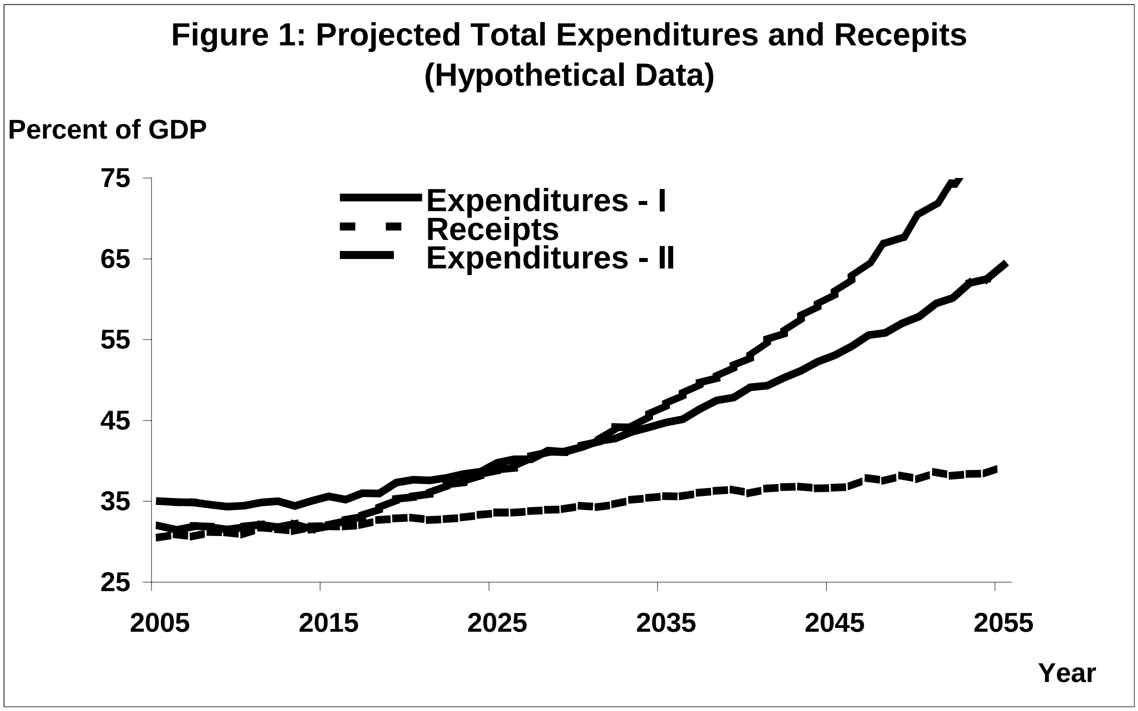
[6] Private sector firms that offer pension benefits to employees may be subject to regulations about funding adequacy. That requires measurement of existing funding levels for comparison with regulated thresholds and accrual accounting is normally used to provide the benchmark for 100 percent funding.

potential to influence those generations' current economic choices (consumption and labor-supply). Hence, analyzing the potential behavioral implications of the current fiscal stance requires a measure of the public provision of net benefits to living generations. Note that this measure is also forward-looking – and fundamentally different from the traditional backward-looking debt and deficit measures.

3. Evaluating Unfunded Obligation Measures

A. Long-term Projections of Revenues, Expenditures, and Annual Deficits

Time series of annual budget cash flow projections – revenues, expenditures, deficits, and debt -- have a few advantages but also a few shortcomings: Their advantage lies in clearly exhibiting the time profile of future revenue shortfalls given projected discretionary and ageing related spending. Such projections are useful for showing how quickly large financial shortfalls are likely to emerge under current policies. For example, Figure 1 shows a nominal revenue time series and two alternative nominal expenditure time series. Under the Expenditures-I alternative, moderate deficits accrue during the first decade and then rise rapidly as a result of ageing related expenses. Under the Expenditure-II alternative, however, the gap between revenues and expenditures is very small during the first 10 years, but expands more rapidly thereafter compared to the Expenditure-I alternative. The difference in the timing and accrual rates of ageing-related deficits constitutes useful and policy-relevant information.



One obvious shortcoming of such time-profiles of nominal revenues, expenditures, and deficits, is that they do not place current and future dollars on a level playing field. Although, future nominal deficits appear to be larger, their real values may not be as large if projected inflation plus real interest rates are high.

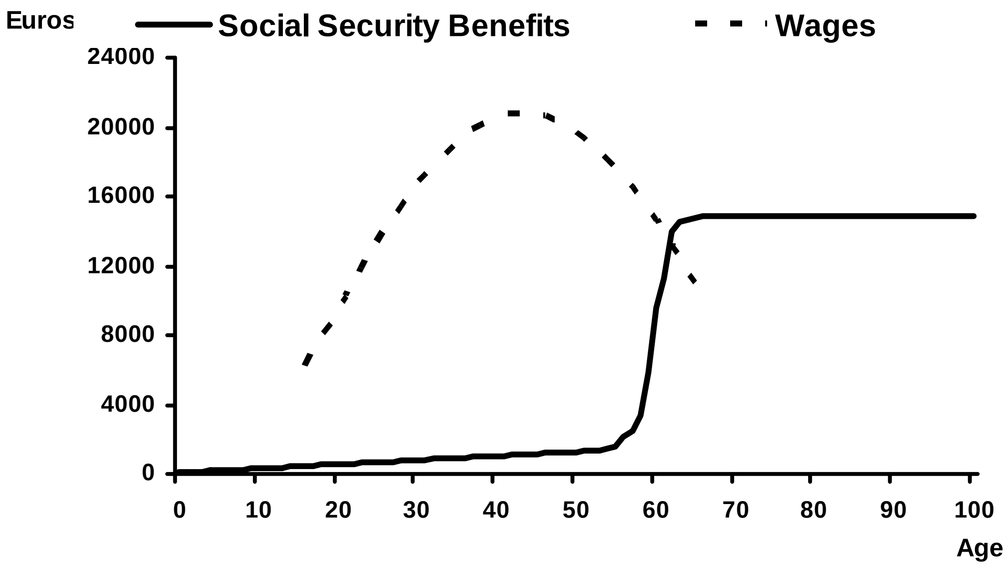
Second, nominal deficits and debt levels do not appear to hold a significant and stable relationship with other economic variables of interest—namely interest rates, currency values, inflation, productivity growth etc. Hence, strict fiscal rules based on deficits and debt may not be sufficient to ensure fiscal stability and long-term sustainability. Third, some countries could follow policies that maintain or even reduce explicit deficits and debt levels while simultaneously increasing prospective deficits (the so-called "one-off" measures). Such policies would alter the timing of deficit accruals but are unlikely to be associated with any measurable regularity in real fiscal impulses.

The reason for such a conclusion is that a particular time-series of government net cash flows may be associated with a myriad ways of arranging the sizes and timing of different taxes and expenditures – each of which may generate different expectations among the public about whether they are temporary or permanent, and each of which could be associated with different distributions of fiscal burdens among differently situated private agents. Hence, a particular time series of deficits and debt may be associated with wildly different real underlying fiscal policies – that is, associated with different real flows and distribution of consumption, saving, investment, and output, and different levels of real interest rates, inflation, and exchange rates. These differences in real economic outcomes would emerge primarily because each distinct policy would exert differential effects on different subgroups of individuals—distinguished, especially, with regard to their life-cycle stage.[7]

To provide a simple example, consider a strictly pay-as-you-go expansion of a public pension program. Retiree benefits are increased immediately and permanently by $X each year and those increases are financed by additional receipts of $X each year sourced from workers' payrolls. Figure 2 shows stylized profiles of public pension benefits and wage earnings by age. Those profiles show that the pay-as-you-go policy of pension increases would benefit older generations and the labor-tax increases would impose additional financial burdens on younger workers. By construction, however, there would be no change in the time series of the projected *difference* between total annual receipts

[7] For a related discussion see Gokhale (2004).

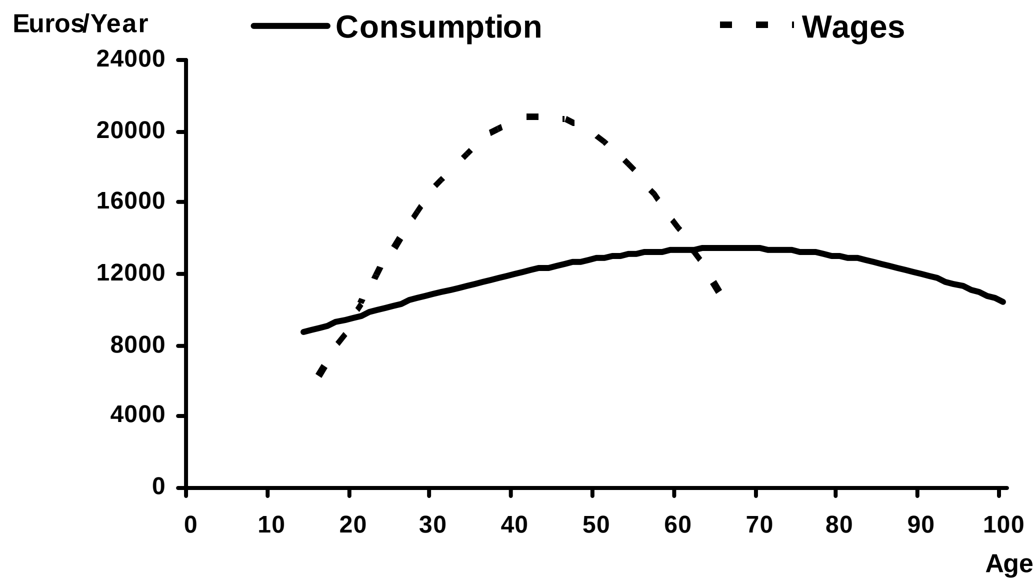
Figure 2: Social Security Benefit and Wage Profiles by Age



and outlays as a result of this policy change.

One could argue that showing the government's future funding gap as the *difference* between total receipts and outlays would, indeed, capture such a policy change as an upward shift in both the total revenue and total expenditure time series. However, other feasible policies exist that would maintain both the projected levels of revenues and expenditures and the gap between them (annual deficits) and yet exert real economic effects by redistributing resource across generations. Consider Figure 2, which shows stylized profiles by age of labor and consumption tax payments. Because the consumption-tax profile is flatter and extends across older individuals, a pay-as-you-go structural tax change – that is, a revenue-neutral switch – an increase in labor income taxes and a reduction of consumption taxes -- that is maintained for a long time could accomplish a sizable redistribution of tax burdens (and wealth).

Figure 3: Consumption and Wage Profiles by Age



As in the case of the pay-as-you-go expansion of public pensions, this policy also provides a windfall benefit to current older generations but reduces the lifetime resources of younger and future generations.[8] However, such a policy change would be completely invisible to Figure 1's fiscal measure -- the time-series of projected revenues, expenditures, and deficits. If there are differences in the consumption propensities out of resources between older and younger generations, such redistributive policy changes – if expected to be permanent -- are likely to exert real economic effects through time – affecting saving, capital formation, interest rates, and eventually inflation and exchange rates.

[8] Generally, a reduction of consumption taxes would make all existing assets more valuable because the consumption financed through their sale now faces a lower tax rate. Much of the immediate increase in asset values arising from this policy would benefit existing older generations who hold most of the country's wealth.

Policymakers may enact diverse fiscal changes designed to alter the time profile of expenditures and revenues to reduce short-term deficits. But only some of those policies may be reflected in fiscal measures such as Figure 1. The net result of such policies may be larger or smaller long-term deficits and debt and possibly erosions or increases in national saving and capital formation regardless of the impact on short- and long-term deficits. Because Figure 1 does not fully reflect the impact of all policy changes, it remains a poor guide for decision makers and should be complemented with additional information. In the words of Auerbach and Kotlikoff, "…conventional deficit measures may cause alarm when alarm is not warranted and, conversely, may calm observers when alarm is most appropriate."[9]

B. Accrual Accounting

As mentioned earlier, accrual accounting "books" obligations and assets based on triggering events through the current period. Since the objective of accrual accounting for the budget would be to characterize current policy, future pension benefits based on past births, labor-force participation, earnings, and tax payments (into "defined benefit" public pension systems) would result in future pension obligations that should be counted among government obligations. Even in the case of health care benefits, future payments based on average cost payments and cost growth may be included to get a fuller estimate of the government financial obligations under current policies.

[9] See Auerbach and Kotlikoff (1987). They make the case that deficits and national debt are not theoretically well grounded fiscal concepts and that their values over time reflect little more than the particular accounting conventions used for labeling different government transactions as taxes and transfers versus loans and repayments of principal plus interest. These arguments are amplified in Kotlikoff (1989)

Proposals to adopt accrual accounting for measuring the government's intertemporal budget balance are generally motivated by the attractive symmetry of applying the same accounting rules to the government as are applied to private companies when evaluating their pension and other obligations. However, the government as an economic entity is sufficiently different from private entities to warrant a different accounting standard. In particular, private entities can potentially fail and terminate at any time whereas the government, at least in principle, is infinitely lived. Moreover, unlike private entities, governments possess the sovereign power to levy taxes.

The purpose of accrual accounting for a private firm is to reveal the extent of funds that must be set aside to meet contractual deferred liabilities – pensions and health coverage for retired employees, etc. Most such liabilities are created from past employee performance and can be measured through explicit formulas. In contrast, the objective of long-term budget accounting is to evaluate the sustainability of current tax and spending rules – as opposed to evaluating it liabilities if the "government fails." Given its power to levy taxes, the government need not necessarily set funds aside to meet its future obligations. Applying accrual accounting to government liabilities could, therefore, create the impression that the government's future obligations to pay pension, health, and welfare benefits somehow are contractual obligations – or liabilities – that can never be reduced.[10]

[10] Discussions about federal financial reporting standards in the United States go into great detail about precisely defining liability recognition criteria and the nature of events that trigger a recognizable federal liability. Such discussions are obviously driven by concerns that if the reporting standards adopted broader definitions about event and liability recognition criteria, the public may come to view those liabilities as contractual and immutable rather than simply legal—that is, based on the laws prevailing when the payment comes due (which may be different in the future relative to current laws). For example, see Federal Accounting Standards Advisory Board (2004).

Moreover, accrual accounting measures are also (partially) backward looking because they include only those future fiscal flows (taxes and transfers) that would result from *past* triggering events. Given the infinitely lived nature of governments however, it does not appear legitimate to ignore future obligation-triggering events -- labor force participation, earnings, tax-payments etc. -- by living and future generations if current policies are continued. Indeed, if accrued net obligations are positive but continuing current fiscal policies would generate net future receipts, reporting accrued net obligations would indicate a positive net liability position even though current policies are sustainable.

C. Generational Accounting

Generational accounting's actuarial (as opposed to accrual) approach includes an evaluation of future government obligations and resources. This method provides a comprehensive perspective for evaluating current fiscal policy. However, its ex post perspective on the government intertemporal budget constraint implies that concepts associated with generational accounting such as "generational balance" involve subtle thought experiments that are difficult to communicate. That thought-experiment involves consideration of a hypothetical and non-implementable policy – of treating all future born-generations under a different fiscal policy compared to the treatment of living generations under existing fiscal policy. In addition, generational accounts are calculated from the perspective of private individuals rather than of the government's financial constraints. That makes generational accounts difficult to integrate with existing budget reports, which usually include short-term projected annual aggregate cash flows (revenues, expenditures, and budget deficits) and total outstanding net debt.

Generational accounts are calculated and used as complementary indicators of fiscal policy in several countries. They are reported in considerable detail in most generational accounting studies – for individual age-sex cohorts (Auerbach, Kotlikoff, and Leibfritz, 1999). Generational accounting also reports the generational lifetime fiscal burdens that would prevail under policy adjustments for achieving a sustainable fiscal policy. Alternatively, it reports the "menu of pain" – policy changes that would be required to restore sustainability. However, the key information becomes obscured by the focus (and confusion) associated with the multiplicity of generational account numbers.[11]

D. Fiscal and Generational Imbalances

a. Fiscal Imbalance

The FI measure assumes continuation of current policy throughout the future – that is, it involves no complicated though-experiments. It provides a summary measure of total budget shortfalls – the sum accrued shortfalls to date and prospective shortfalls under current policy evaluated without a time limit. Because budget shortfalls through the infinite horizon – projected under the best available economic and demographic assumptions – are discounted back to the present, this measure represents a "comprehensive" assessment of the government's financial position under current

[11] For example, generational accounts are supposed to represent each cohort's lifetime net fiscal burden under current policies. However, when the meta-message is that current policies are not sustainable the value of focusing on the accounts reported becomes diluted. Generational accounts have been subject to several other criticisms in the fiscal policy literature. See Cutler (1993), Diamond [1996], and Haveman [1994]).

policies. If calculated for government agencies at all levels, it would also be a "complete" measure.

The FI measure is also easy to communicate: It is the amount of additional resources that the government must have on hand today, invested at interest, in order to continue current policies indefinitely. Alternatively, FI equals the equivalent additional amount of net receipts that the government must obtain through future policy adjustments.[12]

Many practitioners express doubts about calculating and reporting fiscal imbalances through the infinite future. Their main objection is that future projections are uncertain and the degree of uncertainty increases the farther forward budget projections are carried. Hence, most agencies that report FI base them on projections truncated after 25, 50, or 75 years into the future.[13] Although these objections appear valid, arguments favoring infinite horizon calculations seem to be stronger. First, setting any specific limit on the projection horizon implies, at best, the assumption that the government budget is in balanced beyond that horizon. However, if current policies would result in large imbalances persisting beyond the projection horizon, truncating the horizon would be equivalent to ignoring future uncertainty – exactly the opposite of most recommendations about how to deal with uncertainty. A better approach would be to report those imbalances in addition to the imbalance calculated under a truncated projection horizon.

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[12] Finally, unlike traditional measures of deficits and debt, this measure is not subject to change because of the way certain government receipts and outlays are labeled – as taxes and transfers, respectively, or borrowing and repayment of principal with interest respectively.

[13] However, both the Social Security and Medicare Trustees in the United States have been reporting infinite horizon measures of those program's financial shortfalls – precisely the "fiscal imbalance" measure. They also report "generational imbalances" for both programs. The 2003 Technical Advisory Panel that makes recommendations to the Trustees of Social Security and Medicare have endorsed both measures as providing useful additional information.

Second, truncating the horizon usually leads to the "rolling-window" problem. Reforms implemented to achieve budget balance through a pre-determined time horizon would be thrown off balance by the mere passage of time and relatively quickly.[14] If future imbalances are large and growing – as is likely to be the case in countries with rapidly aging populations – it would necessitate repeated reforms to pull the government's financial condition back into balance to avoid escalating fiscal burdens.

The most important but often least appreciated reason for adopting infinite horizon calculations is that truncated budget projections would introduce a bias in policymaking. The bias can be described using a simple example of a reform proposal to establish "Social Security" personal accounts – created by diverting a portion of existing wage taxes (assumed to be dedicated to Social Security) for investment in private securities. In exchange for allowing individuals to invest a part of their payroll taxes into personal accounts, they would be required to agree to actuarially fair reductions in their future Social Security benefits. "Actuarially fair" means that for every euro of payroll taxes deposited into personal accounts, future benefits worth one euro in present value would be surrendered, where present values would be calculated using the government's long-term borrowing rate and average mortality factors.

Under such a reform, the government's financial position is clearly unchanged – the loss in tax revenues is exactly matched in present value by a reduction in future benefit commitments. However, if a truncated estimate of government's fiscal imbalance were used, it would show a worsening in the government's financial position: Revenue losses during the short term would be counted when evaluating the government's position, but

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[14] This is a well-recognized phenomenon in the context of United States' Social Security program which was reformed in 1983 to achieve balance through 2058. Now, however, the program face a sizable 75-year shortfall because the new horizon includes financial shortfalls between 1959 and 2080.

reductions in benefit payments accruing beyond the truncated horizon would be excluded. Hence, a truncated calculation of fiscal imbalance would bias policymakers into avoiding a personal accounts reform of public pensions even though it would leaves the government's true financial position unchanged.

This example could be carried one step further. If the public pension system is initially financially unsustainable, it could be improved through the reform described earlier: The government could offer a personal accounts reform wherein future benefits are reduced by more than dollar-for-dollar in present value. Some individuals may agree to the exchange of smaller future benefits for obtaining personal accounts that they would own and control. Implementing such an exchange would imply a larger reduction in future government outlay commitments compared to the immediate reduction in wage tax receipts. However, again, the reduced revenues in the short-term would be included under a truncated projection horizon but the larger decline in future obligations would be excluded. Hence, focusing exclusively on a truncated FI measure would bias policymakers into rejecting a reform that improves the government's financial condition.

This example also provides the final rationale for adopting an infinite-horizon fiscal imbalance measure in preference to a truncated horizon measure. The FI measure facilitates an apples-to-apples comparison of different policy options. If two budget reforms options are financially equivalent in present value terms but option A involves higher costs in the short-term compared to option B, policymaking would be biased in favor of option B if the evaluation were based on a truncated projection horizon. Alternatively, reform option A might be financially sounder than option B, but the latter may involve larger short-term financial gains and larger long-term costs. If the long-term costs remain hidden under a truncated projection horizon, policymakers would be biased in favor of option B. These considerations are likely to be quite important in the EU and EMU context because of the many differences in member countries' endowments, fiscal policies, and demographic profiles. Hence, long-term fiscal surveillance should be based on a comprehensive, complete, and policy-neutral fiscal measures and evaluations of policy reform options must be made under metrics that allow apples-to-apples comparisons among available choices.

b. Generational Imbalance

As noted earlier, the fiscal imbalance measure shows the total financial shortfall in present value covering all generations—past, present, and future (see Appendix A for a detailed explanation). The generational imbalance measure shows the amount of transfers that past and living generations may expect to receive under current policies in excess of their past and future tax payments toward funding them. In general, the generational imbalance measure can be calculated only for programs not involving pure public goods and that are fully or partially financed out of dedicated government receipts. Most European countries have pension and health care programs that are partly financed out of dedicated taxes. Excess outlays over dedicated revenues are financed out of transfers from the general budget account. Although such programs are usually considered to be "in balance" by definition, the fiscal imbalance measure can be used to show the extent to which the general government is obligated to cover future financial shortfalls in dedicated revenues compared to benefit payments under current fiscal policies. In such cases, GI calculated using just dedicated taxes would indicate the extent to which past and living generations' net benefits are responsible for creating general government obligations for financing the program.[15]

GI calculations provide information that is complementary to FI. FI would tell policymakers how much additional resources must be raised to restore a sustainable fiscal policy. But FI cannot indicate which among the myriad ways of raising the necessary resources would be preferable. However, because GI provides information about how a given policy would change the net benefits of living generations, it can be used as a measure for selecting among alternative policies.

Essentially, GI would inform policymakers about the trade-offs involved in raising resources from current versus future generations for achieving fiscal sustainability. For example, suppose FI=€2,000 billion and GI=€1,600 billion. This implies that past and living generations account for €1,600 of the $2,000 total imbalance and future generations account for $400 billion.[16] Policymakers could choose to enact tax and benefit changes that reduce GI to $600 billion and reduce future generations' contribution to FI to –€600 billion. Such a policy would reduce FI = GI + (FI-GI) to zero. Or they could adopt an alternative combination of taxes and benefits that impose a larger additional burden on living generations and a smaller additional burden on future generations – for example, by reducing GI to €400 billion and (FI-GI) to –€400 billion.

[15] Alternatively, both FI and GI could be calculated by allocating both dedicated and general taxes according to the generations that pay those taxes. This calculation would reveal the part of (zero-valued) FI that past and living generations contribute and the part future generations would contribute under current policies. Note that even if FI=0 by definition because of funding out of general revenues, GI (and FI-GI) need not also equal zero.

[16] Note that if X<Y, current policies would award living generations net benefits that exceed the total fiscal imbalance, implying that future generations would pay taxes on net.

Hence, adopting the combination of FI and GI as indicators of the overall financial condition and generational stance, respectively, of current fiscal policies would provide powerful tool for evaluating the available policy alternatives.

4. General Considerations on FI and GI Measures for EU Countries

Official adoption of measures such as FI and GI should not lead to the conclusion that those amounts are immutable liabilities of the government that happen to be currently unfunded.[17] Instead, they should be viewed as policy guideposts – designed to help in implementing appropriate changes to future fiscal policies – including future taxes, pensions, and other government outlays – with the aim of restoring a sustainable fiscal outlook.

Second, it is obvious that FI and GI are static measures. Adopting FI and GI for estimating country fiscal positions is only the first step in policy formulation within the EMU context. Obviously, static country-specific estimates are insufficient in the context of a monetary union among countries that remain in a long-term economic disequilibrium. Even without any policy changes – were that possible – demographic transitions at differential rates would engender inter-EU-country and international capital flows and labor migrations. Those flows and future policy adjustments may invalidate the economic and demographic assumptions on which FI and GI calculations are based. Nevertheless, the static FI and GI estimates constitute useful information in the formulation of future policies because they indicate the extent of pressure generated by the current fiscal stance that would induce private sector adjustments. If maintained and

[17] Concern that the public would view the adoption of such measures as recognition that they stand on par with outstanding government debt -- as immutable government liabilities appears to be a chief reason cited by those opposing their adoption.

allowed to grow, large fiscal and generational imbalances may imply larger future taxes and higher interest rates and may cause larger private sector adjustments in capital and labor flows.[18]

FI and GI numbers presented in terms of billions (or trillions) of Euros are not easily comprehensible. To provide a reference for comparison, it is useful to calculate them as ratios of GDP or the wage tax base out of which they would have to be financed. Since FI and GI refer to present values of future fiscal flows, it is appropriate to use the present values of GDP or the present value of the wage tax base when forming such ratios. These ratios would show the additional percentage of future GDP or wages that must be devoted to restore a balanced fiscal policy. Using alternative tax or expenditures as a reference bases – such as total public plus private consumption, personal plus corporate income, social transfers etc. – would show the size of the fiscal adjustment required for achieving a balanced policy in terms of those economic flows. Such measures would provide broader understanding of the trade-offs involved under alternative combinations of future fiscal adjustments.

Appendix A clarifies that if policy adjustments are postponed for a few years, the value of FI would grow larger as time passes. This occurs because FI is similar to a corpus of outstanding debt or assets. Left unchecked, FI grows larger because of accruing interest. Hence, a non-zero FI represents a fiscal disequilibrium that would force future policy adjustments. As Appendix B shows, that FI≠0 represents an unsustainable

[18] For example, Boersch-Supan et al model the impact of capital mobility on rates of return and find

policy even when it is expressed as a ratio to GDP or some other tax base that grows over time.[19]

Although it was argued earlier that the FI measure would be comprehensive only if calculated over the infinite horizon, doing so in the European context is very difficult. That is because low fertility in EU countries and low net external immigration cause projected populations to implode over time for some EU countries. Hence, as a first step, the FI measures reported in sub-section 5B below are calculated over a finite horizon—through the terminal year of population projections available from Eurostat--2051.[20]

Finally, FI and GI could be decomposed according to the contributions of alternative rates of population aging and alternative fiscal structures adopted by EU member countries. The motivation for this lies in past experience: The SGP – focused on short and medium term objectives – was revised in 2005 to take account of country specific economic features. The same need is likely to arise if and when the current constraints force further consideration of longer-term structural adjustments to facilitate convergence toward a balanced fiscal stance across EU countries. Reporting the contributions of demographics and country-specific fiscal structures to long-term fiscal imbalances would reveal the feasibility and desirability of adopting differential adjustments by different EU member nations.

5. FI Estimates for EU Countries

[19] This result obtains from the normal condition of a dynamically efficient economy where the interest rate exceeds the growth rate. For the US context, see Abel et al (

[20] As noted earlier, truncating the projection horizon at 2051 implies that a fully apples-to-apples comparison of policy options would not be feasible because cost and benefits of alternative policies beyond 2051 would be excluded from the calculations. However, adopting such long-horizon measures remains better than truncating the horizon after just 5 or 10 years.

A. Overall FI and its Decomposition by Sources – Demographics and Budget Policy

The next sub-section presents FI estimates for 23 EU countries calculated using data available at the time of writing this paper.[21] These estimates should be regarded as provisional because there remains considerable scope for improving the underlying inputs. They are used here mainly to complement the accounting and reporting framework for demonstrating the long-term fiscal implications of EU members' current fiscal policies and estimating the sources of differences among them. Nevertheless the numbers are likely to be reasonable estimates of underlying inter-country demographic and fiscal policy differences.

To reveal those differences, FI is first calculated for the average EU economy defined with reference to four dimensions: demographic, productivity, budget allocations, and generational policy. An "EU benchmark" economy is constructed by averaging across all countries' projected populations – separately by year, age (16 and older), and gender, between 2004 and 2051.[22] This construct is called the "EU demographic benchmark" and it contains about 16 million people aged 16 and older. Appendix D contains more details regarding the construction of this benchmark.

The "EU productivity benchmark" is constructed by calculating population-weighted annual geometric mean labor productivity growth rates (output per hour worked) across EU countries. Country specific labor-productivity growth rates are calculated by using annual geometric average growth rates during the recent past. Appendix F describes these calculations.

[21] Cyprus and Hungary are excluded because data on their annual labor productivity growth is not available.

[22] Although the terminology employed says "EU Benchmark," it should be understood that the calculations include just 23 countries. See the previous footnote.

Similarly, harmonized general government taxes and expenditures are averaged to derive the "EU budget-allocation benchmark."[23] Table 1 shows general government revenues, expenditures, surpluses/deficits, and debt figures for the base year of the calculation (2004) for all EU countries and shows the average across all countries. The totals are calculated using data on detailed revenue and expenditure categories as shown in Appendix C.

It should be noted that the total revenue column in Table 1 includes "imputed social contributions" which represent unfunded obligations on account of social-transfer guarantees provided by some countries—guarantees that are not supported by explicit transactions for funding them. The motivation for including those imputed revenue items was to avoid over-representing current fiscal deficits and retain comparability of fiscal cash flows across EU countries.

Finally, profiles by age and gender of various harmonized taxes and transfer payments per capita are averaged across all EU countries using age and gender specific population weights. Unfortunately, data on tax and transfer profiles are not available for all EU countries. Hence, the estimates reported below are based on available partial data used to construct the "EU cohort-distributive benchmark."[24] Graphs of the age-gender profiles used in this study are shown in Appendix E.

[23] This procedure implies that the "EU-budget-allocation benchmark" allocation consists of population-weighted averages of harmonized taxes and spending per capita. An alternative method would be to use simple averages across countries of their per-capita taxes and transfers. That would imply placing equal weight on each sovereign nation's budget allocation. However, the resulting allocation would not correspond to a "representative" EU budget allocation. Implementing the alternative allocation does results in a slightly smaller estimate of the "EU benchmark" economy's FI because countries with the largest individual FI values receive smaller weights.

[24] This terminology is adopted for lack of a better one (and alternative suggestions are welcome). Obviously, generational policy is also influenced by changing budget allocations – and not just by changing the age-gender distributions of particular taxes and transfers.

Putting all four dimensions together provides the "EU benchmark" economy mentioned above. This framework would enable a decomposition of country specific fiscal imbalances into their demographic, productivity, and fiscal policy ("budget allocation" and "cohort-distribution") components. Replacing the appropriate country-specific feature – demographic, productivity growth, budget allocation, or cohort-distribution profiles – in place of that used to construct the "EU-benchmark" estimate can be used to derive each component for a given country. Replacing all of a particular country's features (and rescaling to match the country's population size) would show the overall FI estimate for that country.

The purpose of such a set-up is to enable a detailed surveillance of country-specific differences in fiscal imbalances by distinguishing between those arising from demographic and fiscal policy differences. Knowledge of these differences is likely to prove useful when judging and negotiating long-term fiscal reforms to approach a balanced fiscal outlook. Agreement on an EU-benchmark construct would provide a common reference point against which to evaluate each country's fiscal stance and the sources of difference. It would provide a common metric, permitting an apples-to-apples comparison of each country's fiscal position.

B. Fiscal Imbalance Estimates and Components for EU Countries

The EU benchmark FI is calculated by using the methodology and data described in Appendices A through F. The population projections used for distributing 2004 budget aggregates by age and gender as described in Appendix D and G, are those provided by Eurostat through 2051. Future taxes, transfers, and general government spending on public goods are estimated for the EU benchmark by applying an average labor-productivity growth factor of 0.24 percent per year. This average is calculated by taking a population weighted geometric mean of average growth in output per hour worked for each of the 25 EU members between 1996 and 2004. The calculations use data on output per hour worked are as reported by Eurostat. Appendix F reports the underlying growth rates, population weights, and calculations.

A fixed and constant real rate of discount is used for discounting projected fiscal flows back to the year 2004. The inflation-adjusted discount rate is calculated as the interest rate on long-term government bonds minus average expected inflation. Long-term budget transactions spanning 50 or more years should be discounted using the government's opportunity cost of funds over a similar term. However, the longest-term interest rates available are on 10-year government bonds. The geometric mean of annual rates calculated over the period 1996-2005 and across all 25 EU countries (using available data) equals 5.39 percent per year (see Appendix F). Average expected inflation is calculated as the geometric mean of inflation rates across all EU countries between 1997 through 2005 (according to data availability). The resulting rate (3.01 percent) is subtracted from the nominal interest rate on government bonds to obtain a real discount rate of 2.38 percent (see Appendix F).[25]

Figure 1 shows FI estimates for 23 EU countries and for the "EU Benchmark" case calculated for the base year 2004.[26] The "EU-benchmark" economy's overall Fiscal

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[25] FI estimates under country-specific long-term interest rate differences are not calculated because capital mobility over time may be expected to erase existing interest rate differentials on long-term government debts. Any residual differences would reflect country specific government default risks which are likely to be minor.

[26] The estimates shown in Figure 4 use only one year's revenues and expenditures for making future projections. Since 2004 was neither a recession year nor a year of particularly strong growth the estimates

Imbalance is estimated at €1,971 billion. Of this, outstanding debt amounts to €282 billion, and the present value of prospective fiscal shortfalls equals €1,690 billion. Note, that the EU benchmark economy constructed is only one twenty-third as large as the sum total of EU economies included (only 23 of 25 EU countries are included). Figure 2 shows that FI for the EU-benchmark equals 8.3 percent of the present value of GDP projected through the year 2051.

Figure 1 also shows that in euro-terms the largest imbalances are contributed by Germany (€9,263) , France (€9,111), Italy (€5,054), and the United Kingdom (€7,666). However, relative to the present value of GDP, the largest imbalance ratios prevail for Malta (12.8 percent, although Malta has the smallest fiscal imbalance in euro terms) and Greece (10.9 percent). Estonia (3.2 percent), Ireland (3.4 percent), Lithuania (3.8 percent) and Latvia (4.9 percent) are among those with the smallest fiscal imbalances as a percent of the present value of their respective GDPs. The present discounted values of EU member nation's projected GDP's are shown in Figure 5.

Figure 3 shows the demographic component of FI. It shows the excess imbalance resulting from replacing a particular country's demographic structure in place of the "EU-benchmark" demographic structure. The figure reports this excess as a percent of the FI estimated for the "EU-benchmark" case. Thus, positive numbers indicate demographic features that would magnify budget shortfalls under current fiscal policies – either population aging that is more rapid due to increases in longevity, a larger than average baby-boom generation approaching retirement (and possibly sooner), or a recent

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are unlikely to be influenced by extreme cyclical variability of fiscal cash flows. If projections of short-run budget forecasts had been available, the resulting FI estimates would have been more accurate because such projections usually incorporate expected changes in future fiscal flows from policy changes that have already been enacted.

relatively more rapid decline in fertility that reduces the number of tax-paying workers. Figure 3 suggests that despite their large estimated FIs – in both, absolute euro terms and as percentages of the present value of GDP – population aging is not more rapid than average in the case of Germany, Italy, and the United Kingdom. This result may appear surprising but it must be noted that these large countries contribute significantly to the "average" demographics of the EU-benchmark. On the other hand, France's demographics causes a 5 percent increase in its FI value. The largest FI-increasing influence of demographics appears in the cases of Ireland and Malta, whereas Estonia, Lithuania, and Latvia appear to have younger projected populations or slower population aging through 2051.

Figure 4 shows the budget-allocation components of FI for EU member countries. As mentioned, this experiment replaces a particular country's harmonized tax, transfer, and spending components in place of those of the "EU-benchmark" case. The calculation is similar to that described earlier for isolating the demographic components (see Appendix D). Figure 4 shows that the budget-allocations of Germany, France, and the United Kingdom contribute significantly toward increasing their FI values. However, Denmark and Luxembourg appear to be following "budget-allocation" policies with the largest prospective fiscal impact in terms of increasing their FIs. Most of the new entrants into the EU appear to be following budget allocation policies consistent with reducing future fiscal imbalances.

Similar experiments are not implemented and reported for the productivity and cohort-distribution components because the required data are unavailable. In the case of productivity, a straightforward replacement of a member country's productivity growth rate would not be appropriate because a higher productivity rate would generally reduce the projected levels of future means-tested social transfer programs and may be associated with higher revenues in a non-linear manner.[27]

Adequate information is also not available for estimating the impact of country-specific cohort-distribution policies. However, the experiments described earlier of isolating the demographic and budget-allocation components provide the basic framework for isolating those components as well. Finally, estimating Generational Imbalance measures is also not feasible given that institutional details about financing arrangements for various sub-programs is not available (to the author). However, see Gokhale and Smetters (2006) for examples based on calculations for US Social Security and Medicare programs.

C. The Impact of Delaying Fiscal Adjustments

As discussed in Appendices A and B, FI grows larger over time if the initial FI value is positive. That's because of accruing interest on the current outstanding FI – similar to that on a corpus of outstanding debt. When FI is calculated over a finite projection horizon, the addition of another year's budget surplus or shortfall at the end of the horizon also influences next year's FI estimate. Table 3 shows estimates of FI for EU countries through the year 2010. Each estimate covers a rolling period of 47 years – 2004 through 2051 for the FI reported under "2004;" 2005 through 2052 for the FI reported under "2005;" and so on. These calculations are based on extending each EU

[27] This observation also casts doubt about the validity of constructing the "EU-productivity" benchmark. However, the method described and used in the text appears to be the best, if not the only, alternative.

member nation's demographic projections for a few additional years beyond 2051. The method used for doing so is provided in Appendix G.

Table 3 shows that FI for the "EU benchmark" case grows from €1,971 billion in 2004 to €2,489 billion by 2010 if current policies and long-term projections remained unchanged through that year. The increase in FI from one year to the next represents an increase in the cost of future fiscal adjustments because the financial resources available to pay for that increase (GDP) generally grows at a slower average rate.

Table 3 shows that with each passing year, about one-third of the increase in FI arises from advancing the terminal year of the projection horizon by an additional year. The remainder of the increase in FI arises from accruing interest. This indicates the shortcoming of adopting a finite projection horizon for capturing the cost of postponing fiscal adjustments. Were policymakers to adopt fiscal adjustments to reduce fiscal imbalances as measured under a limited time horizon, a positive fiscal imbalance would re-emerge in the very next year.[28]

Take the case of France as an example. The French government reported a deficit of 2.9 percent of GDP – that is, €49.6 billion -- in 2005 [Indicateurs… (2006) and Eurostat]. According to Table 3, however, the change in the French Fiscal Imbalance for 2005 equals €368.2 billion – an order of magnitude larger than the reported fiscal deficit for 2005. Similar remarks apply to current reporting on many other EU countries' fiscal stance based on traditional deficit and debt measures. Table 4 compares the reported annual public balances [Eurostat] with FI accruals for 2005 taken from Table 3. In the case of some countries, a surplus public balance indicates an improved and improving

[28] These calculations are based not on official population projections but those constructed by the author as described in Appendix G.

fiscal condition but the FI accrual is also positive pointing to the opposite conclusion. Thus, depending on backward looking fiscal measures such as deficits and debt would cause policy makers to draw incorrect conclusions about future fiscal prospects. Not adopting forward-looking measures would mean driving the fiscal car by looking exclusively in the rear-view mirror.

C. A Proposal for Integrated Reporting of Short- and Long-Term Budgetary Conditions

Each EU country retains sovereignty over fiscal policies. That means each EU member country retains full control over the accounting and reporting of national budget information. Nevertheless, when it comes to fulfilling SGP related budget reporting for long-term fiscal policy surveillance, the budget reports of all countries would benefit from the introduction of a few additional features.

Both short-term budget projections and the long-term implications of current fiscal policies should be included in the reports. The Fiscal Imbalance measure appears to be the easiest to integrate into most existing budget reporting frameworks because it is essentially a "budget measure" and comprehensively incorporates forward-looking fiscal information (as discussed earlier). For social transfer (and possibly other) programs with independent and dedicated financial resources, it is also easy to integrate presentations of both fiscal and generational imbalance measures into existing budget reports.

Many existing short-term budget reports divide the overall budget summary table into "current" and "capital" accounts. Table 2, for example, shows a prototype budget report containing "current" and "capital" accounts followed by additional information on long-term sustainability measures – that is, the implications of continuing current policies through the long-term projection horizon of several decades (if not through the infinite time horizon).

The Fiscal Imbalance figures for each year beyond the base year show FI as of the corresponding future year. As discussed in Appendix A, if the initial FI is positive, future years' FI figures would grow larger over time. Appendix B shows that FI grows larger even as a percentage of the present value of GDP. The components of each year's change in FI could also be included. In the case of finite- horizon estimates, the total change in FI across years would include that due to accruing interest and that due to the addition of another year at the end of the projection horizon. As discussed earlier, such information would be useful for policymakers to appreciate the cost of postponing fiscal adjustments.

This would be followed by reports of the financial implications of current policies for independently financed sub-programs and a final sub-section could include FI and its revenue and expenditure components for the rest-of-government sector. This subsection would "close" the account by reporting intra-government liabilities and net liabilities to the public (net outstanding debt). Supplementary tables could break out the overall fiscal imbalance into its "demographic," "budget-allocation," and "cohort-distribution" components – as described in previous sections.

D. Comparison with Sustainability Measures Proposed by the Ageing Working Group

The Working Group on Ageing Populations (AWG) recommends a two-stage approach to assessing the sustainability of long-term finances (Economic Policy Committee, 2001). It's assessment of sustainable public finances takes SGP's fiscal constraints as a starting point. The objective is to evaluate prospects for compliance with EMU requirements – avoiding excessive deficits and keeping debt levels below 60 percent of GDP. The SGP requires that member nations should maintain a "close to balance or surplus" position over the medium term (3 to 5 years) but not over a longer term. However, if followed, this would result in *de facto* sustainability according to Balassone and Franco (2000). The claim is that this method is simple and transparent. The arguments provided in this paper, however, suggest that this approach is not adequate. The problem is that a short-term and "short-sighted" view of the implications of current policy over the next 3 to 5 years does not provide the relevant information to policymakers. One can envision a situation where policies are enacted to ensure compliance with SGP's constraints, only to discover that the job is not yet done – indeed, has grown bigger as the budget window moves forward. The resources that could have been saved in the meanwhile with a more vigorous adjustment would be lost. Even if a longer-view would not necessarily result in different policies, the policies actually enacted would be made with fuller knowledge of their future implications.

Defining sustainability as a non-violation of pre-determined levels of deficits and debt is not useful because (as discussed above) those indicators alone do not fully reveal the real economic implications of alternative ways of achieving compliance. The simple projections of future debt and deficit levels also do not reveal the sources of imbalances in any meaningful manner. How should decision-makers rank alternative policies that result in the same –say, slightly lower – debt and deficit trajectories from several alternative ways of achieving the same change? Obviously, they need to be given more information regarding exactly who pays additional burdens and who pays less; what are the likely real economic effect of policy alternatives; and whether following a particular policy results in shifting larger fiscal burdens on to future generations (beyond the projection horizon) compared to an alternative policy. There appears no short cut to specifying sustainability in terms of comprehensive and complete measures as described above. More work is needed to complement existing theoretical developments with empirical information in order to improve the quality of long-term sustainability estimates.

6. Conclusion

This paper began by observing that EU countries are undergoing twin transitions: A demographic transition wherein the populations of most EU countries are aging and an economic transition resulting from the adoption of a single currency and associated adjustments in fiscal constraints and agreements. These processes are likely to impose severe and conflicting pressures on policymakers, on the one had to increase deficit spending to support expanding retiree cohorts and, on the other hand, to limit deficits and debt in order to continue expanding a heretofore successful process of monetary unification.

This paper proposes the adoption of an extended framework of budget accounting and reporting within the context of SGP long-term fiscal policy surveillance requirement. Among the several available fiscal measures, this paper argues for adopting fiscal and generational imbalance measures because they can potentially incorporate comprehensive and policy-relevant information about future fiscal prospects under current policies. The baseline FI and GI estimates can be supplemented with their demographic, budget-allocation, productivity growth, and cohort-distribution policy components. The advantage of doing so is to present policy-makers with tools for evaluating the feasibility and consequences of alternative policy options.

This paper argues in detail why traditional debt and deficit measures can be potentially misleading as measures of the national fiscal stance. It also argues that accrual-accounting approaches, although already adopted by several countries, are less appropriate for government entities as opposed to private ones. Among generational accounting and fiscal and generational imbalances, the latter measures appear simpler to communicate and can be more easily integrated into existing budget reports – as demonstrated through a prototype report template above.

The paper provides provisional estimates of Fiscal Imbalances for 23 EU countries and for the "EU benchmark" case under a projection horizon extending through 2051. Although they are based on provisional and incomplete data, the estimates are likely to be reasonable approximations to prevailing fiscal imbalances in EU member countries. Those imbalances are quite large. On average, EU countries face a Fiscal Imbalance of 8.3 percent of the present value of GDP projected through 2051. That implies a considerable shortfall of resources to pay for social transfers and other general government expenditures during the next 4 or 5 decades.

The estimates show considerable differences in underlying demographics and budget allocations that generate the country-specific FI values. In addition, the results show a much larger rate of accruing fiscal costs compared to public balances reported under traditional and backward-looking budget measures. Those accruals suggest an urgent need for adopting fiscal adjustments to resolve outstanding EU fiscal imbalances.

Future adjustments would involve combinations of tax increases or reductions in social and other expenditures. On balances, it seems that EU countries need to undergo a third transition in order to facilitate a resolution of outstanding fiscal imbalances – one that results in a retrenchment in the existing system of social protections—if only because the current protections are clearly unaffordable. The alternative of seeking revenue-side adjustments to cover looming fiscal shortfalls appear quite impractical because they would further weaken economic incentives among EU citizens given their already rather high tax burdens.

Table 1: Total Revenues, Total Expenditures, Budget Balances, and Consolidated Debt Levels (2004) - EU Countries and EU Average

Country	Millions of				GDP	Percent of GDP			
	Total Revenues	Total Outlays	Surplus(+)/ Deficit(-)	General Govt. Debt		Total Revenues	Total Outlays	Surplus(+) / Deficit(-)	General Govt. Debt
Belgium	134,843	140,417	-5,574	272,874	288,089	46.8	48.7	-1.9	94.7
Denmark	97,996	108,077	-10,080	84,000	197,222	49.7	54.8	-5.1	42.6
Germany	880,780	1,038,040	-157,260	1,451,000	2,215,650	39.8	46.9	-7.1	65.5
Greece	62,703	83,270	-20,567	182,702	168,417	37.2	49.4	-12.2	108.5
Spain	293,926	325,095	-31,169	388,495	837,316	35.1	38.8	-3.7	46.4
France	743,826	880,553	-136,727	1,069,165	1,659,020	44.8	53.1	-8.2	64.4
Ireland	45,282	50,072	-4,791	43,743	147,569	30.7	33.9	-3.2	29.6
Italy	564,912	657,167	-92,255	1,441,879	1,388,870	40.7	47.3	-6.6	103.8
Luxembourg	10,461	11,696	-1,235	1,782	27,056	38.7	43.2	-4.6	6.6
Netherlands	187,204	227,535	-40,331	256,924	488,642	38.3	46.6	-8.3	52.6
Austria	104,181	118,255	-14,074	150,649	235,819	44.2	50.1	-6.0	63.9
Portugal	37,945	65,668	-27,722	83,781	143,029	26.5	45.9	-19.4	58.6
Finland	66,082	76,505	-10,423	67,270	151,935	43.5	50.4	-6.9	44.3
Sweden	143,857	159,814	-15,957	144,066	282,014	51.0	56.7	-5.7	51.1
United Kingdom	640,281	750,629	-110,348	684,776	1,733,603	36.9	43.3	-6.4	39.5
Cyprus									
Czech Republic	31,608	38,468	-6,860	28,069	87,205	36.2	44.1	-7.9	32.2
Estonia	2,936	3,292	-357	486	9,043	32.5	36.4	-3.9	5.4
Hungary									
Lithuania	5,163	6,007	-844	3,522	18,083	28.6	33.2	-4.7	19.5
Latvia	3,185	3,997	-812	1,547	11,157	28.5	35.8	-7.3	13.9
Malta	1,558	2,084	-526	3,211	4,316	36.1	48.3	-12.2	74.4
Poland	65,908	85,907	-19,998	94,578	203,711	32.4	42.2	-9.8	46.4
Slovakia	8,315	13,434	-5,119	14,560	33,863	24.6	39.7	-15.1	43.0
Slovenia	10,408	12,396	-1,988	7,697	26,146	39.8	47.4	-7.6	29.4
EU Benchmark*	180,146	211,234	-31,088	281,599	450,338	40.0	46.9	-6.9	62.5

* Population weighted per capita values multiplied by "EU benchmark" population (=total EU population divided by 23).
Source: Author's calculations based on data from Eurostat.

Table 2

Budget Report -- Country X (€ billion)

	2006	2007	2008	2009	2010
Current Budget					
Total Current Receipts	516	553	585	615	645
Total Current Outlays	507	534	559	585	612
Current Surplus(+) / Deficit(-)	-7	1	7	10	12
Capital Budget					
Net Investment	29	31	32	34	36
Net Borrowing	36	30	25	24	23
Public Sector Net Debt - end year	493	530	560	590	619

Future implications of current policies

Fiscal Imbalance (Open group-obligations through year XXXX)	
Annual Change	
Interest Accrual	
Shift in Projection Window	

Program 1: (Public Pensions)	
Fiscal Imbalance	
Generational Imbalance	
Present Value: Current Generations' Future Net Benefits	
Assets (Claims on Rest-of-Government)	
Present Value of Future Generations' Net Benefits	

Program 2: (Unemployment Insurance)	
Fiscal Imbalance	
Generational Imbalance	
Present Value: Current Generations' Future Net Benefits	
Assets (Claims on Rest-of-Government)	
Present Value of Future Generations' Net Benefits	

•
•
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Rest of Government	
Fiscal Imbalance	
Net Debt Outstanding	
Present Value of Excess Future Outlays over Revenues	
Present Value of Future Outlays	
Present Value of Future Revenues	
Liability to Program 1	
Liability to Program 2	
•	
•	
•	

Table 3: Annual Changes in Fiscal Imbalances: Interest Accruals and Shifting the Projection Window

COUNTRY	MEASURE	2004	2005	2006	2007	2008	2009	2010	2004	2005	2006	2007	2008	2009	2010
		€ Billions							Percent of PV_GDP(FI) / Annual_GDP (Annual Change and Components						
EU BENCHMARK	Fiscal Imbalance	1,971.1	2,050.9	2,133.2	2,218.1	2,305.6	2,395.8	2,488.6	8.25	8.58	8.92	9.27	9.63	10.01	10.39
	Annual Change	-	79.8	82.3	84.9	87.5	90.2	92.8	-	0.18	0.18	0.18	0.19	0.19	0.20
	Interest Accrual	-	46.9	48.8	50.8	52.8	54.9	57.0	-	0.10	0.11	0.11	0.11	0.12	0.12
	Shift in Projection Window	-	32.9	33.5	34.1	34.7	35.3	35.8	-	0.07	0.07	0.07	0.08	0.08	0.08
BELGIUM	Fiscal Imbalance	853.8	886.5	920.1	954.7	990.2	1,026.9	1,064.6	5.92	6.13	6.35	6.57	6.81	7.04	7.28
	Annual Change	-	32.6	33.6	34.6	35.6	36.6	37.7	-	0.11	0.12	0.12	0.12	0.13	0.13
	Interest Accrual	-	20.3	21.1	21.9	22.7	23.6	24.4	-	0.07	0.07	0.08	0.08	0.08	0.08
	Shift in Projection Window	-	12.3	12.5	12.7	12.9	13.1	13.2	-	0.04	0.04	0.04	0.04	0.05	0.05
DENMARK	Fiscal Imbalance	753.5	781.6	810.6	840.5	871.3	903.2	936.0	7.81	8.09	8.37	8.67	8.97	9.28	9.60
	Annual Change	-	28.1	29.0	29.9	30.8	31.8	32.9	-	0.14	0.15	0.15	0.16	0.16	0.16
	Interest Accrual	-	17.9	18.6	19.3	20.0	20.7	21.5	-	0.09	0.09	0.10	0.10	0.10	0.11
	Shift in Projection Window	-	10.2	10.4	10.6	10.8	11.1	11.4	-	0.05	0.05	0.05	0.06	0.06	0.06
GERMANY	Fiscal Imbalance	9,263.4	9,605.9	9,957.5	10,318.2	10,688.3	11,067.8	11,456.9	9.16	9.51	9.87	10.24	10.61	11.00	11.39
	Annual Change	-	342.5	351.5	360.7	370.1	379.5	389.1	-	0.15	0.16	0.16	0.17	0.17	0.18
	Interest Accrual	-	220.5	228.6	237.0	245.6	254.4	263.4	-	0.10	0.10	0.11	0.11	0.11	0.12
	Shift in Projection Window	-	122.1	122.9	123.7	124.5	125.1	125.7	-	0.06	0.06	0.06	0.06	0.06	0.06
GREECE	Fiscal Imbalance	1,470.4	1,539.2	1,610.7	1,685.0	1,762.3	1,842.5	1,925.8	10.87	11.39	11.93	12.49	13.07	13.68	14.31
	Annual Change	-	68.8	71.5	74.3	77.2	80.2	83.3	-	0.40	0.41	0.41	0.42	0.42	0.43
	Interest Accrual	-	35.0	36.6	38.3	40.1	41.9	43.9	-	0.20	0.21	0.21	0.22	0.22	0.23
	Shift in Projection Window	-	33.8	34.9	36.0	37.1	38.3	39.4	-	0.20	0.20	0.20	0.20	0.20	0.20

Table 3 (Continued): Annual Changes in Fiscal Imbalances: Interest Accruals and Shifting the Projection Window

		2004	2005	2006	2007	2008	2009	2010	2004	2005	2006	2007	2008	2009	2010
SPAIN	Fiscal Imbalance	2,044.7	2,129.9	2,217.0	2,306.1	2,397.1	2,490.1	2,585.1	5.40	5.62	5.84	6.07	6.30	6.53	6.77
	Annual Change	-	85.2	87.1	89.1	91.0	93.0	95.0	-	0.10	0.10	0.10	0.11	0.11	0.11
	Interest Accrual	-	48.7	50.7	52.8	54.9	57.1	59.3	-	0.06	0.06	0.06	0.06	0.07	0.07
	Shift in Projection Window	-	36.5	36.4	36.3	36.1	35.9	35.7	-	0.04	0.04	0.04	0.04	0.04	0.04
FRANCE	Fiscal Imbalance	9,111.0	9,479.2	9,858.9	10,250.6	10,654.6	11,071.1	11,500.5	9.66	10.02	10.39	10.77	11.16	11.56	11.97
	Annual Change	-	368.2	379.7	391.7	404.0	416.5	429.3	-	0.22	0.23	0.23	0.24	0.24	0.25
	Interest Accrual	-	216.8	225.6	234.6	244.0	253.6	263.5	-	0.13	0.13	0.14	0.14	0.15	0.15
	Shift in Projection Window	-	151.4	154.1	157.1	160.0	162.9	165.9	-	0.09	0.09	0.09	0.09	0.09	0.10
IRELAND	Fiscal Imbalance	599.7	639.3	681.1	725.2	771.6	820.4	871.6	3.44	3.64	3.85	4.07	4.30	4.54	4.79
	Annual Change	-	39.6	41.8	44.1	46.4	48.8	51.2	-	0.26	0.26	0.27	0.27	0.28	0.28
	Interest Accrual	-	14.3	15.2	16.2	17.3	18.4	19.5	-	0.09	0.10	0.10	0.10	0.10	0.11
	Shift in Projection Window	-	25.4	26.6	27.9	29.1	30.4	31.7	-	0.17	0.17	0.17	0.17	0.17	0.17
ITALY	Fiscal Imbalance	5,054.0	5,224.2	5,398.2	5,576.0	5,757.7	5,943.5	6,133.4	9.73	10.06	10.41	10.76	11.12	11.49	11.86
	Annual Change	-	170.2	173.9	177.8	181.8	185.8	189.9	-	0.12	0.13	0.13	0.14	0.14	0.14
	Interest Accrual	-	120.3	124.3	128.5	132.7	137.0	141.5	-	0.09	0.09	0.10	0.10	0.10	0.11
	Shift in Projection Window	-	50.0	49.6	49.3	49.0	48.7	48.4	-	0.04	0.04	0.04	0.04	0.04	0.04
LUXEMBOURG	Fiscal Imbalance	101.7	106.6	111.6	116.8	122.1	127.7	133.4	5.13	5.33	5.53	5.74	5.94	6.15	6.36
	Annual Change	-	4.8	5.0	5.2	5.4	5.6	5.8	-	0.18	0.18	0.18	0.18	0.19	0.19
	Interest Accrual	-	2.4	2.5	2.7	2.8	2.9	3.0	-	0.09	0.09	0.09	0.10	0.10	0.10
	Shift in Projection Window	-	2.4	2.5	2.5	2.6	2.7	2.7	-	0.09	0.09	0.09	0.09	0.09	0.09
THE NETHERLANDS	Fiscal Imbalance	2,556.3	2,655.2	2,757.3	2,863.1	2,972.4	3,085.5	3,202.4	9.03	9.35	9.69	10.04	10.39	10.76	11.14
	Annual Change	-	98.8	102.2	105.7	109.3	113.1	116.9	-	0.20	0.21	0.21	0.22	0.22	0.23
	Interest Accrual	-	60.8	63.2	65.6	68.1	70.7	73.4	-	0.12	0.13	0.13	0.13	0.14	0.14
	Shift in Projection Window	-	38.0	39.0	40.1	41.2	42.3	43.5	-	0.08	0.08	0.08	0.08	0.08	0.08

Table 3 (Continued): Annual Changes in Fiscal Imbalances: Interest Accruals and Shifting the Projection Window

AUSTRIA	Fiscal Imbalance	967.1	1,005.1	1,044.2	1,084.3	1,125.5	1,167.8	1,211.2	8.48	8.80	9.13	9.46	9.80	10.14	10.50
	Annual Change	-	38.1	39.1	40.1	41.2	42.3	43.4	-	0.16	0.17	0.17	0.17	0.18	0.18
	Interest Accrual	-	23.0	23.9	24.9	25.8	26.8	27.8	-	0.10	0.10	0.10	0.11	0.11	0.12
	Shift in Projection Window	-	15.0	15.2	15.3	15.4	15.5	15.6	-	0.06	0.06	0.06	0.06	0.07	0.07
PORTUGAL	Fiscal Imbalance	703.4	730.1	757.7	785.9	814.9	844.7	875.3	10.07	10.46	10.85	11.26	11.68	12.12	12.56
	Annual Change	-	26.8	27.5	28.3	29.0	29.8	30.6	-	0.19	0.19	0.20	0.20	0.20	0.21
	Interest Accrual	-	16.7	17.4	18.0	18.7	19.4	20.1	-	0.12	0.12	0.12	0.13	0.13	0.14
	Shift in Projection Window	-	10.0	10.1	10.2	10.3	10.4	10.5	-	0.07	0.07	0.07	0.07	0.07	0.07
FINLAND	Fiscal Imbalance	819.7	852.2	885.8	920.6	956.5	993.6	1,031.9	9.55	9.93	10.31	10.71	11.12	11.54	11.97
	Annual Change	-	32.5	33.6	34.7	35.9	37.1	38.3	-	0.21	0.22	0.22	0.23	0.23	0.24
	Interest Accrual	-	19.5	20.3	21.1	21.9	22.8	23.6	-	0.13	0.13	0.14	0.14	0.14	0.15
	Shift in Projection Window	-	13.0	13.3	13.7	14.0	14.3	14.6	-	0.09	0.09	0.09	0.09	0.09	0.09
SWEDEN	Fiscal Imbalance	1,214.6	1,264.1	1,315.5	1,369.1	1,424.7	1,482.5	1,542.6	7.28	7.55	7.83	8.12	8.42	8.73	9.05
	Annual Change	-	49.5	51.5	53.5	55.6	57.8	60.0	-	0.17	0.18	0.18	0.19	0.19	0.20
	Interest Accrual	-	28.9	30.1	31.3	32.6	33.9	35.3	-	0.10	0.10	0.11	0.11	0.11	0.12
	Shift in Projection Window	-	20.6	21.4	22.2	23.1	23.9	24.7	-	0.07	0.07	0.08	0.08	0.08	0.08
UNITED KINGDOM	Fiscal Imbalance	7,666.1	8,009.6	8,366.4	8,736.9	9,121.6	9,520.7	9,934.5	6.45	6.72	7.00	7.29	7.59	7.90	8.21
	Annual Change	-	343.5	356.7	370.5	384.7	399.1	413.8	-	0.20	0.20	0.20	0.21	0.21	0.22
	Interest Accrual	-	182.5	190.6	199.1	207.9	217.1	226.6	-	0.10	0.11	0.11	0.11	0.12	0.12
	Shift in Projection Window	-	161.1	166.1	171.4	176.7	182.0	187.2	-	0.09	0.09	0.09	0.10	0.10	0.10
CYPRUS	Fiscal Imbalance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Annual Change	-	0.0	0.0	0.0	0.0	0.0	0.0	-	0.00	0.00	0.00	0.00	0.00	0.00
	Interest Accrual	-	0.0	0.0	0.0	0.0	0.0	0.0	-	0.00	0.00	0.00	0.00	0.00	0.00
	Shift in Projection Window	-	0.0	0.0	0.0	0.0	0.0	0.0	-	0.00	0.00	0.00	0.00	0.00	0.00

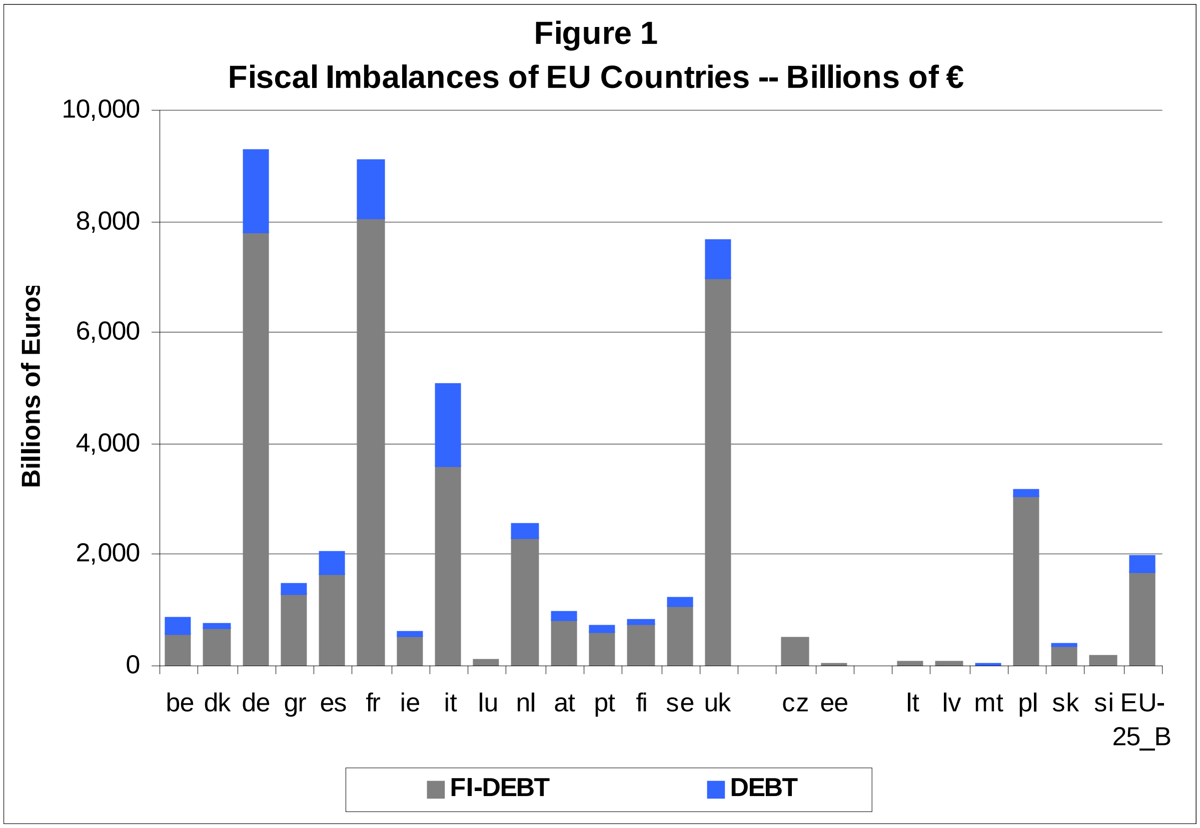
Table 3 (Continued): Annual Changes in Fiscal Imbalances: Interest Accruals and Shifting the Projection Window

CZECH REPUBLIC	Fiscal Imbalance	514.0	538.6	564.1	590.5	618.0	646.5	675.9	8.59	9.02	9.46	9.93	10.41	10.91	11.43
	Annual Change	-	24.6	25.5	26.5	27.5	28.5	29.5	-	0.28	0.28	0.29	0.29	0.30	0.30
	Interest Accrual	-	12.2	12.8	13.4	14.1	14.7	15.4	-	0.14	0.14	0.15	0.15	0.15	0.16
	Shift in Projection Window	-	12.3	12.7	13.1	13.4	13.7	14.1	-	0.14	0.14	0.14	0.14	0.14	0.15
ESTONIA	Fiscal Imbalance	41.0	43.9	47.1	50.5	54.1	58.0	62.2	3.17	3.41	3.67	3.95	4.24	4.56	4.90
	Annual Change	-	3.0	3.2	3.4	3.6	3.9	4.2	-	0.31	0.32	0.33	0.34	0.35	0.36
	Interest Accrual	-	1.0	1.0	1.1	1.2	1.3	1.4	-	0.10	0.11	0.11	0.11	0.12	0.12
	Shift in Projection Window	-	2.0	2.1	2.3	2.4	2.6	2.8	-	0.21	0.21	0.22	0.23	0.23	0.24
HUNGARY	Fiscal Imbalance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Annual Change	-	0.0	0.0	0.0	0.0	0.0	0.0	-	0.00	0.00	0.00	0.00	0.00	0.00
	Interest Accrual	-	0.0	0.0	0.0	0.0	0.0	0.0	-	0.00	0.00	0.00	0.00	0.00	0.00
	Shift in Projection Window	-	0.0	0.0	0.0	0.0	0.0	0.0	-	0.00	0.00	0.00	0.00	0.00	0.00
LITHUANIA	Fiscal Imbalance	89.5	95.4	101.7	108.5	115.7	123.4	131.5	3.77	4.03	4.31	4.61	4.93	5.27	5.63
	Annual Change	-	5.9	6.3	6.8	7.2	7.7	8.1	-	0.32	0.32	0.33	0.34	0.35	0.35
	Interest Accrual	-	2.1	2.3	2.4	2.6	2.8	2.9	-	0.11	0.12	0.12	0.12	0.12	0.13
	Shift in Projection Window	-	3.8	4.1	4.3	4.6	4.9	5.2	-	0.20	0.21	0.21	0.22	0.22	0.23
LATVIA	Fiscal Imbalance	68.1	72.3	76.8	81.6	86.7	92.0	97.7	4.91	5.24	5.58	5.95	6.34	6.76	7.20
	Annual Change	-	4.2	4.5	4.8	5.1	5.4	5.6	-	0.37	0.37	0.38	0.39	0.39	0.40
	Interest Accrual	-	1.6	1.7	1.8	1.9	2.1	2.2	-	0.14	0.14	0.15	0.15	0.15	0.16
	Shift in Projection Window	-	2.6	2.8	3.0	3.1	3.3	3.5	-	0.23	0.23	0.23	0.24	0.24	0.25
MALTA	Fiscal Imbalance	18.7	19.3	19.9	20.5	21.1	21.7	22.4	12.76	13.06	13.37	13.69	14.02	14.36	14.70
	Annual Change	-	0.6	0.6	0.6	0.6	0.6	0.7	-	0.14	0.14	0.14	0.15	0.16	0.16
	Interest Accrual	-	0.4	0.5	0.5	0.5	0.5	0.5	-	0.10	0.11	0.11	0.12	0.12	0.13
	Shift in Projection Window	-	0.1	0.1	0.1	0.1	0.1	0.1	-	0.03	0.03	0.03	0.03	0.03	0.03

Table 3 (Continued): Annual Changes in Fiscal Imbalances: Interest Accruals and Shifting the Projection Window															
POLAND	Fiscal Imbalance	3,162.9	3,386.9	3,626.6	3,882.8	4,156.1	4,447.3	4,757.0	9.05	9.71	10.43	11.19	12.01	12.88	13.81
	Annual Change	-	224.0	239.7	256.2	273.3	291.2	309.7	-	1.04	1.06	1.08	1.09	1.11	1.12
	Interest Accrual	-	75.3	80.6	86.3	92.4	98.9	105.8	-	0.35	0.36	0.36	0.37	0.38	0.38
	Shift in Projection Window	-	148.7	159.1	169.9	180.9	192.3	203.8	-	0.69	0.70	0.71	0.72	0.73	0.74
SLOVAKIA	Fiscal Imbalance	390.7	415.7	442.3	470.5	500.4	531.9	565.1	8.74	9.33	9.95	10.61	11.30	12.04	12.82
	Annual Change	-	25.1	26.6	28.2	29.8	31.5	33.3	-	0.71	0.72	0.73	0.74	0.75	0.76
	Interest Accrual	-	9.3	9.9	10.5	11.2	11.9	12.7	-	0.26	0.27	0.27	0.28	0.28	0.29
	Shift in Projection Window	-	15.8	16.7	17.7	18.6	19.6	20.6	-	0.45	0.45	0.46	0.46	0.47	0.47
SLOVENIA	Fiscal Imbalance	197.2	207.7	218.7	230.1	242.0	254.4	267.3	8.68	9.16	9.65	10.16	10.70	11.25	11.82
	Annual Change	-	10.5	11.0	11.4	11.9	12.4	12.9	-	0.39	0.40	0.40	0.41	0.41	0.42
	Interest Accrual	-	4.7	4.9	5.2	5.5	5.8	6.1	-	0.17	0.18	0.18	0.19	0.19	0.20
	Shift in Projection Window	-	5.8	6.0	6.2	6.4	6.6	6.8	-	0.22	0.22	0.22	0.22	0.22	0.22

Table 4
Comparing Public Balances and Accruing Fiscal Imbalances in EU Countries for 2005 (€ Billions).

Country	Public Deficit	FI Accrual	Country	Public Deficit	FI Accrual	Country	Public Deficit	FI Accrual
be	-0.3	32.6	**lu**	0.6	4.8	**ee**	-0.2	3.0
dk	-10.2	28.1	**nl**	1.5	98.8	**lt**	5.4	5.9
de	74.0	342.5	**at**	3.7	38.1	**lv**	0.1	4.2
gr	8.2	68.8	**pt**	8.8	26.8	**mt**	0.0	0.6
es	-10.0	85.2	**fi**	-4.1	32.5	**pl**	0.2	224.0
fr	49.6	368.2	**se**	-8.4	49.5	**sk**	6.1	25.1
ie	-1.6	39.6	**uk**	64.5	343.5	**si**	1.1	10.5
it	58.1	170.2	**cz**	2.6	24.6	**EU-B**	10.6	79.8

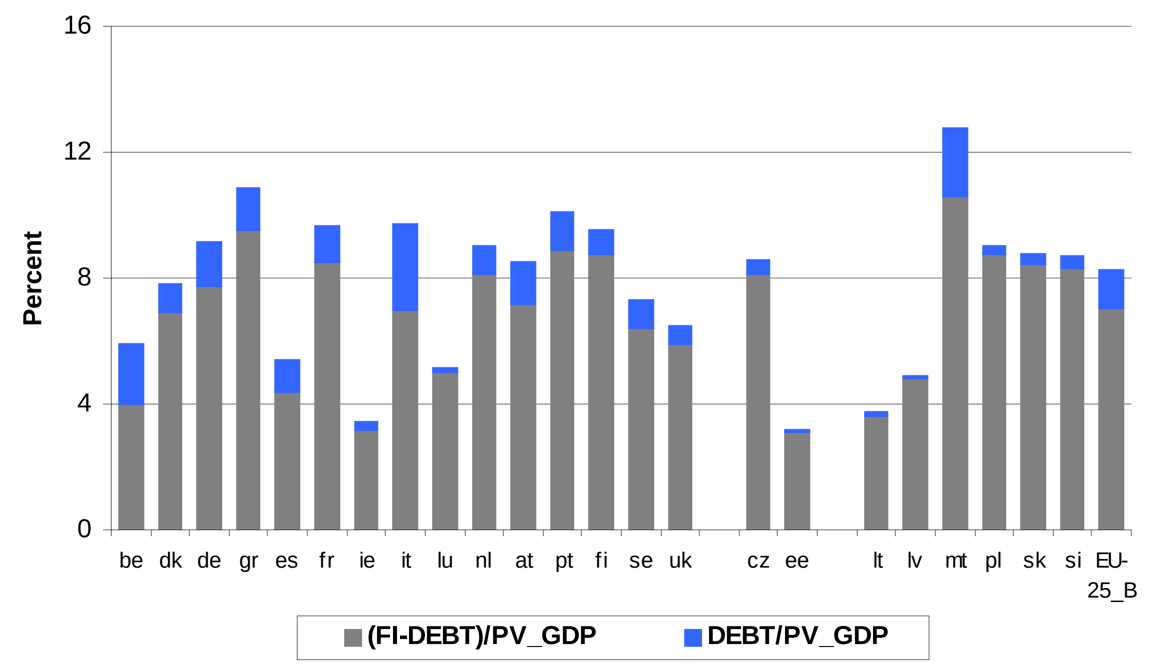


Country	Total FI	Debt	FI-Debt
be	854	273	581
dk	754	84	670
de	9,263	1451	7812
gr	1,470	183	1288
es	2,045	389	1656
fr	9,111	1069	8042
ie	600	44	556
it	5,054	1442	3612
lu	102	2	100
nl	2,556	257	2299
at	967	151	817
pt	703	84	620
fi	820	67	752

Country	Total FI	Debt	FI-Debt
se	1,215	144	1071
uk	7,666	685	6981
cy			
cz	514	28	486
ee	41	1	41
hu			
lt	90	4	86
lv	68	2	67
mt	19	3	16
pl	3,163	95	3068
sk	391	15	376
si	197	8	190
EU_B	**1,971**	**282**	**1690**

Source: Author’s calculations.

Figure 2
Fiscal Imbalances of EU Countries -- Percent of PV_GDP



Country	Total FI	Debt	FI-Debt
be	5.9	1.9	4.0
dk	7.8	0.9	6.9
de	9.2	1.4	7.7
gr	10.9	1.4	9.5
es	5.4	1.0	4.4
fr	9.7	1.1	8.5
ie	3.4	0.3	3.2
it	9.7	2.8	7.0
lu	5.1	0.1	5.0
nl	9.0	0.9	8.1
at	8.5	1.3	7.2
pt	10.1	1.2	8.9
fi	9.6	0.8	8.8

Country	Total FI	Debt	FI-Debt
se	7.3	0.9	6.4
uk	6.4	0.6	5.9
cy	0.0		
cz	8.6	0.5	8.1
Ee	3.2	0.0	3.1
hu			
lt	3.8	0.1	3.6
lv	4.9	0.1	4.8
mt	12.8	2.2	10.6
pl	9.0	0.3	8.8
sk	8.7	0.3	8.4
si	8.7	0.3	8.3
EU_B	**8.3**	**1.2**	**7.1**

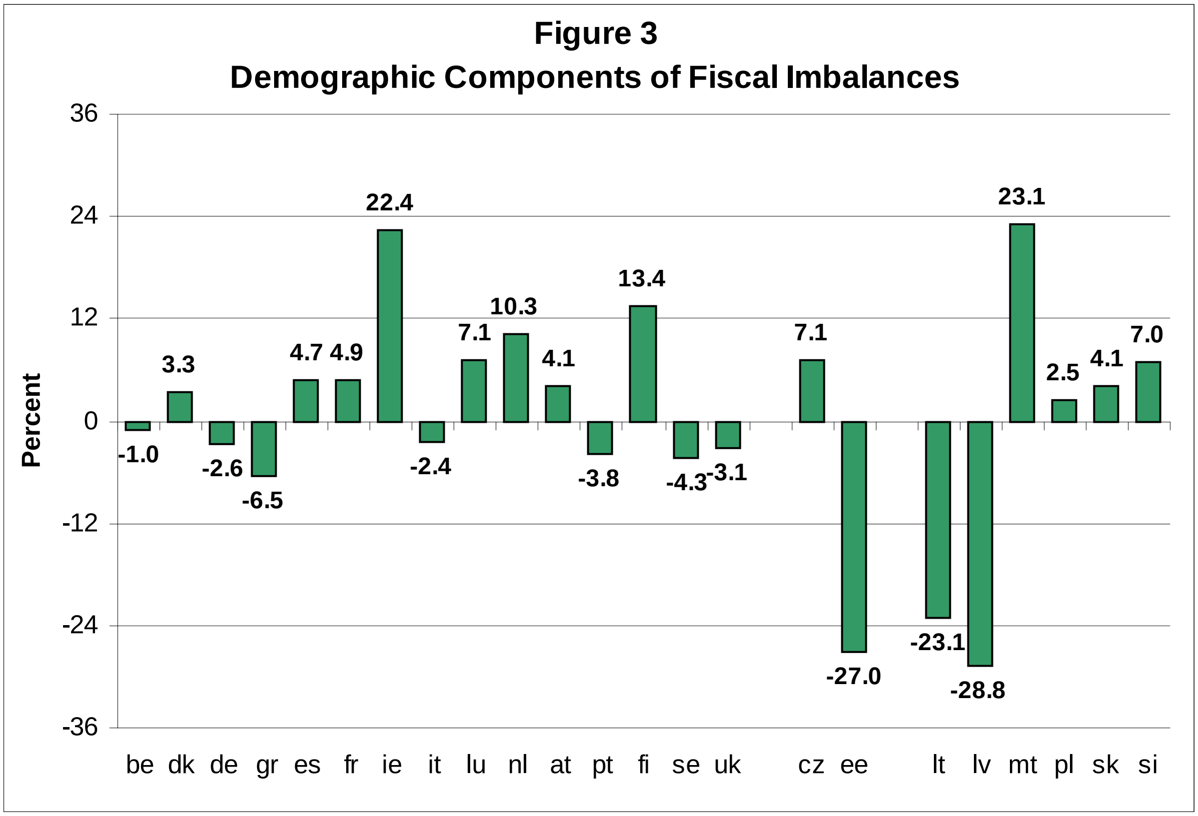


Figure 3
Demographic Components of Fiscal Imbalances
Percent
36
24
12
0
-12
-24
-36
-1.0
3.3
-2.6
-6.5
4.7
4.9
22.4
-2.4
7.1
10.3
4.1
-3.8
13.4
-4.3
-3.1
7.1
-27.0
-23.1
-28.8
23.1
2.5
4.1
7.0
be dk de gr es fr ie it lu nl at pt fi se uk cz ee lt lv mt pl sk si

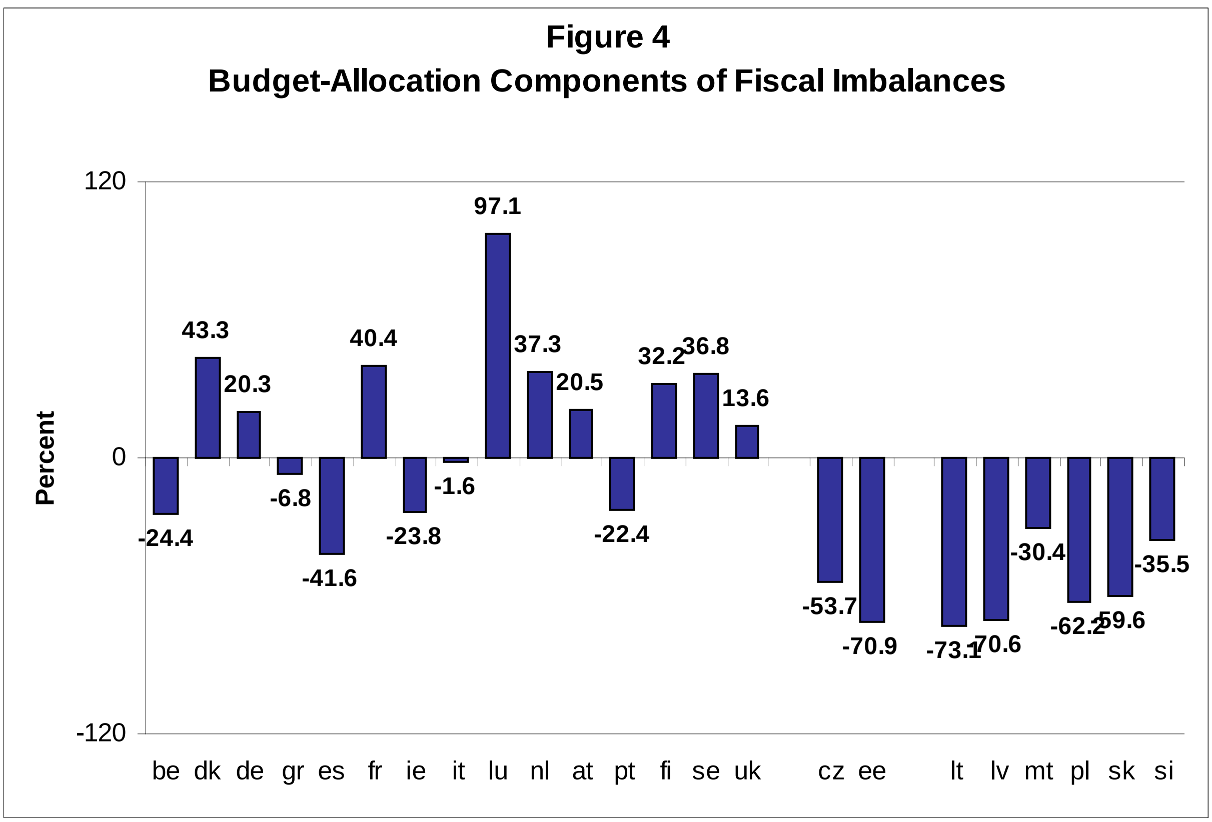
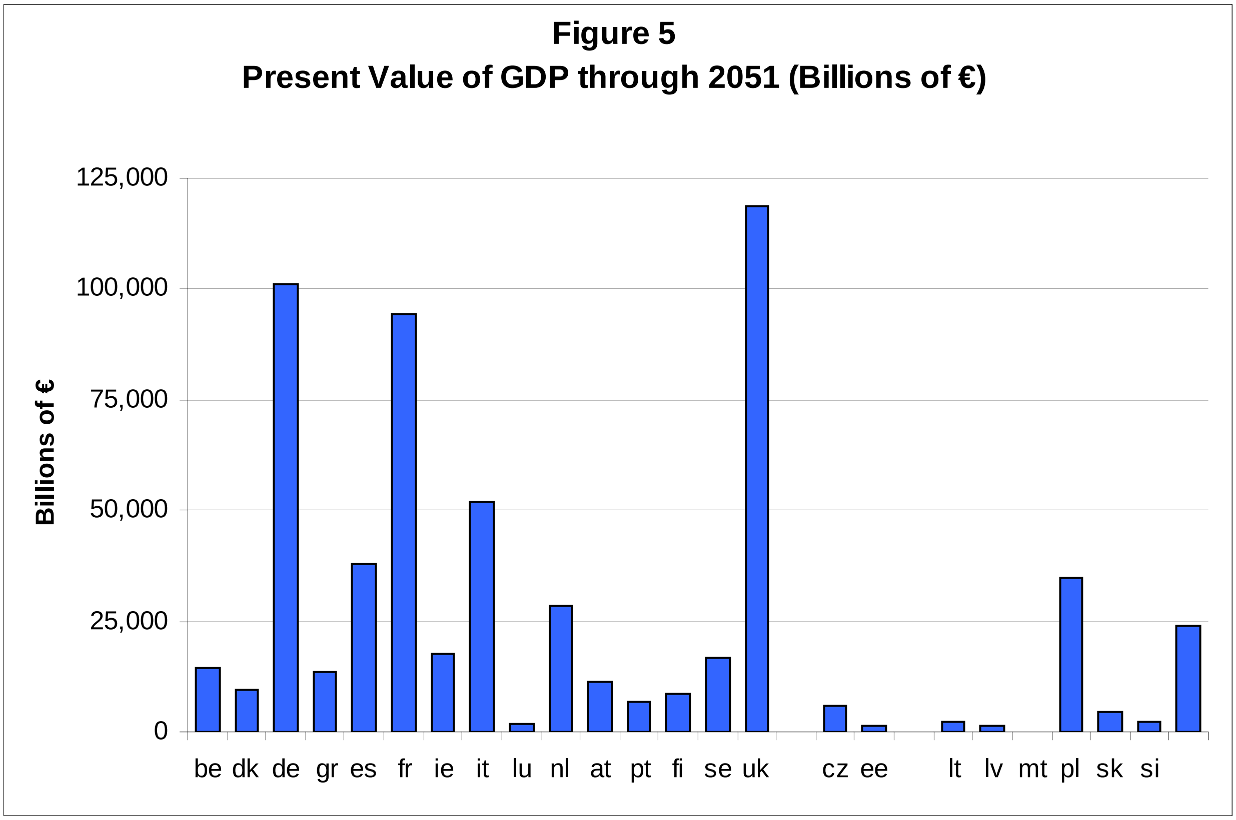


Figure 4
Budget-Allocation Components of Fiscal Imbalances
Percent
120
0
-120
-24.4
43.3
20.3
-6.8
-41.6
40.4
-23.8
-1.6
97.1
37.3
20.5
-22.4
32.2
36.8
13.6
-53.7
-70.9
-73.1
-70.6
-30.4
-62.2
-59.6
-35.5
be dk de gr es fr ie it lu nl at pt fi se uk cz ee lt lv mt pl sk si



Country	PV_GDP (€ billions)
be	14,435
dk	9,653
de	101,130
gr	13,530
es	37,851
fr	94,327
ie	17,435
it	51,949
lu	1,982
nl	28,326
at	11,401
pt	6,985
fi	8,580

Country	PV_GDP (€ billions)
se	16,682
uk	118,870
cy	
cz	5,987
Ee	1,292
hu	
lt	2,375
lv	1,387
mt	146
pl	34,970
sk	4,470
si	2,271
EU_B	**23,891**

Appendix A[29]

Fiscal Imbalance (FI)

As discussed in the text, the Fiscal Imbalance measure equals the present value of government financial shortfalls projected under current policies throughout the future. Equation (2) from the text is reproduced here for convenience as equation (A1). All fiscal flows are assumed to be under current policies and the subscript 'c' of equation (2) is assumed to apply to all terms and is omitted from equation (A1). Time subscripts, *t*, are added with $t=0$ representing the current period (year).

$$(A1)\qquad FI_0 = PV\_P_0 + PV\_L_0 + PV\_F_0 - NW$$

$$= \sum_{b=-\Delta}^{\infty} \sum_{t=\max(0,b)}^{b+\Delta} R^t \pi_{b,t} \sum_{x=m,f} p_{b,t}^x + \sum_{b=-\Delta}^{\infty} \sum_{t=\max(0,b)}^{b+\Delta} R^t \left\{ \sum_{x=m,f} \left[\sum_{i=1}^{N} z_{b,i,t}^x \right] p_{b,t}^x \right\} - NW_{-1} R^{-1}$$

In equation (A1), government purchases in period *t* equal projected purchases per capita distinguished by age, *a*, $\pi_{a,t}$, times the corresponding population in period t, $\sum_{x=m,f} p_{a,t}^x$.[30] The present value of *lifetime net benefits* of living and future generations is calculated by summing over estimated benefits (taxes, if negative) of type *i* received in year $t \geq 0$ by an individual of sex *x* born in year *b*, $z_{b,i,t}^x$, and discounting those population weighted amounts back to period $t=0$. Note, that the terms *z* include all government transfers except interest payments on net debt.

The discount factor *R* equals $1/(1+r)$, where *r* is the per-period real interest rate. In equation (A1), Δ represents the maximum age of life for each individual. The distinction between living and future generations can be seen by splitting the summation over birth-years, *b*, in the second term of equation (A1), $\sum_{b=-\Delta}^{\infty}$, into two parts: $\sum_{b=-\Delta}^{0}$ and $\sum_{b=1}^{\infty}$. Annual benefits and taxes, z, can be estimated from micro-survey information on tax payments and transfer receipts by age and sex and projected forward at an appropriate (assumed) productivity growth rate. The projections normally assume that current distributions of taxes and benefits by age and gender (representing current policies) remain unchanged. Of course, future changes in policies already enacted could be incorporated by appropriately altering the age- and gender-profiles of taxes and transfers applicable in future years.

Subtracting from this total the inherited value of the government's net financial assets – denoted by $NW_{-1}R^{-1}$ – yields the government's overall fiscal imbalance. Note that present values

[29] This derivation is a slight variation of derivations given in Gokhale and Smetters 2003 and 2006.

[30] The public goods, π, are considered to be collective consumption goods as in Samuelson (1954). Such goods may be subject to depreciation, but their benefits cannot be parceled out to as in the case of direct monetary or in-kind transfers to particular cohorts. Projecting expenditures on such "pure public goods" in this manner attempts to capture current policy in per-capita terms. But that should not be taken to imply that the corresponding generations receive benefits valued at that per-capita amount.

are calculated in perpetuity. FI is alternatively called the government's infinite horizon open-group unfunded obligation or fiscal gap.

How the FI measure changes over time under demographic projections and current-policy projections of taxes, transfers, government purchases of public goods can be seen by decomposing the first term into two parts—the current surplus/deficit and the present value of future surpluses/deficits. Doing so yields

$$(A2) \qquad FI_0 = \sum_{b=-\Delta}^{0} \pi_{b,0} \sum_{x=m,f} p_{b,0}^{x} + R \sum_{b=-\Delta+1}^{\infty} \sum_{t=\max(1,b)}^{b+\Delta} R^{t-1} \pi_{b,t} \sum_{x=m,f} p_{b,t}^{x}$$

$$+ \sum_{b=-\Delta}^{0} \sum_{x=m,f} \left[\sum_{i=1}^{N} z_{b,i,0}^{x} \right] p_{b,0}^{x} + R \sum_{b=-\Delta+1}^{\infty} \sum_{t=\max(1,b)}^{b+\Delta} R^{t-1} [\sum_{x=m,f} \left[\sum_{i=1}^{N} z_{b,i,t}^{x} \right] p_{b,t}^{x}] - \Gamma_{-1} R^{-1} .$$

Manipulate equation (A2)—add and subtract NW_0 and use the relation

$$(A3) \qquad NW_0 = NW_{-1} R^{-1} - \sum_{b=-\Delta}^{0} \pi_{b,0} \sum_{x=m,f} p_{b,0}^{x} - \sum_{b=-\Delta}^{0} \sum_{x=m,f} \left[\sum_{i=1}^{N} z_{b,i,0}^{x} \right] p_{b,0}^{x}$$

to get

$$(A4) \qquad FI_0 = R \bullet \left\{ \sum_{b=-\Delta+1}^{\infty} \sum_{t=\max(1,b)}^{b+\Delta} R^{t-1} \pi_{b,t} \sum_{x=m,f} p_{b,t}^{x} + \sum_{b=-\Delta+1}^{\infty} \sum_{t=\max(1,b)}^{b+\Delta} R^{t-1} \left[\sum_{x=m,f} \left[\sum_{i=1}^{N} z_{b,i,t}^{x} \right] p_{b,t}^{x} \right] - NW_0 R^{-1} \right\}$$

$$= R \bullet FI_1$$

Thus, under given budget projections, the time series of FI grows at the rate of interest. If FI_0 =0, equation (A4) implies that all terms in the FI_t time series equal 0. Hence, this measure exhibits a knife-edge characteristic: Absent changes in projections and policy, if the government's intertemporal budget is initially solvent, it stays so through time. However, if FI_0 exhibits a positive or negative fiscal imbalance, the imbalance grows larger over time at a rate equal to the rate of interest.

Generational Imbalance (GI)

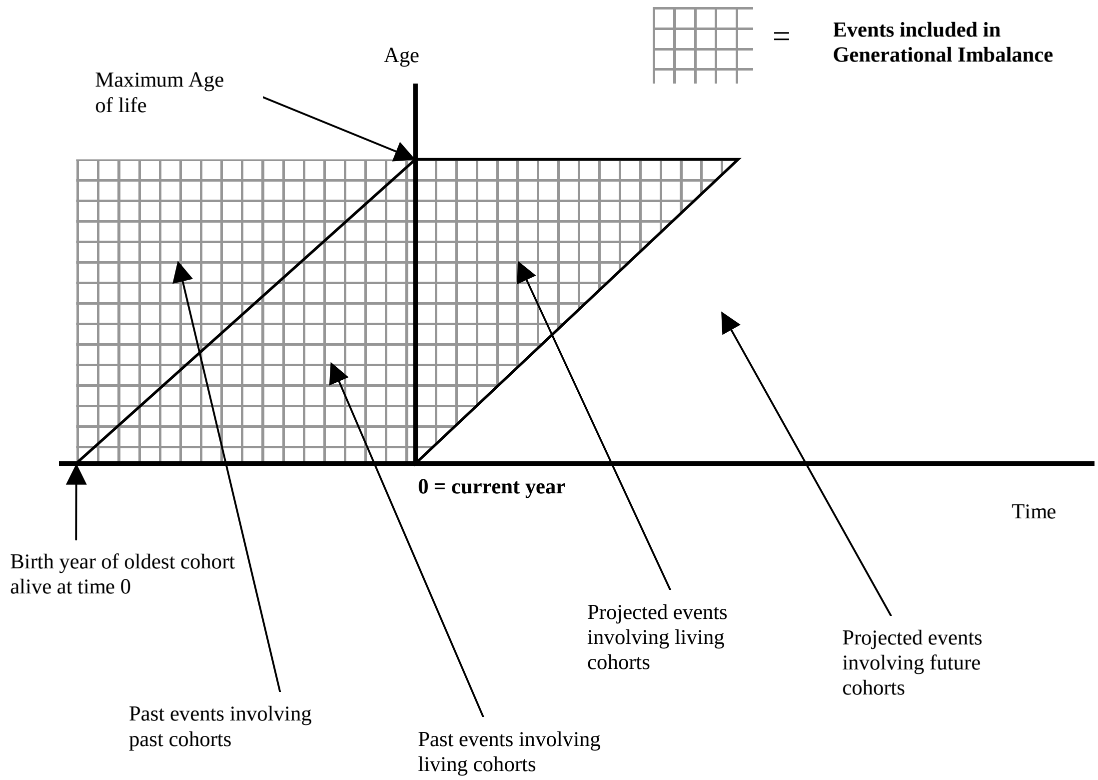
Allocating the benefits of public goods purchases to specific cohorts is generally not possible without making very strong assumptions, if at all. Hence, although the life-cycle economic paradigm suggests that isolating the net contribution of specific cohorts to the government's overall fiscal imbalance would be a useful statistic, it is difficult to isolate it in a clean manner. Independent calculations of fiscal and generational imbalances are possible, however, for pure transfer programs that are a part of overall government operations and that are funded out of exclusive and dedicated revenues.

Rewrite equation (A1) for such a program – generically labeled as "Social Security" (SS) – by omitting public good purchases, π.

$$(A5) \qquad FI_0^{SS} = \sum_{b=-\Delta}^{\infty} \sum_{t=\max(0,b)}^{b+\Delta} R^t \left\{ \sum_{x=m,f} f\left[\sum_{i=1}^{N} z_{b,i,t}^{x,SS} \right] p_{b,t}^{x} \right\} - NW_{-1}^{SS} R^{-1}$$

The right-hand-side of equation (A5) can be decomposed according to cohort-specific present values of benefits net of taxes, $\sum_{i=1}^{N} z_{b,i,t}^{x,SS}$, where the z terms now pertain only to taxes and transfers of the Social Security program. The generational imbalance measure distinguishes between the cohort of those yet to be born and the rest (see Appendix Figure 1). The latter include cohorts alive in period *0* (which includes those born Δ periods ago through period-0 newborns) and the cohort of past generations – those no longer alive and whose net impact on Social Security's fiscal imbalance is embodied in the program's accumulated net assets as of period-*0*, $NW_{-1}R^{-1}$. Here, *R* represents the discount factor based on the effective borrowing/lending rate applicable to the Social Security program.

Appendix Figure 1
The Scope of Generational Imbalance



Generational imbalance is calculated as the present value of net Social Security benefits to be received by those currently alive (prospective benefits minus taxes) and minus the program's net assets, that reflect past net benefits received by them and past generations.

Decomposing equation (A5) to separate the contribution of future (period 1 and later) born generations yields

$$(A6)\qquad FI_0^{SS} = \left\{ \sum_{b=-\Delta}^{0} \sum_{t=0}^{b+\Delta} R^t \Big[\sum_{x=m,f} \left[\sum_{i=1}^{N} z_{b,i,t}^{x,SS} \right] p_{b,t}^x \Big] - NW_{-1}^{SS} R^{-1} \right\} + \sum_{b=1}^{\infty} \sum_{t=b}^{b+\Delta} R^t \left[\sum_{x=m,f} \left[\sum_{i=1}^{N} z_{b,i,t}^{x,SS} \right] p_{b,t}^x \right].$$

The term in curly brackets in equation (A6) is GI_0. Expanding this term into current flows and the present value of future flows, and expanding the second term into the present values of benefits minus taxes of those born in period 1 and those born in periods 2 and later, we get.

$$(A7)\qquad FI_0^{SS} = \sum_{b=-\Delta}^{0} \sum_{x=m,f} \left[\sum_{i=1}^{N} z_{b,i,0}^{x,SS} \right] p_{b,0}^x + R \sum_{b=-\Delta+1}^{0} \sum_{t=1}^{b+\Delta} R^{t-1} \Big[\sum_{x=m,f} \left[\sum_{i=1}^{N} z_{b,i,t}^{x,SS} \right] p_{b,t}^x \Big] - NW_{-1}^{SS} R^{-1}$$

$$+ R \sum_{t=1}^{1+\Delta} R^{t-1} [\sum_{x=m,f} \left[\sum_{i=1}^{N} z_{1,i,t}^{x,SS} \right] p_{1,t}^{x}] + \sum_{b=2}^{\infty} \sum_{t=b}^{b+\Delta} R^{t} [\sum_{x=m,f} \left[\sum_{i=1}^{N} z_{b,i,t}^{x,SS} \right] p_{b,t}^{x}]$$

Manipulate equation (A7) as earlier -- add and subtract NW_0^{SS} and use the relation

$$(A8) \quad NW_0^{SS} = NW_{-1}^{SS} R^{-1} - \sum_{b=-\Delta}^{0} \sum_{x=m,f} \left[\sum_{i=1}^{N} z_{b,i,0}^{x,SS} \right] p_{b,0}^{x}$$

to get

$$(A9) \quad FI_0^{SS} = R \bullet \left\{ \sum_{b=-\Delta+1}^{1} \sum_{t=1}^{b+\Delta} R^{t-1} \left[\sum_{x=m,f} \left[\sum_{i=1}^{N} z_{b,i,t}^{x,SS} \right] p_{b,t}^{x} \right] - NW_0^{SS} R^{-1} \right\}$$

$$+ R \sum_{b=2}^{\infty} \sum_{t=b}^{b+\Delta} R^{t-1} \left[\sum_{x=m,f} \left[\sum_{i=1}^{N} z_{b,i,t}^{x,SS} \right] p_{b,t}^{x} \right].$$

Hence, the relationship between the *GI* terms [the terms in curly brackets in equations (A6) and (A9)] can be expressed as

$$(A10) \quad GI_0^{SS} = R \bullet GI_1^{SS} - R \sum_{t=1}^{1+\Delta} R^{t-1} \left[\sum_{x=m,f} \left[\sum_{i=1}^{N} z_{1,i,t}^{x,SS} \right] p_{1,t}^{x} \right].$$

Rearranging (A10), we get

$$(A11) \quad R \bullet GI_1^{SS} - GI_0^{SS} = R \bullet NT_1^{SS}$$

or

$$(A12) \quad NT_1^{SS} = GI_1^{SS} - (GI_0^{SS} / R)$$

where NT_b^{SS} stands for $\sum_{t=b}^{b+\Delta} R^{t-b} \left[\sum_{x=m,f} \left[\sum_{i=1}^{N} z_{b,i,t}^{x,SS} \right] p_{b,t}^{x} \right]$—the net transfer to the cohort born in period b. Equation (A12) says that the difference between GI_1 and the interest accumulated value of GI_0 equals the lifetime net benefits awarded to the generation born in period 1 under current Social Security policies. Rewriting equation (A12) after shifting the time index ahead by one period yields

$$(A13) \quad NT_2^{SS} = GI_2^{SS} - (GI_1^{SS} / R) .$$

Hence, it is easy to deduce that,

$$(A14)\quad R^n \bullet GI_n^{SS} - GI_0^{SS} = \sum_{s=1}^{n} R^s \bullet NT_s^{SS}$$

In general, the difference between appropriately discounted GI measures equals the total net transfer to cohorts born in the intervening time periods.

Under a pure transfer program, the sum of net transfers to all cohorts – past, living, and those born in the future – must be zero. Hence, calculating and reporting the projected time series of *GI* measures provides two pieces of information. First, it informs about the extent to which past and living generations are receiving more by way of benefits relative to their contributions for funding the Social Security program.

If it is reasonable to assume that private intergenerational transfers do not fully offset public transfers, a positive value of *GI* implies that living and past generations' resources and consumption would be larger (and, therefore, national saving and capital formation would be smaller) because of such transfers. Thus, information on the current *GI* value is a first necessary step toward understanding the likely macro-economic impact of continuing Social Security's current tax and benefit policy.

The total value of *GI* represents the net transfer to all past and living generations. Second, the difference between the GI_t and (discounted) GI_{t+1} values would inform policymakers about the extent to which that transfer would increase by keeping current policies in effect for an additional year.

Generational Accounts (GA)

Although it is tempting to conclude that the foregoing derivations are similar to generational accounting, it is useful to remember that GA's are based on the government's ex-post budget constraint. To reiterate this point, equation (1) from the text is repeated below as equation A(15).

$$(A15)\quad PV\_P \equiv NW + PV\_L_c + PV\_F_f\,;$$

that is,

$$(A16)\quad PV\_F_f \equiv PV\_P - NW + PV\_L_c.$$

The right-hand-side of equation *(A16)* can be calculated as

$$(A17)\quad PV\_F_f \equiv \sum_{b=-\Delta}^{0} \sum_{t=0}^{b+\Delta} R^t \pi_{b,t} \sum_{x=m,f} p_{b,t}^{x} + \sum_{b=-\Delta}^{0} \sum_{t=0}^{b+\Delta} R^t \left\{ \sum_{x=m,f} \left[\sum_{i=1}^{N} z_{b,i,t}^{x} \right] p_{b,t}^{x} \right\} - NW_{-1} R^{-1}$$

Note that the taxes and transfers represented by z terms and government public good purchases, π, are calculated under current fiscal policies. The net fiscal burden represented by the right-hand-side of equation (*A17*) would be distributed across future-born generations through future policy changes that are unknown in the current period (period-*0*).

Generational accounting calculates the implications of distributing the net fiscal burden equally across all future generations after an adjustment for economic growth. Thus, NT_t^f for all *t>0* equals

$$(A18)\quad ntl_1^h = \frac{\sum_{b=-\Delta}^{0}\sum_{t=0}^{b+\Delta} R^t \pi_{b,t} \sum_{x=m,f} p^x_{b,t} + \sum_{b=-\Delta}^{0}\sum_{t=0}^{b+\Delta} R^t \left\{ \sum_{x=m,f} \left[\sum_{i=1}^{N} z^x_{b,i,t} \right] p^x_{b,t} \right\} - NW_{-1}R^{-1}}{R \sum_{t=1}^{\infty} \sum_{x=m,f} p^x_{t,t} (GR)^{t-1}} .$$

In equation (A18), $G=(1+g)$ represents the gross labor productivity growth factor, and ntl_1^h represents the *lifetime net taxes* per capita that the cohort born in period $t=1$ would pay under the hypothetical policy (denoted by superscript *h*) of equal distribution (except for a growth adjustment) of the fiscal burden across all future generations.[31] The growth adjustment is introduced to make the per-capita fiscal burdens grow at the same pace as earnings so that successive future-born cohorts face the same lifetime net tax rate on their lifetime earnings.

Generational accounting also calculates a "generational balance" (B) metric to assess the sustainability of current fiscal policy. This metric is given by

$$(A19)\quad B = \frac{ntl_1^h}{G \sum_{t=0}^{\Delta} R^t \left\{ \sum_{x=m,f} \left[\sum_{i=1}^{N} z^x_{0,i,t} \right] p^x_{0,t} \right\}} .$$

Equation *(A19)* states that the generational balance equals the ratio of the lifetime net tax burden on newborns in period *1*, ntl_1^h, (calculated under the hypothetical policy) to that on newborns in period 0 calculated under current policies and adjusted for one period's labor productivity growth. Current fiscal policy is deemed unsustainable if $B>1$.

Unfunded Accrued Obligation (UAO)

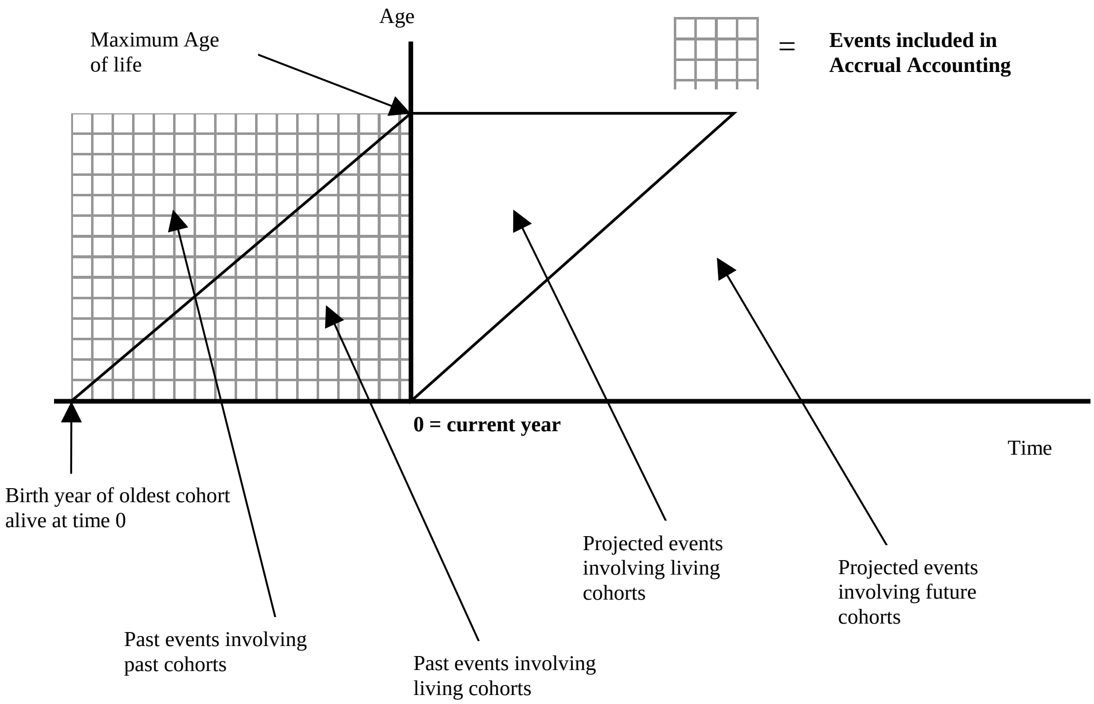
Accrual accounting considers the government's financial obligations and assets that have been "earned" or "booked" based on events that have occurred through the current period whether or not the funds associated with those events have been paid or received. Accruals of

[31] Generational accounting makes a distinction between the lifetime net taxes faced by future male and female cohorts. The ratio between those two lifetime net taxes is set equal to the ratio between the lifetime net taxes of current newborn males and females as calculated under current fiscal policy. The derivations presented here ignore this distinction for simplicity. See Gokhale et al. 1999 for more details.

government obligations mostly occur in public pension and other transfer programs. Hence, the derivations below are restricted to those of "Social Security."[32]

Because future obligations can only result from events through the current period, accrual accounting records zero obligations to future-born generations (see Appendix Figure 2). Hence, the government's unfunded accrued obligation (UAO) measure is similar in scope to the GI measure described earlier. Both measures concern past and living generations only.

Appendix Figure 2
The Scope of Accrual Accounting



Accrued government obligations and assets are usually less than or equal to the corresponding future payments that would be estimated under current policies. That is because realized future benefit payments would include additional benefits from accrual triggering-events after today and most triggering events in public pension and other transfer programs do not produce negative benefit accruals. Modifying the expression for GI (equation A) to reflect benefit accruals, α, rather than estimated payments, z, with ($\alpha \le z$) we have

$$\text{(A20)} \quad UAO_0^{SS} = \left\{ \sum_{b=-\Delta}^{0} \sum_{t=0}^{b+\Delta} R^t \left[\sum_{x=m,f} \left[\sum_{i=1}^{N} \alpha_{b,i,t}^{x,SS} \right] p_{b,t}^{x} \right] - NW_{-1}^{SS} R^{-1} \right\}.$$

[32] Some programs such as student loan programs or tax-deferred saving programs may be associated with accruing assets for the government.

Here, α values for each cohort depend on that cohorts' history of labor-force participation, earnings, tax payments and so on.

To clarify the distinction between GI and UAO measures, let θ_t^n represent the collection of government obligation (or receipt) triggering events where t stands for the date of the triggering event and n stands for the date when the payment comes due. Then, in equation (*A20*), $\alpha_{b,i,t}^{x,SS} = \alpha_i(\theta_t^n; b)$, where for both measures (1≤n≤b+Δ). However, for the *UAO* measure the date of the triggering event must be in the past (b≤t≤0), whereas for the *GI* measure, the trigger date could be in the past or future (b≤t≤b+Δ).

Appendix B[33]

Ratio of Fiscal Imbalance to the Present Value of GDP

Equation (*A4*) in Appendix A showed that absent policy adjustments and with no changes in future budget projections, an initially positive FI accrues interest over time and becomes larger – and a negative FI becomes more negative. This Appendix shows that the same remains true of the ratio of FI to the present value of the gross domestic product (GDP). Equation *A4* can be re-expressed as

(*B1*) $$FI_{t+1} = FI_t R^{-1}.$$

Let Y_t stand for the discounted present value of GDP as of period t. If annual GDP in year t, y_t, grows at rate g per year and G represents the growth factor $1/(1+g)$, we can write

(*B2*) $$Y_t = \sum_{s=t}^{\infty} y_t (R/G)^{s-t}.$$

Therefore,

(*B3*) $$Y_{t+1} = \sum_{s=t+1}^{\infty} y_{t+1} (R/G)^{s-(t+1)}$$

$$= \sum_{s=t+1}^{\infty} y_t G^{-1} (R/G)^{s-(t+1)}$$

$$= G^{-1} \sum_{s=t}^{\infty} y_t (R/G)^{s-t}$$

$$= G^{-1} Y_t$$

Dividing both sides of equation (A1) by Y_t and manipulating the expression by using equation (*B3*) yields

(*B4*) $$\frac{FI_{t+1}}{Y_{t+1}} = \frac{FI_t}{Y_t} (R/G)^{-1}.$$

Under normal conditions the economy is dynamically efficient – that is, $g<r$, implying that $G>R$. That implies

(*B5*) $$\frac{FI_{t+1}}{Y_{t+1}} > \frac{FI_t}{Y_t}.$$

---

[33] This Appendix is reproduced from Gokhale and Smetters (2006).

That is, absent changes in policy and projections, the ratio of the fiscal imbalance to GDP grows larger over time. Thus, the share of GDP that must be devoted to resolving the Fiscal Imbalance increases if corrective policy changes are postponed.

Ratio of Generational Imbalance to the Present Value of GDP

In Equation (A9) of Fiscal *and Generational Imbalances*, we show that

$$(B6) \qquad R \bullet GI_{t+1}^{SS} - GI_{t}^{SS} = R \bullet NT_{t+1}^{SS}$$

Here, GI_t stands for Generational Imbalance in period *t*, and NT_t represents the present value lifetime net transfers to those born in period *t* as scheduled under current fiscal policies. Written alternatively,

$$(B2) \qquad GI_{t+1} = GI_t R^{-1} + NT_{t+1} .$$

Equation (*B2*) says that next period's *GI* equals this period's *GI* accumulated at the rate of interest plus the present value of the lifetime net transfer scheduled to be awarded to next period's newborn cohort under current fiscal policies.

Dividing both sides of equation (*B2*) by Y_{t+1} and using equation (*B3*) to manipulate the expression, we get

$$(B3) \qquad \frac{GI_{t+1}}{Y_{t+1}} = \frac{GI_t}{Y_t}\left(\frac{R}{G}\right)^{-1} + \frac{NT_{t+1}}{Y_{t+1}} .$$

That is, whether the ratio of *GI* to GDP grows faster, just as fast, or slower than the ratio of *FI* to GDP depends on two factors. The relative values of R and G, and whether current policies provide positive or negative net transfers to future newborns – that is, upon whether $NT_{t+1} \gtreqless 0$. Since under normal conditions $R<G$, maintaining a constant generational imbalance ratio to GDP requires each future newborn to make positive lifetime net tax payments.

Appendix C

General Government Taxes and Expenditures

Personal income taxes are decomposed into taxes on labor earnings and taxes capital income based on data provided in European Commission (2005). That publication divides personal income taxes into four components: (1) employed labour income taxes, τ_l, (2) taxes on income from self-employment, τ_s, (3) capital income taxes, τ_c, and (4) taxes allocated to social transfers and pensions (pensions for short), τ_p. Note that $\tau_l + \tau_s + \tau_c + \tau_p = 1$.

Although this decomposition does not directly provide the share, α, of non-pension personal income taxes falling on labour income, that share can be calculated by assuming that the labor income taxes as a share of self-employment taxes is the same as the labor income tax share of non-pension personal income taxes. That implies the relationship $\tau_l + \alpha\tau_s = \alpha(1-\tau_p)$, which can be solved for α, to yield $\alpha = \tau_l / [\tau_s + (1-\tau_p)]$.

Appendix Table C1 shows country specific values of the four components of the personal income tax as reported in European Commission (2005). That table also shows the values of α_i calculated separately for each country, *i*. The last row of the table shows the population weighted averages of the four components. Thus there are two alternative ways of calculating the average value of α across member countries. First, the population weighted average of α_i, (call this $\bar{\alpha}_i$) and, second, the value resulting from the population weighted averages of the four components (call this α_a). The table shows that the two alternatives are quite close: α_a=0.634, and $\bar{\alpha}_i$ =0.629.

In splitting personal income taxes into their labor and capital share, therefore, the labor share is assumed to be 0.63 and the share of capital equals =0.37. These shares are applied to non-pension personal income taxes $(1-\tau_p)$. Based on the tax categories defined in European Commission (2005), the four categories of taxes are calculated for the year 2004 as follows.[34]

1. Labor income taxes:[35]	(d51a+d51c1)×0.63	(labor share of individual and household taxes)
	+ d29c	(production based wage and payroll taxes)
2. Capital income taxes:	(d51a+d51c1)×0.37	(capital share of individual and household taxes)
	+ d51b + d51c2 + d51c3 + d51d + d51e	(capital income taxes)
	+ d214b + d214c + d214d	(stamps; fin. transactions; car registration fees)
	+ d29a + d29b + d29e + d29h	(structures, fixed assets, business licenses etc.)
	+ d59a + d59f	(current taxes on capital)
	+ d91	(capital taxes)
	+ d61131	(compulsory social contributions by self- and non-employed persons)
3. Social Contributions:	d611 + d612 – d61131	(compulsory and voluntary contributions minus those by self- and non-employed persons)[36]

[34] See European Commission (2005) for a fuller description of tax category codes.
[35] In the case of Germany, Spain, Portugal, Finland, Czech Republic, Hungary, and Poland, tax category d51 was not broken down into component parts in Eurostat data. In those cases, the entire amount was allocated to labor taxes.

4. Production and consumption taxes: d2 (taxes on production and consumption)
– (d29c + d214b + d214c + d214d + d29a + d29b + d29e + d29h)
(minus taxes allocated to other categories)

Appendix Table C2 shows the values of the four tax categories calculated for the 25 EU countries.

Appendix Table C1

Calculating the Share of Labor Income Taxes in Non-Pension Personal Income Taxes (2004)

	Labor Income Taxes	Self-Employment Taxes	Capital Income Taxes	Tax on Social Transfers and Pensions	Total	Population Aged 16+	α_i
Belgium	0.755	0.122	-0.019	0.142	1.00	8,474,039	0.770
Czech Republic	0.753	0.051	-0.031	0.227	1.00	4,317,772	0.914
Denmark	0.771	0.186	0.021	0.022	1.00	69,388,222	0.662
Germany	0.487	0.248	0.123	0.142	1.00	9,322,832	0.440
Estonia	0.552	0.131	0.109	0.208	1.00	35,751,074	0.598
Greece	0.730	0.180	0.080	0.000	0.99	48,000,901	0.619
Spain	0.817	0.119	0.055	0.008	1.00	3,129,187	0.735
France	0.570	0.207	0.052	0.171	1.00	49,093,165	0.550
Ireland	0.724	0.159	0.015	0.103	1.00	361,446	0.686
Italy	0.643	0.234	0.090	0.114	1.08	13,047,018	0.574
Cyprus	0.635	0.152	0.016	0.196	1.00	6,694,968	0.664
Latvia	0.672	0.098	0.147	0.056	0.97	8,709,272	0.645
Lithuania	0.703	0.081	0.038	0.179	1.00	4,234,843	0.779
Luxembourg	0.664	0.026	0.017	0.294	1.00	7,257,299	0.907
Hungary	0.737	0.126	0.120	0.017	1.00	47,979,020	0.665
Malta	0.915	0.051	0.009	0.025	1.00	572,888	0.892
Netherlands	0.765	0.159	0.076	0.000	1.00	8,525,288	0.660
Austria	0.918	0.048	0.005	0.030	1.00	1,112,821	0.902
Poland	0.815	0.016	0.090	0.079	1.00	8,387,217	0.870
Portugal	0.938	0.028	0.034	0.000	1.00	2,783,659	0.912
Slovenia	0.964	0.002	0.015	0.019	1.00	1,925,821	0.981
Slovakia	0.697	0.085	0.078	0.143	1.00	321,265	0.740
Finland	0.540	0.231	0.187	0.042	1.00	31,039,323	0.454
Sweden	0.830	0.114	0.055	0.000	1.00	4,353,650	0.745
United Kingdom	0.911	0.048	0.020	0.021	1.00	1,679,577	0.887
Population Weighted Average	0.6824	0.1627	0.0774	0.0784	1.0009	$\bar{\alpha}_i$ =	**0.629**
α_a =		**0.633**					

Source: Author's calculations based on data from Eurostat.

[36] Voluntary contributions are included to offset the benefit payments that they trigger. Not including these transfers would overstate the magnitude of estimated fiscal imbalances. Separate estimates for voluntary and compulsory contributions are not available for some countries in the Eurostat database – for example, France.

Appendix Table C2

Decomposition of General Government Revenues for 2004 (millions of Euros)

	Labor Income taxes	Capital Income Taxes	Social Insurance Taxes	Production & Consumption Taxes	Total
Belgium	23334.1	37804.9	43369.5	30334.3	134842.8
Denmark	31685.7	34633.1	4133.0	27544.5	97996.3
Germany	214430.0	67220.0	332330.0	266800.0	880780.0
Greece	5115.6	15572.4	21620.0	20395.0	62703.0
Spain	82671.0	28921.0	109037.0	77353.0	293926.0
France	100125.8	167712.2	298167.0	177821.0	743826.0
Ireland	8469.4	12956.4	9059.1	16312.2	45281.6
Italy	91551.0	189729.0	155391.0	128241.0	564912.0
Luxembourg	3396.5	1238.1	2838.3	2988.3	10461.2
Netherlands	18957.9	54929.1	60420.0	52897.0	187204.0
Austria	20444.2	23264.1	33734.6	26738.3	104181.2
Portugal	12394.8	24.7	17576.1	20344.5	37945.3
Finland	25535.0	3337.0	16809.0	20401.0	66082.0
Sweden	36705.3	31089.3	40538.4	35523.7	143856.7
United Kingdom	113453.4	197336.2	136902.4	192526.7	640280.6
Cyprus					
Czech Republic	8050.0	1583.6	12302.5	9671.8	31607.8
Estonia	383.1	434.0	1010.7	1107.7	2935.5
Hungary					
Lithuania	783.7	921.6	1557.5	1900.2	5163.0
Latvia	423.6	565.6	987.8	1208.0	3185.0
Malta	193.7	486.6	332.0	545.8	1558.1
Poland	11978.8	8244.5	22844.6	23526.6	65908.1
Slovakia	1933.7	442.1	3672.5	4298.1	8315.1
Slovenia	1454.2	1790.7	3560.2	3602.9	10408.0
EU Budget Allocation Benchmark*	35,368.3	38,271.1	57,747.5	49,655.7	180,146.1

* Population aged 16 and older in 2004.
Source: Author's calculations based on data from Eurostat.

Appendix Table C2 (Continued)

Decomposition of General Government Revenues for 2004 (Percent of Total Revenues)

	Labor Income taxes	Capital Income Taxes	Social Insurance Taxes	Production & Consumption Taxes	Total
Belgium	17.3	28.0	32.2	22.5	100.0
Denmark	32.3	35.3	4.2	28.1	100.0
Germany	24.3	7.6	37.7	30.3	100.0
Greece	8.2	24.8	34.5	32.5	100.0
Spain	28.1	9.8	37.1	26.3	100.0
France	13.5	22.5	40.1	23.9	100.0
Ireland	18.7	28.6	20.0	36.0	100.0
Italy	16.2	33.6	27.5	22.7	100.0
Luxembourg	32.5	11.8	27.1	28.6	100.0
Netherlands	10.1	29.3	32.3	28.3	100.0
Austria	19.6	22.3	32.4	25.7	100.0
Portugal	32.7	0.1	46.3	53.6	100.0
Finland	38.6	5.0	25.4	30.9	100.0
Sweden	25.5	21.6	28.2	24.7	100.0
United Kingdom	17.7	30.8	21.4	30.1	100.0
Cyprus					
Czech Republic	25.5	5.0	38.9	30.6	100.0
Estonia	13.1	14.8	34.4	37.7	100.0
Hungary					
Lithuania	15.2	17.9	30.2	36.8	100.0
Latvia	13.3	17.8	31.0	37.9	100.0
Malta	12.4	31.2	21.3	35.0	100.0
Poland	18.2	12.5	34.7	35.7	100.0
Slovakia	23.3	5.3	44.2	51.7	100.0
Slovenia	14.0	17.2	34.2	34.6	100.0
EU Budget Allocation Benchmark	19.6	21.2	32.1	27.6	100.0

Source: Author’s calculations based on data from Eurostat.

Appendix Table C3

Decomposition of General Government Expenditures in 2004 (millions of Euros)

Country	General Public Services	Defence	Public Order and Safety	Economic Affairs	Environment Protection	Housing and Community Amenties	Health	Recreation, Culture and Religion	Education	Social Protection	Total
Belgium*	26,117	3,227	4,826	14,630	1,973	840	19,146	3,544	16,974	49,140	140,417
Denmark	14,611	3,141	2,017	7,194	1,025	1,282	13,952	3,504	16,292	45,059	108,077
Germany	133,930	24,690	35,800	79,710	11,310	23,510	134,970	14,800	89,480	489,840	1,038,040
Greece	16,367	4,672	2,096	11,463	1,129	785	8,108	682	5,835	32,133	83,270
Spain	40,624	9,524	15,271	40,623	7,563	8,489	46,008	11,572	36,516	108,905	325,095
France	117,125	36,311	17,791	52,723	13,470	31,011	120,867	24,429	105,812	361,014	880,553
Ireland	5,216	826	2,077	7,427	0	2,946	10,568	746	6,678	13,589	50,072
Italy	117,020	17,559	24,956	54,194	10,916	10,560	91,721	13,323	68,114	248,804	657,167
Luxembourg	1,385	77	289	1,260	292	226	1,403	535	1,397	4,833	11,696
Netherlands	39,711	7,194	8,705	22,924	4,006	5,686	22,073	6,945	25,565	84,726	227,535
Austria	16,672	2,056	3,266	12,048	852	1,362	15,850	2,310	13,512	50,327	118,255
Portugal	8,754	2,007	2,754	6,912	862	1,177	9,405	1,711	10,484	21,603	65,668
Finland	9,906	2,448	2,255	7,213	468	498	10,038	1,804	9,049	32,826	76,505
Sweden	21,336	5,467	3,860	13,585	987	2,359	19,750	2,891	20,912	68,668	159,814
United Kingdom	82,083	45,297	43,960	49,564	11,952	11,290	119,817	9,047	98,776	278,844	750,629
Cyprus											
Czech Republic	4,143	1,108	1,909	6,450	999	646	5,449	1,103	4,377	12,283	38,468
Estonia	287	132	213	394	63	47	368	198	596	993	3,292
Hungary											
Lithuania	847	252	337	653	82	68	746	134	1,064	1,825	6,007
Latvia	512	138	247	477	87	87	496	151	665	1,139	3,997
Malta	371	45	75	309	43	50	279	28	261	623	2,084
Poland	11,500	2,056	3,234	6,436	1,132	2,871	8,684	1,872	12,197	35,926	85,907
Slovakia	1,663	339	429	2,199	175	410	1,378	392	1,210	5,239	13,434
Slovenia	2,068	355	494	915	137	40	1,731	246	1,529	4,883	12,396
EU Budget Allocation Benchmark	**29,228**	**7,344**	**7,690**	**17,361**	**3,023**	**4,619**	**28,818**	**4,433**	**23,795**	**84,923**	**211,234**

* 2003 Figures Adjusted for 1 Year's Productivity Growth.
Source: Author’s calculations based on data from Eurostat.

Appendix Table C3 (Continued)

Decomposition of General Government Expenditures (Percent of Total Expenditures)

Country	General Public Services	Defence	Public Order and Safety	Economic Affairs	Environment Protection	Housing and Community Amenties	Health	Recreation, Culture and Religion	Education	Social Protection	Total
Belgium*	18.6	2.3	3.4	10.4	1.4	0.6	13.6	2.5	12.1	35.0	100.0
Denmark	13.5	2.9	1.9	6.7	0.9	1.2	12.9	3.2	15.1	41.7	100.0
Germany	12.9	2.4	3.4	7.7	1.1	2.3	13.0	1.4	8.6	47.2	100.0
Greece	19.7	5.6	2.5	13.8	1.4	0.9	9.7	0.8	7.0	38.6	100.0
Spain	12.5	2.9	4.7	12.5	2.3	2.6	14.2	3.6	11.2	33.5	100.0
France	13.3	4.1	2.0	6.0	1.5	3.5	13.7	2.8	12.0	41.0	100.0
Ireland	10.4	1.6	4.1	14.8	0.0	5.9	21.1	1.5	13.3	27.1	100.0
Italy	17.8	2.7	3.8	8.2	1.7	1.6	14.0	2.0	10.4	37.9	100.0
Luxembourg	11.8	0.7	2.5	10.8	2.5	1.9	12.0	4.6	11.9	41.3	100.0
Netherlands	17.5	3.2	3.8	10.1	1.8	2.5	9.7	3.1	11.2	37.2	100.0
Austria	14.1	1.7	2.8	10.2	0.7	1.2	13.4	2.0	11.4	42.6	100.0
Portugal	13.3	3.1	4.2	10.5	1.3	1.8	14.3	2.6	16.0	32.9	100.0
Finland	12.9	3.2	2.9	9.4	0.6	0.7	13.1	2.4	11.8	42.9	100.0
Sweden	13.4	3.4	2.4	8.5	0.6	1.5	12.4	1.8	13.1	43.0	100.0
United Kingdom	10.9	6.0	5.9	6.6	1.6	1.5	16.0	1.2	13.2	37.1	100.0
Cyprus											
Czech Republic	10.8	2.9	5.0	16.8	2.6	1.7	14.2	2.9	11.4	31.9	100.0
Estonia	8.7	4.0	6.5	12.0	1.9	1.4	11.2	6.0	18.1	30.2	100.0
Hungary											
Lithuania	14.1	4.2	5.6	10.9	1.4	1.1	12.4	2.2	17.7	30.4	100.0
Latvia	12.8	3.4	6.2	11.9	2.2	2.2	12.4	3.8	16.6	28.5	100.0
Malta	17.8	2.1	3.6	14.8	2.0	2.4	13.4	1.4	12.5	29.9	100.0
Poland	13.4	2.4	3.8	7.5	1.3	3.3	10.1	2.2	14.2	41.8	100.0
Slovakia	12.4	2.5	3.2	16.4	1.3	3.1	10.3	2.9	9.0	39.0	100.0
Slovenia	16.7	2.9	4.0	7.4	1.1	0.3	14.0	2.0	12.3	39.4	100.0
EU Budget Allocation Benchmark	13.8	3.5	3.6	8.2	1.4	2.2	13.6	2.1	11.3	40.2	100.0

* 2003 Figures Adjusted for 1 Year's Productivity Growth.
Source: Author’s calculations based on data from Eurostat

.**Appendix D**

Calculations of sub-components of Member Countries' Fiscal Imbalances

The "EU demographic benchmark" economy is calculated by dividing each year-age-gender cell of the projected population by the number of countries included in the calculations – 23. This provides a population of 15,978,368 people in 2004, projected to grow at the average rate of growth of the 23 countries. Table D1 shows the country-specific populations of those aged 16 and older and the EU-demographic benchmark population for 2004.

EU Country Populations – Age 16 and Older	
Belgium	8,474,039
Denmark	4,317,772
Germany	69,388,222
Greece	9,322,832
Spain	35,751,074
France	48,000,901
Ireland	3,129,187
Italy	49,093,165
Luxembourg	361,446
Netherlands	13,047,018
Austria	6,694,968
Portugal	8,709,272
Finland	4,234,843
Sweden	7,257,299
United Kingdom	47,979,020
Cyprus	
Czech Republic	8,525,288
Estonia	1,112,821
Hungary	
Lithuania	2,783,659
Latvia	1,925,821
Malta	321,265
Poland	31,039,323
Slovakia	4,353,650
Slovenia	1,679,577
EU Budget Allocation Benchmark	15,978,367.9

The Demographic Component of FI

For calculating the demographic component of a given country's FI, its age- and gender-specific population projections are re-scaled (divided) by the ratio of its population in the base year (2004) to that of the "EU demographic benchmark," also in the base year. This makes the country's initial population equal that of the "EU benchmark" and rescales its projected population by the same ratio. However, the population structure resembles that of the specific country being considered rather than that of the "EU demographic benchmark." All other inputs are maintained at their "EU benchmark" levels. FI calculated under these parameters can be compared to that under the "EU benchmark" – including the "EU demographic benchmark." The percentage difference in the two FIs may be attributed to the particular demographic structure of the country under consideration.

Budget-Allocation Structure

The contribution of a country's budget-allocation structure to its fiscal imbalance is calculated as the difference between FI under the "EU benchmark" and that obtained by replacing the EU benchmark's aggregate budget allocations with those of the member country under consideration. The "EU budget-allocation benchmark" is derived by calculating a simple average of each harmonized tax and expenditure across EU countries. See Appendix C for details.

The budget-allocation component for a given country is calculated by replacing the "EU benchmark" budget allocation by that of the country under consideration. The replacement is done after rescaling the country's taxes and expenditures by the ratio of the EU benchmark population and the country's population in the base year. FI calculated under these parameters can be compared to that of the EU benchmark to show the impact of that country's budget allocation component.

This method begs the question of whether policy-makers decide on the amounts and proportions between different types of revenues and expenditures before deciding the details of how exactly they would be raised and spent (that is, their cohort distribution). Alternatively, aggregate revenues and expenditures may just be the residual result of the policymaking process.

Isolating the impact of budget allocations in the manner described here is motivated by the view that policymakers have a broad sense of how high revenues should be, how much the government should spend on public goods, and how generous social transfer, retirement, and health service programs ought to be in per-capita terms. Obviously, altering the balance between revenues and expenditures and between different types of taxes and spending could have a significant impact on a country's fiscal imbalance.

Note that the budget-allocation benchmark constructed here is based on a simple average of per-capita revenues and taxes across different countries. The benchmark does not include any "optimal tax" considerations – that is, concerns about the most efficient way of raising revenue for financing a given amount of public spending. Those considerations are not within the scope of this study – which is mainly concerned with measuring the size of existing fiscal imbalances and distinguishing between their demographic and policy-related sources for various member countries.

Cohort-Distribution Structure

The contribution of a country's cohort-distribution policy can be calculated by replacing the EU benchmark profiles of tax and transfer distributions by age and gender by those applicable to the country under consideration.[37] The remaining details of this calculation would be similar to those described earlier.

[37] Note that unavailability of country-specific profiles of taxes and transfers by age and gender precludes such analysis from the current version of the paper.

Productivity Growth

This calculation simply involves replacing the country-specific labor-productivity growth in the calculation of the "EU benchmark" case. All other inputs of the EU benchmark are kept unchanged. Note, that a under faster productivity growth, revenues would be projected increase more rapidly over time but the growth of some government expenditures may become slower—especially transfers and subsidies that are means tested.[38]

[38] Lacking clear information about how to model budget projections under alternative productivity growth assumptions, this analysis is currently excluded from the paper.

Appendix E

Relative Profiles by Age and Gender

Profiles by age and gender are constructed for distributing and projecting various taxes and transfers for the "EU benchmark" economy. These profiles are derived as smoothed age- and gender-specific averages of consumption expenditures, labor income capital incomes, wage taxes, social contributions, premium payments etc. For public transfers, the profiles represent receipts of social benefits including retirement, welfare, and unemployment benefits, etc. In the case of health-care benefits, micro data sets for EU countries record only the frequency of service utilization. No cost or payment data is available in countries with national health-insurance systems because health services are provided free of charge. Payments for corresponding private services could be used, if available, as proxy measures of the value of public services provided. However, doing so would involve the assumption that the qualities and efficiency of goods, treatments, and outcomes from private and public health provision are identical – which is unlikely to be true. Hence, age- and gender-profiles for distributing government health-care outlays are based only on the relative frequency of utilization by age and gender.

The profiles shown in this section are derived from a combination of data from Eurostat and specific EU member countries. They are used to calculate the Fiscal Imbalance for the "EU benchmark" case. However, the data used to construct the profiles are sparse and not representative of average relative spending, taxes, and transfers in EU countries. Hence, they should be interpreted as a heuristic for demonstrating Fiscal Imbalance calculations and related experiments described in Section 4 of the main text.

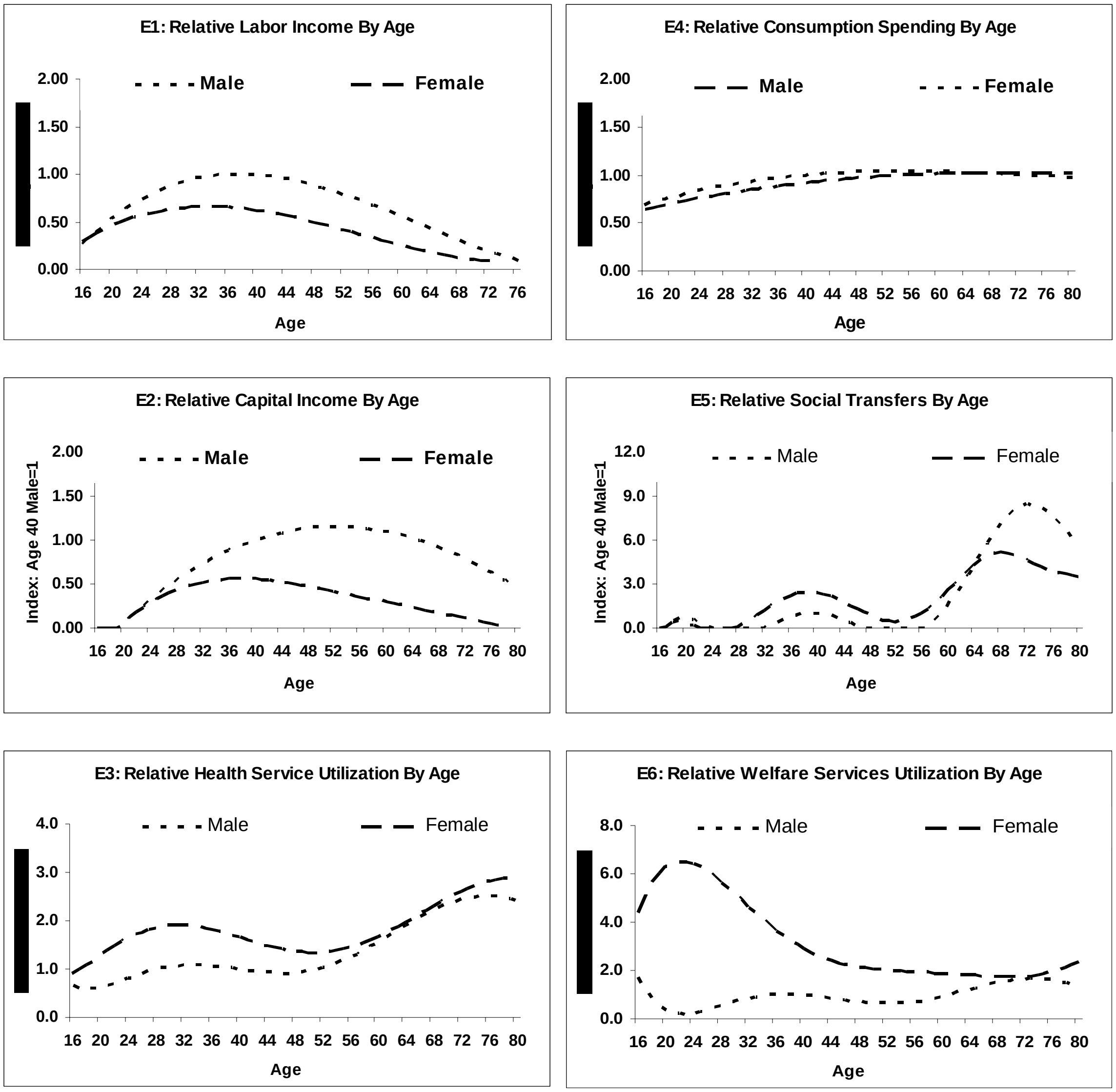
Figure E1 shows male and female relative profiles of labor income by age normalized to the labor income of a 40-year-old male. These profiles are used for distributing labor income taxes and payroll taxes (or social insurance taxes)

Figure E2 shows male and female relative profiles of capital income normalized to the capital income of a 40-year-old male. These profiles are used for distributing capital taxes.

Figure E3 shows male and female relative profiles of consumption normalized to the consumption of a 40-year-old male. These profiles are used for distributing consumption, production, and other indirect taxes.

Figure E4 shows male and female relative profiles of non-health and non-welfare retirement benefits normalized to the labor income of a 40-year-old male. They are used for distributing retirement benefits from public pension programs.

Figure E5 shows male and female relative profiles of health care utilization normalized to the average utilization level for 40-year-old males. They are used for distributing general government outlays on health care goods and services.



Finally, Figure E6 shows male and female relative profiles of welfare transfers normalized to the welfare income of a 40-year-old male. They are used for distributing social transfers other than health services and pension benefits.

Appendix F

Productivity Growth Calculation for “EU Benchmark”

Table F1 shows annual growth output per hour worked for each of the 25 EU members between 1996 and 2004 (where available), the geometric mean of annual growth rates for each member, and the population weighted average across all members.

Table F2 shows the geometric mean of inflation in EU member countries between 1997 and 2004, and table F3 shows the geometric mean of long-term interest rates on government bonds of EU countries. The difference between the two geometric means (5.39 percent minus 3.01 percent = 2.38 percent) is taken as the appropriate real long-term opportunity cost of funds for EU government’s. This real discount rate is applied in calculating present values of fiscal flows for all FI calculation reported in the main text.

Table F1: Growth in Labor Productivity (Output Per Hour; Gross) – EU 25 Countries and "EU Benchmark"

	1996	1997	1998	1999	2000	2001	2002	2003	2004	Geometric Mean of Productivity Growth 1996-2004	Population Aged 16+
Belgium	0.982	0.982	0.998	0.998	1.002	1.002	1.002	1.007	1.019	1.00	8,474,039
Denmark	1.010	0.989	0.984	1.018	0.998	0.990	0.974	1.008	1.021	1.00	4,317,772
Germany	1.007	0.994	0.991	0.996	0.989	1.000	0.997	1.007	0.999	1.00	69,388,222
Greece	1.018	1.044	0.976	0.995	1.037	1.019	1.049	1.035	1.003	1.02	9,322,832
Spain	0.996	0.968	0.996	1.015	0.958	1.000	1.009	1.010	0.998	0.99	35,751,074
France	0.994	1.014	1.012	0.992	1.014	1.009	1.004	1.003	0.987	1.00	48,000,901
Ireland	1.009	1.074	1.027	1.017	1.021	1.017	1.031	1.016	1.010	1.02	3,129,187
Italy	0.987	0.994	1.002	0.991	0.998	0.981	0.974	0.980	0.991	0.99	49,093,165
Luxembourg	0.992	0.962	1.000	1.096	0.991	0.939	1.007	1.059	1.034	1.01	361,446
Netherlands	0.999	1.010	0.983	0.998	1.027	1.008	0.992	1.001	1.021	1.00	13,047,018
Austria	0.994	0.973	0.999	1.025	1.010	0.979	0.981	0.997	1.020	1.00	6,694,968
Portugal	1.013	1.027	1.015	1.019	1.020	0.989	0.991	0.931	0.995	1.00	8,709,272
Finland	0.995	1.024	1.032	0.987	1.011	1.018	0.984	0.984	1.012	1.00	4,234,843
Sweden	1.001	1.006	0.991	1.017	1.010	0.975	0.996	1.032	1.014	1.00	7,257,299
United Kingdom	1.009	1.011	1.010	1.005	1.012	1.013	1.028	1.001	1.007	1.01	47,979,020
Cyprus	:	:	:	:	:	:	:	:	:	:	572,888
Czech Republic	1.044	0.967	0.998	1.023	0.996	1.060	1.017	1.008	1.033	1.02	8,525,288
Estonia	:	:	:	:	:	1.031	1.042	1.043	1.063	1.04	1,112,821
Hungary	:	:	:	:	:	:	:	:	:	:	8,387,217
Lithuania	1.024	1.037	1.068	1.021	1.012	1.091	1.011	1.059	1.045	1.04	2,783,659
Latvia	:	:	:	1.048	1.064	1.033	1.016	1.016	1.069	1.04	1,925,821
Malta	:	:	:	:	:	0.982	0.996	0.974	0.953	0.98	321,265
Poland	:	:	:	:	:	0.985	1.015	1.149	1.048	1.05	31,039,323
Slovakia	1.045	1.041	1.054	1.019	1.048	1.033	1.080	1.023	1.006	1.04	4,353,650
Slovenia	:	1.058	1.029	1.017	0.985	1.017	1.002	1.011	1.066	1.02	1,679,577
Population Weighted Geometric Mean (EU Benchmark)										**1.0024**	

Table F2: Inflation Rates (Geometric Means) – 1997-2005

	1997	1998	1999	2000	2001	2002	2003	2004	2005	Geometric Mean of Inflation 1997-2004
Belgium	1.0150	1.0091	1.0113	1.0267	1.0244	1.0155	1.0152	1.0186	1.0253	1.0253
Denmark	1.0190	1.0128	1.0207	1.0270	1.0230	1.0247	1.0199	1.0082	1.0173	1.0173
Germany	1.0158	1.0056	1.0066	1.0143	1.0184	1.0138	1.0105	1.0176	1.0194	1.0194
Greece	1.0543	1.0453	1.0213	1.0290	1.0366	1.0391	1.0344	1.0303	1.0349	1.0349
Spain	1.0189	1.0176	1.0223	1.0349	1.0282	1.0360	1.0310	1.0306	1.0338	1.0338
France	1.0128	1.0067	1.0057	1.0182	1.0178	1.0194	1.0216	1.0235	1.0190	1.0190
Ireland	:	1.0209	1.0255	1.0523	1.0391	1.0478	1.0402	1.0230	1.0215	1.0215
Italy	1.0183	1.0204	1.0165	1.0255	1.0237	1.0265	1.0279	1.0219	1.0225	1.0225
Luxembourg	1.0138	1.0097	1.0101	1.0379	1.0240	1.0205	1.0255	1.0322	1.0377	1.0377
Netherlands	1.0185	1.0178	1.0203	1.0234	1.0511	1.0387	1.0224	1.0138	1.0150	1.0150
Austria	1.0116	1.0083	1.0052	1.0196	1.0229	1.0169	1.0130	1.0196	1.0210	1.0210
Portugal	1.0189	1.0221	1.0218	1.0280	1.0441	1.0368	1.0325	1.0251	1.0212	1.0212
Finland	1.0123	1.0135	1.0131	1.0295	1.0267	1.0200	1.0131	1.0014	1.0077	1.0077
Sweden	1.0181	1.0103	1.0056	1.0128	1.0267	1.0193	1.0233	1.0102	1.0083	1.0083
United Kingdom	1.0182	1.0156	1.0132	1.0087	1.0118	1.0127	1.0136	1.0134	1.0204	1.0204
Cyprus	1.0332	1.0234	1.0113	1.0487	1.0198	1.0279	1.0397	1.0189	1.0204	1.0204
Czech Republic	1.0803	1.0974	1.0175	1.0402	1.0453	1.0148	0.9990	1.0250	1.0163	1.0163
Estonia	1.0928	1.0878	1.0310	1.0393	1.0563	1.0359	1.0138	1.0304	1.0411	1.0411
Hungary	:	:	:	:	:	1.0525	1.0467	1.0677	1.0349	1.0349
Lithuania	1.1028	1.0539	1.0146	1.0108	1.0155	1.0034	0.9892	1.0116	1.0266	1.0266
Latvia	1.0805	1.0430	1.0213	1.0263	1.0253	1.0195	1.0294	1.0619	1.0689	1.0689
Malta	1.0391	1.0370	1.0229	1.0304	1.0251	1.0261	1.0194	1.0272	1.0253	1.0253
Poland	:	:	:	1.1008	1.0526	1.0196	1.0075	1.0360	1.0215	1.0215
Slovakia	1.0600	1.0669	1.1045	1.1219	1.0716	1.0350	1.0843	1.0747	1.0280	1.0280
Slovenia	1.0834	1.0791	1.0612	1.0895	1.0856	1.0747	1.0569	1.0365	1.0246	1.0246
Geometric Mean										**1.0301**

Source: Author's calculations based on data from Eurostat.

Table F3: Interest Rates (Geometric Means) – 1996-2005

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Geometric Mean of Inflation 1997-2004
Belgium	1.0649	1.0575	1.0475	1.0475	1.0559	1.0513	1.0499	1.0418	1.0415	1.0343	1.0474
Denmark	1.0719	1.0626	1.0494	1.0491	1.0564	1.0508	1.0506	1.0431	1.043	1.034	1.0487
Germany	1.0622	1.0564	1.0457	1.0449	1.0526	1.048	1.0478	1.0407	1.0404	1.0335	1.0455
Greece	1.1446	1.0992	1.0848	1.063	1.061	1.053	1.0512	1.0427	1.0426	1.0359	1.0591
Spain	1.0874	1.064	1.0483	1.0473	1.0553	1.0512	1.0496	1.0412	1.041	1.0339	1.0479
France	1.0631	1.0558	1.0464	1.0461	1.0539	1.0494	1.0486	1.0413	1.041	1.0341	1.0463
Ireland	1.0729	1.0629	1.048	1.0471	1.0551	1.0501	1.0501	1.0413	1.0408	1.0333	1.0476
Italy	1.0940	1.0686	1.0488	1.0473	1.0558	1.0519	1.0503	1.0425	1.0426	1.0356	1.0492
Luxembourg	:	:	:	:	:	:	:	:	:	:	:
Netherlands	1.0615	1.0558	1.0463	1.0463	1.054	1.0496	1.0489	1.0412	1.041	1.0337	1.0463
Austria	1.0632	1.0568	1.0471	1.0468	1.0556	1.0507	1.0497	1.0415	1.0415	1.0339	1.0470
Portugal	1.0856	1.0636	1.0488	1.0478	1.0559	1.0516	1.0501	1.0418	1.0414	1.0344	1.0483
Finland	1.0708	1.0596	1.0479	1.0472	1.0548	1.0504	1.0498	1.0413	1.0411	1.0335	1.0473
Sweden	1.0803	1.0662	1.0499	1.0498	1.0537	1.0511	1.053	1.0464	1.0442	1.0338	1.0498
United Kingdom	1.0794	1.0713	1.056	1.0501	1.0533	1.0501	1.0491	1.0458	1.0493	1.0446	1.0522
Cyprus	:	1.0693	1.0674	1.0736	1.0755	1.0765	1.0537	1.047	1.0608	1.0516	1.0639
Czech Republic	:	:	:	:	1.0694	1.0631	1.0487	:	:	:	1.0604
Estonia	:	:	:	:	:	:	:	:	:	:	:
Hungary	:	:	:	1.0991	1.0855	1.0794	1.0709	1.0683	1.0819	1.066	1.0787
Lithuania	:	:	:	:	:	:	1.0597	1.0522	1.0443	1.0373	1.0446
Latvia	:	:	:	:	:	:	:	:	1.0485	1.0353	1.0419
Malta	:	:	:	:	1.0575	1.0611	1.0574	1.0498	1.0468	1.0457	1.0530
Poland	:	:	:	1.0953	1.1179	1.1068	1.0732	1.0578	1.0692	1.0523	1.0815
Slovakia	:	:	:	:	1.0833	1.0805	1.0691	1.0499	1.0502	1.0352	1.0612
Slovenia	:	:	:	:	:	:	:	:	1.0249	1.0381	1.0315
Geometric Mean											**1.0539**

Source: Author's calculations based on data from Eurostat.

Appendix G

Population Projections

Eurostat, the official repository of social, economic, and demographic statistics for EU countries, provides population data by age (by single year from 0 through 80+) and gender beginning in 1999 through 2005. It also provides population projections by age and gender spanning the years 2004 through 2051. Because actual population data for 2005 are not available for all member countries, the base year of the calculations is set to 2004, and Eurostat's population projections are used beginning in 2005.

The population projections are extended beyond 2051 using mortality, fertility, and immigration information provided by Eurostat. Unfortunately, data on these items is not available for the terminal year of Eurostat's population projections. Hence, current fertility rates are benchmarked using the ratio of 2051 newborns to those obtained by applying current fertility rates by female age. Mortality rates and immigration levels are assumed to be the same as current rates implying a slower population growth post 2051 than would be obtained using lower mortality rates. Doing so, implies that budget shortfalls beyond the terminal year are likely to be biased downward compared to the case where lower mortality rates and immigration levels are assumed. The population projections are extended beyond 2051 using the methods described below.

First, the 80+ population (those aged 80 and older) is distributed across ages 80-99+ using mortality rates by single year of age. This is done in to match the population age-distribution with the age span of relative tax and expenditure profiles constructed to span ages 0 through 99+ (those aged 99 and older) for both sexes. The expansion of the distribution of the 80+ population is implemented by assuming that the fraction of those aged *a* ($81 \le a \le 99$) equals the probability of surviving through age *a* conditional on having reached age 80. Letting p_s represent the conditional probability of death within 1 year at age *s*, the fraction of the 80+ population at age *a*, f_a, equals

$$\text{(D1)} \qquad f_a = \frac{\prod_{s=80}^{a}(1-p_s)}{\sum_{a=80}^{99}\prod_{s=80}^{a}(1-p_s)}.$$

For each EU member country, population projections beyond 2051 are implemented as follows.

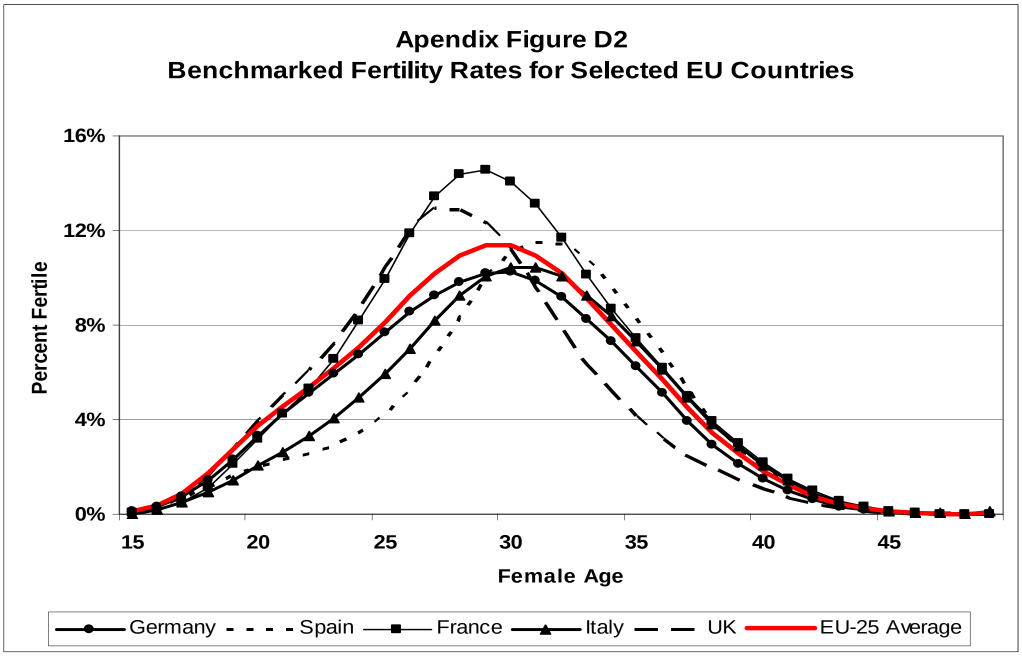
First, the population of newborns in year t are calculated by applying fertility rates to females age 15 through 49. Fertility profiles by female age for the latest available year (2003 for most countries) are used after benchmarking them to the aggregate fertility rate in the projected population in 2051. Fertility rates by female age are assumed to be constant after 2051. Thus, letting $F_{a,t}$ represent the fertility rate of females aged *a* in year *t*, and $P_{a,s,t}$, represent the population of those aged *a* and sex *s* (= *m* or *f*) in year *t*, the benchmarking of fertility rates to aggregate fertility in 2051 involves the following operation:

(D2) $$F_{a,2051} = F_{a,2003} \frac{P_{0,m,2051} + P_{0,f,2051}}{\sum_{s=15}^{49} F_{s,2003} P_{s,f,2050}}, \forall\ a=15\ldots49.$$

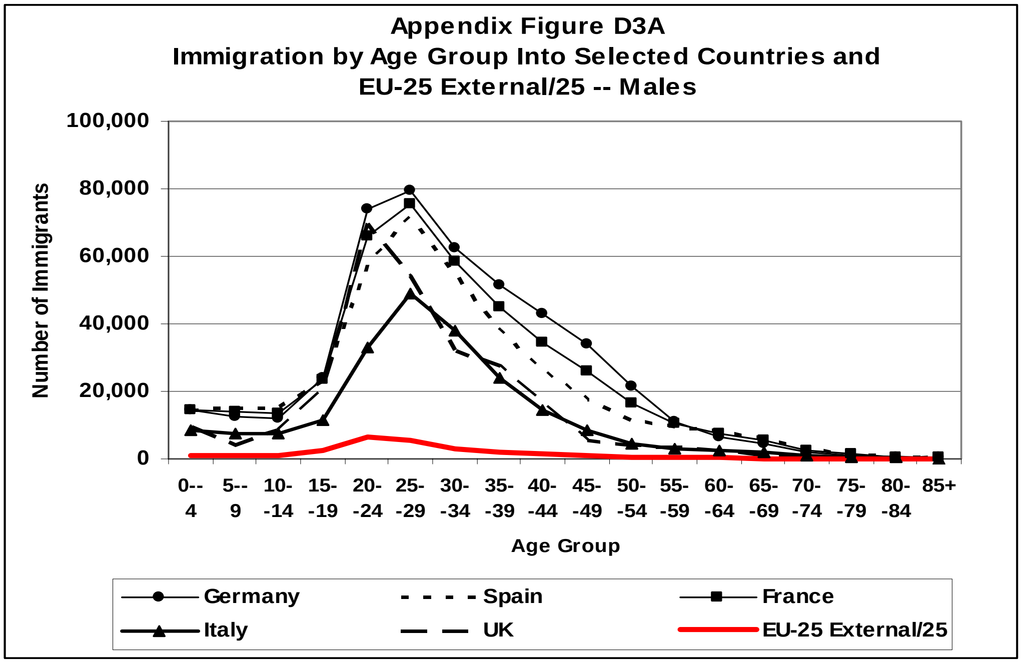
That is, the 2051 fertility rates equal the 2003 fertility rates scaled by the ratio of 2051 newborns in the projected population (from Eurostat) to those obtained by applying the 2003 fertility rates to the female population in 2050.

The 2052 population of newborns is obtained by applying the benchmarked fertility rates to the population of 2051 females aged 15 through 49. The population of those aged 1 through 98 in 2052 is obtained by applying age-specific mortality rates to those alive in 2051 and adding to the surviving population the assumed number of age-specific immigrants. Note that current mortality rates are applied to the 2051 population, implying no improvement in longevity throughout the future. This assumption is obviously unsatisfactory but incorporating the required adjustment would require projected rates of mortality reduction that was not available at the time of writing this paper.

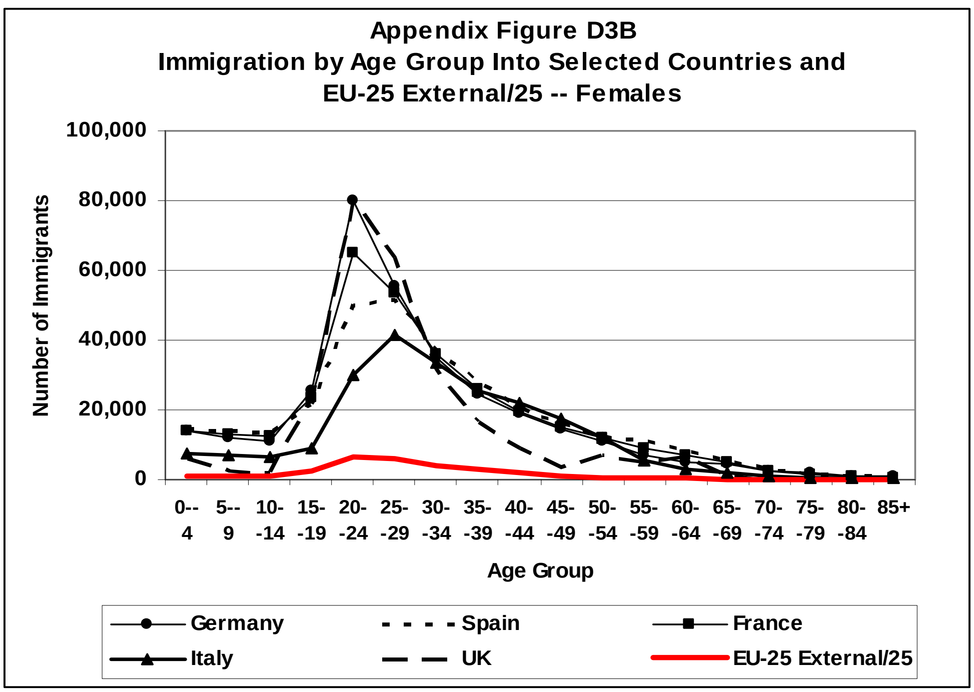
Appendix Figures D2, D3A, D3B, and D4A and D4B show the fertility, male and female immigration, and male and female mortality components for the same countries as in Figure D1 and the corresponding averages for EU countries.



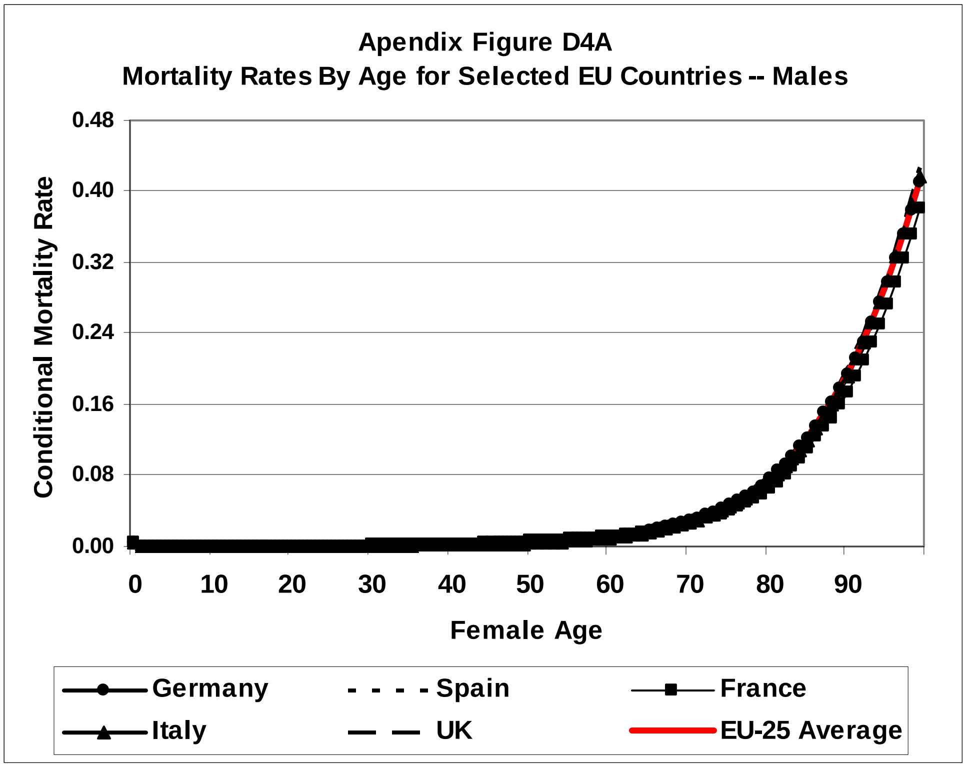
Source: Author's calculations based on data from Eurostat.



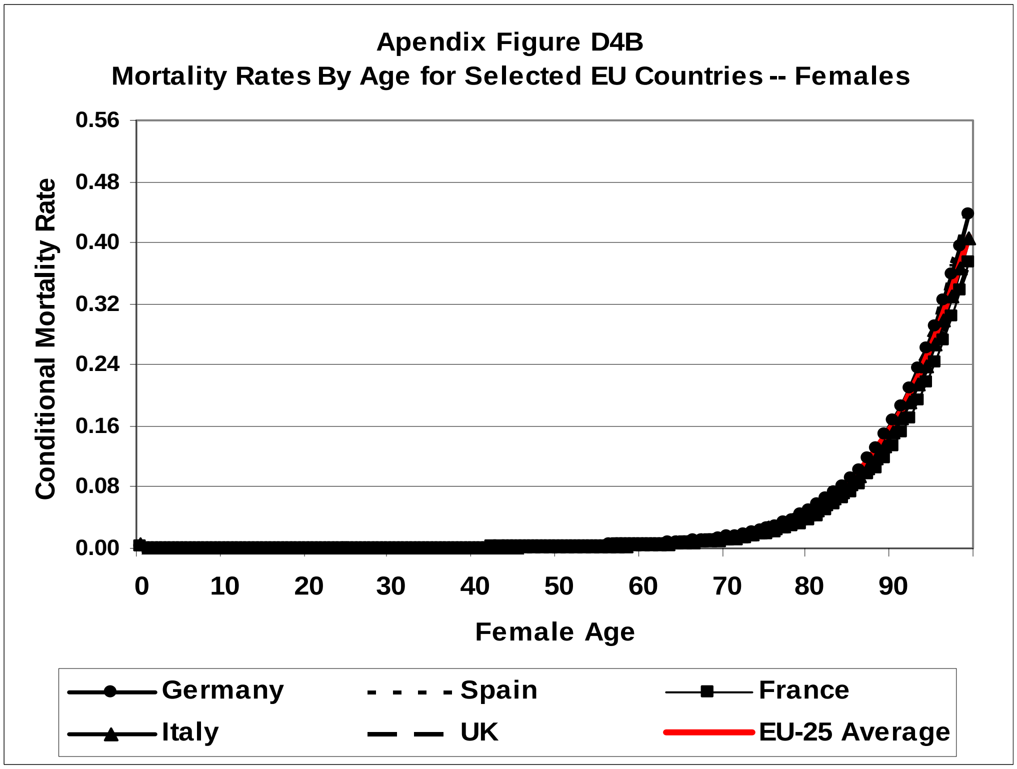
Source: Eurostat.



Source: Eurostat.



Source: Eurostat.



Source: Eurostat.

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