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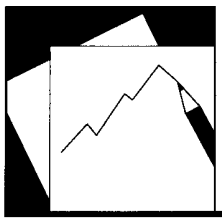

IMF Working Paper

Modeling Optimal Fiscal Consolidation Paths in a Selection of European Countries

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Modeling Optimal Fiscal Consolidation Paths in a Selection of European Countries

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Abstract

For a number of countries—Italy, Netherlands, the United Kingdom, Germany, Ireland, and France—this paper develops an inter-temporal model that elicits the implied country-preferences over balancing the conflicting objectives of fiscal consolidation and reduction of economic slack. The model suggests that some front-loading of adjustment is desirable, although the extent would vary by country preferences. It also finds that proposed consolidations may prove to be stronger than acceptable, especially if somewhat larger than anticipated fiscal multipliers lead to a sizeable economic deceleration.

JEL Classification Numbers: E62,H68

Keywords: Fiscal Sustainability, Italy, Netherlands, U.K., Germany, Ireland, France

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I. INTRODUCTION

This paper develops a tractable inter-temporal model that elicits the implied country-preferences over balancing the conflicting objectives of fiscal consolidation and reduction of the slack in the economy in a selection of European countries. Given country preferences and starting points, the model then predicts the most advantageous pace of fiscal adjustment needed to close fiscal sustainability gaps. The first part of the paper examines the issues related to the calculation of sustainability gaps, and then goes on to calculate sustainability gaps for the selected countries. The second part develops a model incorporating quadratic preferences of the authorities and laws governing the evolution of sustainability gaps and output gaps over time. The rationale here is that country authorities would prefer that both output and sustainability gaps be zero, but that action to reduce one gap typically comes at the expense of widening the other gap. Thus these two objectives must be balanced over time, given authorities' preferences and various features of the economy which are expounded on below.

A country's fiscal position can be measured in a variety of ways, with each having its strengths and weaknesses. Typically, a more theoretically satisfactory measurement of the fiscal position comes at the cost of requiring better quality data and greater institutional capacity for successful use. The most commonly used measures are the headline fiscal balance, public gross or net debt-GDP ratio, the structural or cyclically adjusted fiscal balance, the structural primary balance, and the fiscal sustainability gap. A key determinant of the degree of usage is the difficulty of measurement. Virtually all countries calculate the headline fiscal balance, but many countries with institutional capacity limitations do not attempt the calculation of the cyclically adjusted balances, as these require reasonably accurate estimation of potential output and various elasticities that determine the impact of output gaps on the headline balance. Nevertheless, it is also clear that structural balances—properly calculated—give a more satisfactory indication of the fiscal position of a country, as output gaps obscure the true underlying fiscal position expected to obtain over the medium to long run. In a similar vein, sustainability gaps provide a more satisfactory measure of the fiscal position than structural balances, but generally require greater institutional capacity and resources to implement successfully, as they require long run projections of the evolution of the economy.

The concept of fiscal sustainability is the most satisfactory basis for measuring the fiscal health of a country. It poses the following question: if the authorities decide to take no further fiscal measures from now onward, can they maintain that posture over the long run? If they can do so, then the fiscal position is considered sustainable (and the sustainability gap is then zero). However, in most countries this is not the case, and protracted inaction then typically leads to a situation where the debt-GDP ratio rises continuously without bound, implying that interest payments take an ever increasing share of government expenditure. This crowds out non-interest spending and increases the difficulties associated with financing the debt until the government is forced to take drastic action to restore sustainability. The measurement of

sustainability gaps thus informs policymakers about the amount of measures needed to get to the point of sustainability. Since this is inherently a forward looking exercise, most of the measurement issues one has to deal with to estimate sustainability gaps have to do with projecting the likely evolution of the economy and key fiscal variables over the long run. This then provides the basis to project the likely evolution of the headline balance and public debt, and thus the means to answer whether debt grows without bound over the long run under current policies.

Reflecting these considerations, and the central need to ensure healthy fiscal policies in the European Monetary Union (EMU), the European Commission (EC) has been at the forefront of pushing for the widespread calculation and use of fiscal sustainability gaps. Indeed, it is now customary for all EU countries to calculate fiscal sustainability gaps, in coordination with the EC, every few years, with the last such exercise conducted in 2009 (EC 2009a and 2009b). The practical experience gained has helped refine the exercise into a credible coherent one that takes into account all the major changes expected over the long run—particularly population aging—and identifies the scale of fiscal effort needed in each country to achieve sustainability.

The analysis in the EC's sustainability exercise forms the point of departure for our analysis. We focus on only six countries rather than all 27 countries in the EU, and first update the estimates of sustainability gaps for those countries. This is done to give a view of the degree of damage done to fiscal health from the global crisis, and therefore the scale of adjustment effort these countries now face. We then develop a model of the authorities' problem, and elicit country preferences by comparing model-predicted consolidation paths to the near-term adjustment paths announced by these countries. This then gives insights on the implications for the timing and overall scale of efforts needed to achieve sustainability. We then finally do a sensitivity test to see how adjustment paths should change if the value used in the calibration of the fiscal multiplier turns moderately higher.

II. Estimating the Fiscal Sustainability Gap

Consistent with the approach used to calculate the S2 sustainability indicator in the EC's sustainability reports, a country is considered to be running a sustainable fiscal policy if it satisfies the general government inter-temporal budget constraint. This constraint is derived from the equation defining the evolution of public debt as follows:

$$B_t = B_{t-1}(1+r) - P_{t-1} \tag{1}$$

Where B_t, r, and P_t, represent the debt stock at the beginning of period t, the discount rate, and the primary surplus in period t, respectively. Dividing equation (1) by GDP gives the following equation:

$$b_t = b_{t-1}\left(\frac{1+r}{1+g}\right) - p_{t-1}\left(\frac{1}{1+g}\right) \tag{2}$$

Where b_t and p_t represent the debt to GDP ratio at the beginning of period t and the primary surplus to GDP ratio in period t, respectively, and g represents the growth rate of GDP, assumed to be constant for algebraic simplicity. Solving equation (2) forward and imposing the no-Ponzi-scheme condition yields the government inter-temporal budget constraint:

$$b_t = \left(\frac{1}{1+r}\right)\sum_{j=0}^{\infty}\left(\frac{1+g}{1+r}\right)^j p_{t+j} \tag{3}$$

Thus, essentially, for a government to satisfy its inter-temporal budget constraint it must run future primary surpluses of sufficient size in present value terms to pay off the initial stock of debt. This is required so that over the long run the government can meet all its obligations. Otherwise, at some point it will become clear that the government cannot meet all its obligations, which will prompt investors to refuse to buy its debt and thus force drastic changes to fiscal policy.

For any given structural primary fiscal balance, and given the outlook for growth and the impact of other expected exogenous changes such as demographic change and depletion of natural resources, a "passive" path for the primary surplus over an infinite horizon can be estimated. For most advanced countries the most substantial change expected is that due to population aging. Whereas this used to be a relatively abstract concern about a decade ago, signs of aging are now perceptible in several countries, adding renewed urgency to the need to address its likely impact on fiscal health. The EC has done substantial work on this in coordination with member countries, and as a result, estimates are available for all member countries on the likely impact of aging on public expenditure and taxation (EC 2009a and EC 2009b). On that basis the sustainability gap in stock terms (which is the total inter-temporal debt in present value terms) is then given by:

$$V_t = b_t - \left(\frac{1}{1+r}\right)\sum_{j=0}^{\infty}\left(\frac{1+g}{1+r}\right)^j p_{t+j} \tag{4}$$

And the sustainability gap in flow terms—hereafter simply called the sustainability gap—which is defined as the constant change to the primary balance in percent of GDP such that the sustainability gap in stock terms is zero is thus derived as:

$$S_t = (r-g)\left[b_t - \left(\frac{1}{1+r}\right)\sum_{j=0}^{\infty}\left(\frac{1+g}{1+r}\right)^j p_{t+j}\right] \tag{5}$$

As an operational matter, in using equation (5) to calculate the sustainability gap one has to also take into account the fact that in most years the output gap is not zero, so that the passive path for the primary balance over the medium term is influenced also by the closing of the output gap. For example, if—as is currently the case for most industrial countries—the output gap is negative, then even without measures one would expect the primary surplus to improve as the output gap closes, with the amount of improvement dependent on the sensitivity of the primary surplus to the output gap. We model this explicitly, using the following commonly used equation for estimating the structural primary balance:

$$p_t^* = p_t - \partial O_t \tag{6}$$

Where O_t, p_t^* and ∂ represent the output gap in percent of GDP in period t, the structural primary balance in percent of GDP in period t, and the elasticity of the primary balance with respect to the output gap, respectively. Substituting equation (6) into equation (5), we obtain:

$$S_t = (r-g)\left[b_t - \left(\frac{1}{1+r}\right)\sum_{j=0}^{\infty}\left(\frac{1+g}{1+r}\right)^j \left(p_{t+j}^* + \partial O_{t+j}\right)\right] \tag{7}$$

And we can then write:

$$S_t = S_t^* - \left[\left(\frac{\partial(r-g)}{1+r}\right)\sum_{j=0}^{\infty}\left(\frac{1+g}{1+r}\right)^j O_{t+j}\right] \tag{8}$$

where

$$S_t^* = (r-g)\left[b_t - \left(\frac{1}{1+r}\right)\sum_{j=0}^{\infty}\left(\frac{1+g}{1+r}\right)^j p_{t+j}^*\right] \tag{9}$$

Equations (8)-(9) thus separate the calculation of the sustainability gap into a part that captures structural changes in the fiscal stance and a part that captures the impact of the cycle.

Another issue that arises operationally is how to calculate the infinite sum in the formula. Here, a common assumption used is that at some point in the distant future a steady state is achieved, beyond which the primary balance in percent of GDP stays constant. This then means that the sum of terms from the point the steady state is achieved to infinity becomes

that of a geometric progression with a finite sum, and so we can calculate the sustainability gap over an infinite horizon.

Figure 1 presents a comparison of sustainability gaps for a selection of European countries as well as a breakdown of the key components of the calculations. Countries included are Germany, France, Italy, Ireland, the Netherlands, and the U.K. Year t is taken to be 2011. Estimates of the impact of aging pressures on budgets over the long run are taken from EC 2009a and EC 2009b, but the estimate of the initial structural primary balance and initial public debt are taken from IMF staff projections as of March 2011.[2] Of these countries, Italy has by far the smallest sustainability gap at 2½ percent of GDP, while on the other hand Ireland has the largest sustainability gap at 12¼ percent of GDP.

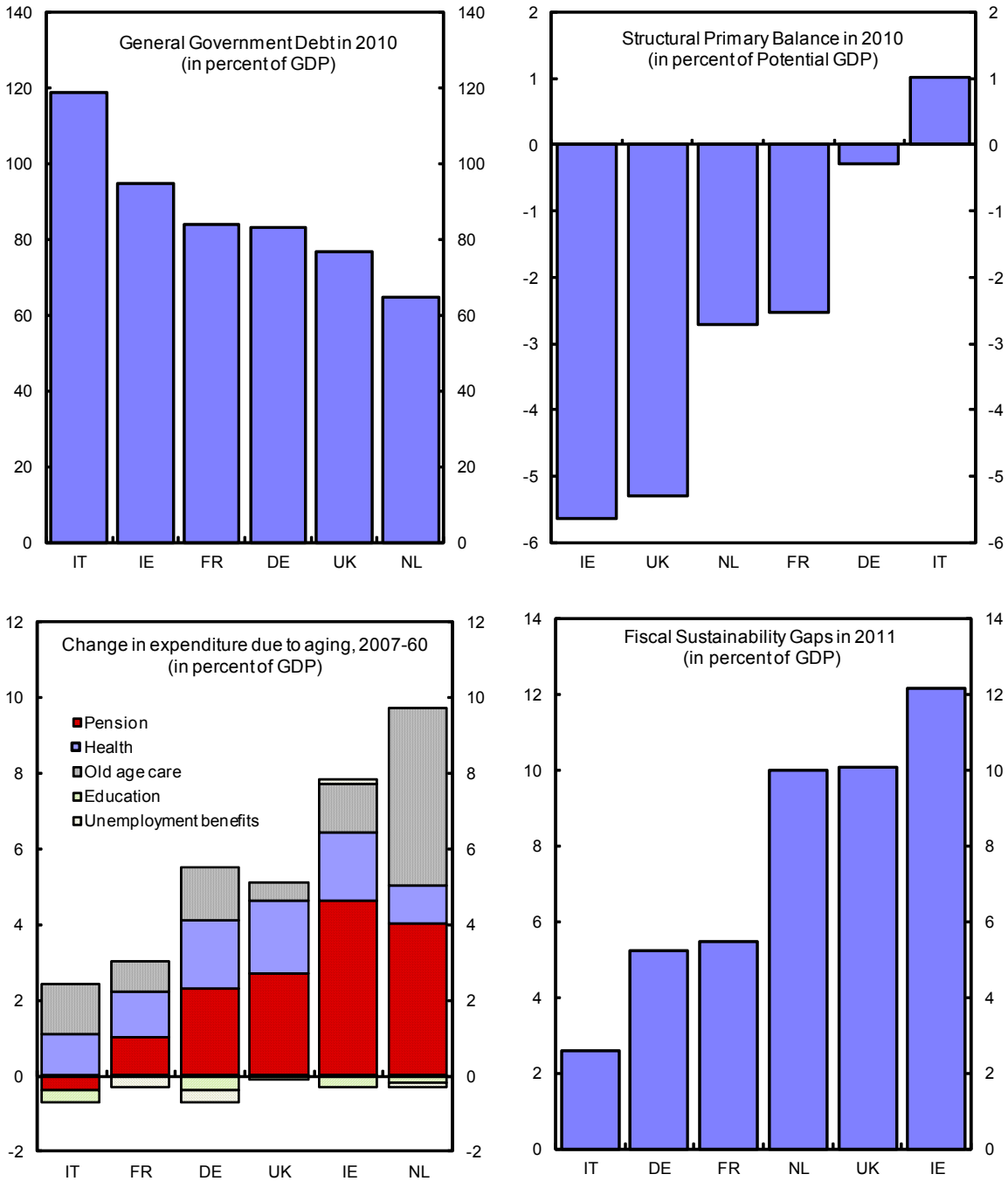
A look at the various indicators that go into the calculation of the sustainability gap reveals that if used alone they would each have given sharply different rankings of fiscal health. Thus, for example, on the basis of the public debt burden Italy is in the worst shape fiscally, yet it has the smallest sustainability gap because it is already running a structural primary surplus, and pension expenditures are actually expected to decline over the long run as the result of deep pension reforms enacted, keeping the overall impact of aging low. The U.K. has relatively moderate debt by advanced European country standards, but has a very large sustainability gap because of its very large structural primary deficit. Ireland overall, however, is consistently ranked at or near the bottom by all the indicators, with high debt, large structural primary deficits, and a substantial impact of aging expected on public expenditure.

Similarly, France and Germany have comparable levels of public debt, and their sustainability gaps are also similar, because although France has a much weaker structural primary balance than that of Germany, it also has lower expected impact of aging. The Netherlands has comparatively low debt, but its weak structural primary balance and the large expected impact of aging on public expenditure (which is most notable for old age care) yields one of the largest sustainability gaps. This then demonstrates that the most satisfactory way to compare fiscal health across countries is by use of sustainability gaps, which allow for the appropriate integration of all the relevant indicators in a coherent fashion.

It should be understood that long run projections, by their very nature, are prone to wide error margins. Indeed, for each country EC 2009a provides several alternative scenarios concerning the impact of aging on pensions, health, old age care education, and unemployment benefits which demonstrate this point. Therefore our estimates could be thought of as a baseline with a significant margin of error. Even the underlying population projections themselves are also prone to wide error margins. For example, in the case of

[2] It should be noted that significant reforms to pension systems are being envisaged in some European countries, which will reduce sustainability gaps once implemented.

Figure 1. Fiscal Indicators for Selected European Countries



Source: WEO, European Commission: Sustainability Report 2009, and Author's calculations.

Netherlands the demographic projections of Statistics Netherlands yield a significantly more favorable profile for the buildup of aging pressures than those used by the EC, with aging pressures peaking around 2040 and then declining thereafter, and it is estimated that this shaves off about one percent of GDP from the estimate of the sustainability gap.[3]

In all countries, substantial and sustained efforts will be required in order to achieve fiscal sustainability. This however will come at some cost, as fiscal tightening is well known to dampen economic activity. For example, recent research by the IMF (WEO, October 2010) reveals that there is very little evidence in the data to support the hypothesis of expansionary fiscal contractions, and that the fiscal multiplier for advanced European countries is around 0.5. Moreover, Christiano, Eichenbaum, and Rebelo (2010) suggest that the fiscal multiplier could be even higher under certain conditions such as interest rates at the zero lower bound.

In most cases, 2011 has been identified as the opportune time to commence the process of fiscal tightening, following the substantial fiscal stimulus packages implemented to stem further economic deterioration during the global crisis. However, different countries have announced different consolidation paths reflecting different country circumstances and preferences, and there is still a considerable debate in several countries as to the appropriate pace for fiscal consolidation, with the concern often voiced that overly rapid consolidation would undermine the nascent global recovery.

III. Modeling the Fiscal Consolidation Path

This paper contributes to this debate by constructing a model of the most advantageous pace of fiscal consolidation as follows: the authorities are assumed to care about both the sustainability and output gaps, and to prefer that both be zero. However, these objectives are conflicting, in that action to close the sustainability gap (fiscal tightening) dampens domestic demand and opens up a negative output gap, while on the other hand, action to close the output gap (fiscal loosening) increases the sustainability gap.[4] The pace of consolidation will therefore reflect the balancing of the government's twin objectives of reducing both the output and the fiscal sustainability gaps.

If we adjust the sustainability gap in equation (7) to take account of discretionary fiscal measures taken in time t, in addition to the "passive" evolution of the primary surplus, this yields:

[3] The estimated sustainability gap for Netherlands is significantly higher than that found in its 2011 IMF Article IV staff report, because the staff report calculates the gap as of 2012, giving full "credit" for the significant fiscal adjustment planned for 2011, and, also, this paper uses EC demographic projections which are less favorable than those from Statistics Netherlands which underpin the estimates in the staff report.

[4] For simplicity, we abstract from consideration of structural reforms (such as increasing the retirement age or measures to raise potential growth) which can improve fiscal sustainability with little effect on the output gap.

$$S_t = (r-g)\left[b_t - \left(\frac{1}{1+r}\right)\sum_{j=0}^{\infty}\left(\frac{1+g}{1+r}\right)^j \left(p^*_{t+j} + \partial O_{t+j}\right) - \left(\frac{1}{1+r}\right)\sum_{j=0}^{\infty}\left(\frac{1+g}{1+r}\right)^j f_t\right] \tag{10}$$

where f_t represents discretionary fiscal measures (in percent of GDP) taken in period t. Since discretionary measures taken in time t are expected to uniformly change the path for the primary balance over the entire horizon, the last expression in equation (10) is the sum of a geometric progression with a finite sum, and we can therefore express equation (10) as:

$$S_t = (r-g)\left[b_t - \left(\frac{1}{1+r}\right)\sum_{j=0}^{\infty}\left(\frac{1+g}{1+r}\right)^j \left(p^*_{t+j} + \partial O_{t+j}\right) - \left(\frac{1}{r-g}\right) f_t\right] \tag{11}$$

The output gap is assumed to evolve according to the following equation:

$$\mathrm{O}_t = \lambda \mathrm{O}_{t-1} - \xi\left(f_t - f_{t-1}\right) \tag{12}$$

Where λ and ξ represent an autoregressive parameter on the output gap which determines how long it would take for the output gap to be eliminated absent fiscal action, and the fiscal multiplier. Thus, λ reflects the impact of all non-fiscal factors that have an impact on the output gap, including spillovers from developments in the external environment, endogenous responses of monetary authorities to the state of the economy, confidence effects, and other factors that promote the self-repair of the economy.[5] Following any shock that produces a non-zero output gap, the output gap is assumed to close at a pace governed by λ unless fiscal policy changes delay or accelerate this process, with the impact of fiscal policy governed by the size of the fiscal multiplier.

Substituting equation (12) into equation (11), and bearing in mind that in calculating the sustainability gap in period t the only discretionary fiscal measures that are included are those that are implemented in period t, we have:

$$S_t = (r-g)\left[b_t - \left(\frac{1}{1+r}\right)\sum_{j=0}^{\infty}\left(\frac{1+g}{1+r}\right)^j p^*_{t+j} - \left(\frac{\partial}{1+r-\lambda(1+g)}\right)O_t - \left(\frac{1}{r-g}\right) f_t\right] \tag{13}$$

And some algebraic manipulations reveal that the sustainability gap evolves as follows:

[5] In principle, monetary authorities could apply sufficient stimulus to close output gaps very quickly. However, most monetary authorities have inflation control as the primary objective, which constrains their ability to aggressively apply stimulus under most scenarios because such stimulus often raises inflationary pressures.

$$S_t = \left(\frac{1+r}{1+g}\right)S_{t-1} + \left(\frac{\partial(r-g)}{1+g}\right)O_{t-1} - \left(1-\left(\frac{\partial\xi(r-g)}{1+r-\lambda(1+g)}\right)\right)(f_t - f_{t-1}) \tag{14}$$

We can simplify equation (14) further by noting that for plausible values of the parameters the coefficients of the second and third expressions are closely approximated by zero and -1, respectively, and doing so yields:[6]

$$S_t = \left(\frac{1+r}{1+g}\right)S_{t-1} - (f_t - f_{t-1}) \tag{15}$$

Equation (15) reveals that in the normal case where the discount rate exceeds the GDP growth rate, delaying actions to ensure sustainability is costly. The magnitude of the sustainability gap increases over time absent discretionary measures to close it, since the discount rate (which governs the pace of debt accumulation) exceeds the GDP growth rate (which governs the burden of debt relative to GDP). Moreover, the larger the gap between the discount rate and the GDP growth rate, the higher is cost of delaying adjustment. This then suggests that for countries in monetary union, where the discount rate can be expected to be similar across countries, slower growing countries have less room for maneuver in addressing fiscal sustainability issues than the faster growing countries.

Discretionary fiscal measures are assumed to have no effect on potential growth. In effect, discretionary measures only affect GDP growth temporarily, with corresponding changes to the output gap. The constant growth rate assumed in the derivation of the sustainability gap is best interpreted as the average of the annual growth rates that obtain over the infinite horizon. With the underlying potential growth path unchanged, temporary deviations of annual growth rates have a negligible impact on the average calculated over the infinite horizon. Moreover, since the output gap closes, temporarily low growth rates must be offset by temporarily higher growth rates, and vice versa. Therefore, notwithstanding some variation in growth rates, equation (15) would still give a close approximation to the evolution of the sustainability gap.

Thus, over an infinite horizon, the authorities' problem can be characterized as choosing a path for the fiscal stance that minimizes the following quadratic objective function.

$$\sum_{t=0}^{\infty} \beta^t \left(\alpha O_t^2 + \gamma S_t^2\right) \tag{16}$$

[6] This approximation of the coefficients of equation (14) is accurate to one decimal place, and the simplification enables us to derive analytical solutions for the optimal fiscal path below. As a check, equation (14) was also used directly in the optimization problem, and the coefficients obtained in the policy functions for the different countries from a numerical solution method closely matched those obtained algebraically using equation (15) even for values of ∂ as high as 1.

Where α, γ, and β represent the weight placed by the authorities on closing the output gap, the weight placed by the authorities on closing the sustainability gap, and the authorities' rate of time preference, respectively, with $\beta = 1/(1+r)$.

The quadratic objective function is intended to capture the fact that the authorities' "distress" increases in non-linear fashion as output or sustainability gaps increase. Thus, for example, as the (positive) sustainability gap rises problems related to investor confidence and market access to fiscal financing begin to escalate in non-linear fashion. On the other hand, an increasingly negative sustainability gap would also likely raise political headaches in non-linear fashion as the population is unlikely to accept unwarranted fiscal tightening. Rising negative output gaps also typically bring political and social headaches in non-linear fashion, while rising positive output gaps also tend to raise problems related to overheating and bubbles in non-linear fashion. Positive and negative output and sustainability gaps are treated symmetrically for analytical tractability.

The authorities' problem is to choose f_t to minimize the objective function (16) subject to equations (12) and (15). The first order condition for this optimization problem is given by:

$$\alpha\xi\left[\lambda O_{t-1} - \xi\left(f_t - f_{t-1}\right)\right] - \gamma\left[\left(\frac{1+r}{1+g}\right)S_{t-1} - \left(f_t - f_{t-1}\right)\right] + \beta\alpha\xi\left[\lambda O_t - \xi\left(f_{t+1} - f_t\right)\right] + \beta\gamma\left[\left(\frac{1+r}{1+g}\right)S_t - \left(f_{t+1} - f_t\right)\right] = 0 \tag{17}$$

Given the quadratic preferences and linear constraints, we know that the policy function is linear. We therefore guess that the fiscal consolidation pace is governed by the following equation:

$$f_t - f_{t-1} = A\mathrm{O}_{t-1} + BS_{t-1} \tag{18}$$

where $A > 0$ and $B > 0$. Substituting equation (18) into equation (17) and bearing in mind that the first order condition equals zero we are able (after some tedious algebraic manipulations) to derive two polynomial equations in A and B. Solving these simultaneously yields:[7]

$$A = \frac{\alpha\xi\lambda}{\left(\alpha\xi^2 + \gamma\right)} \tag{19}$$

[7] Strictly speaking, there are three solutions found, but only one where both A and B are positive.

$$B = \frac{\gamma(1+r)}{(\alpha\xi^2 + \gamma)(1+g)} \tag{20}$$

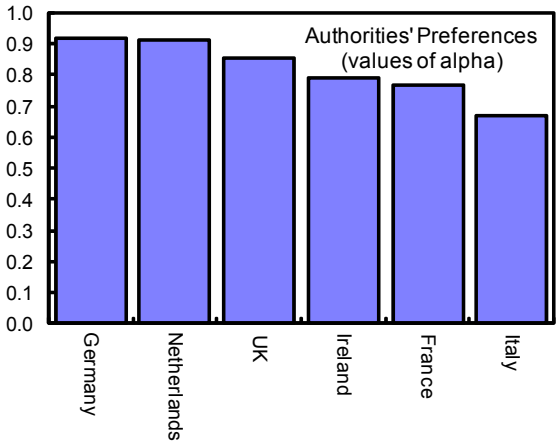
Thus, the chosen path for fiscal consolidation depends on the starting values for the output and sustainability gaps, the fiscal multiplier, the speed of correction of output gaps via non-fiscal means, the discount and GDP growth rates, and the authorities' preferences.

A. Calibration

Determining the adjustment path for each country requires a calibration exercise to provide estimates of the parameters in the policy function. The discount rate is taken from the EC Sustainability Report 2009, and is set at 5 percent for all countries. The GDP growth rate is calculated as the geometric average of annual growth rates, with IMF staff projections up to 2015 augmented by estimates from the EC Sustainability Report 2009 for later years. λ is calibrated to equal 0.5, implying that absent fiscal measures and all other things equal an output gap of 2 percent of GDP is eliminated after six years via spillovers, confidence effects, monetary policy reactions, and self-repair. The October 2010 WEO estimates a fiscal multiplier of 0.5 for advanced European countries, and that is what we use as the value for ξ.

Given these estimates, the parameters governing the authorities' preferences are pinned down by "revealed preference." We renormalize the policy function, without loss of generality, by assuming that $\gamma = 1 - \alpha$, where $0 \le \alpha \le 1$. On this basis, for each country the value of α is taken to be that which is consistent with the size of the announced change in the structural primary balance in 2011, given the initial values of the output and sustainability gaps. We focus on 2011 (rather than using the entire path of announced annual tightening over the medium term to pin down α) because all the countries have had to pay unusual attention to sustainability issues and the trade-off with output gaps in the aftermath of the global crisis and the general recognition that consolidation must commence in 2011. Moreover, measures for 2011 are fully fleshed out and passed by parliaments in the 2011 budgets. For subsequent years, plans are often less detailed and measures to support envisaged tightening may not be fully in place. So the approach used is to first derive α based on planned consolidation in 2011, and then check the realism of this calibration by comparing model predictions with announced annual tightening over the medium term.

The text chart presents the values of α derived in this manner. Bearing in mind that higher values of α indicate greater sensitivity to output gaps and thus lower fiscal hawkishness, in all countries the authorities place a significantly greater weight on closing the output gap than



closing the sustainability gap, and in fact only in the case of Italy do we see α even approaching the neighborhood of 0.5. The ordering of preferences is somewhat surprising at first glance, with Germany—with a reputation for sound fiscal policy—having the highest value for α, and Italy (with very high debt) the most hawkish. However, given the scale of Italy's debt and the associated risks to macroeconomic stability inherent in it, it is perhaps not a surprise that Italy be more sensitive to fiscal sustainability issues.[8]

IV. Application of the Model to Countries

In general, the predicted consolidation path includes some front-loading of adjustment, but also envisages that full elimination of the sustainability gap takes place over a long horizon. Quadratic preferences mean that the pressure to act to reduce any of the two gaps under consideration increases in nonlinear fashion with the size of that gap. Thus, if the sustainability gap is large enough relative to the output gap, the appropriate immediate fiscal tightening would be one that trades a substantial reduction in the sustainability gap for some increase in the output gap. Therefore (subject to the weights in the authorities' preferences) the larger the sustainability gap, the more the front-loading of adjustment. Also, country authorities have a very long horizon over which to consider and implement adjustment, and under quadratic preferences they would tend to select a path in which both the output and sustainability gaps trend toward zero, taking proper advantage of the non-fiscal factors that help close the output gap over time. This then pushes back the timing for full sustainability to be achieved.

Figure 2 presents announced and predicted fiscal adjustment paths for each country. In each year the announced tightening is calculated as the change to the structural primary balance in IMF staff projections as of March 2011, obtained by translating the authorities' announced measures into IMF staff projections of the medium term macro outlook.[9] One caveat is that for Italy measures have been announced for only 2011–12, with the structural primary balance remaining flat thereafter in the projection, so the comparison of optimal and announced paths is only valid for those two years. Similarly, for Ireland measures have not been fleshed out for 2015. In general, the predicted and announced paths are broadly consistent, which offers a degree of comfort that the model and calibrated parameters give a reasonable approximation of the real world.

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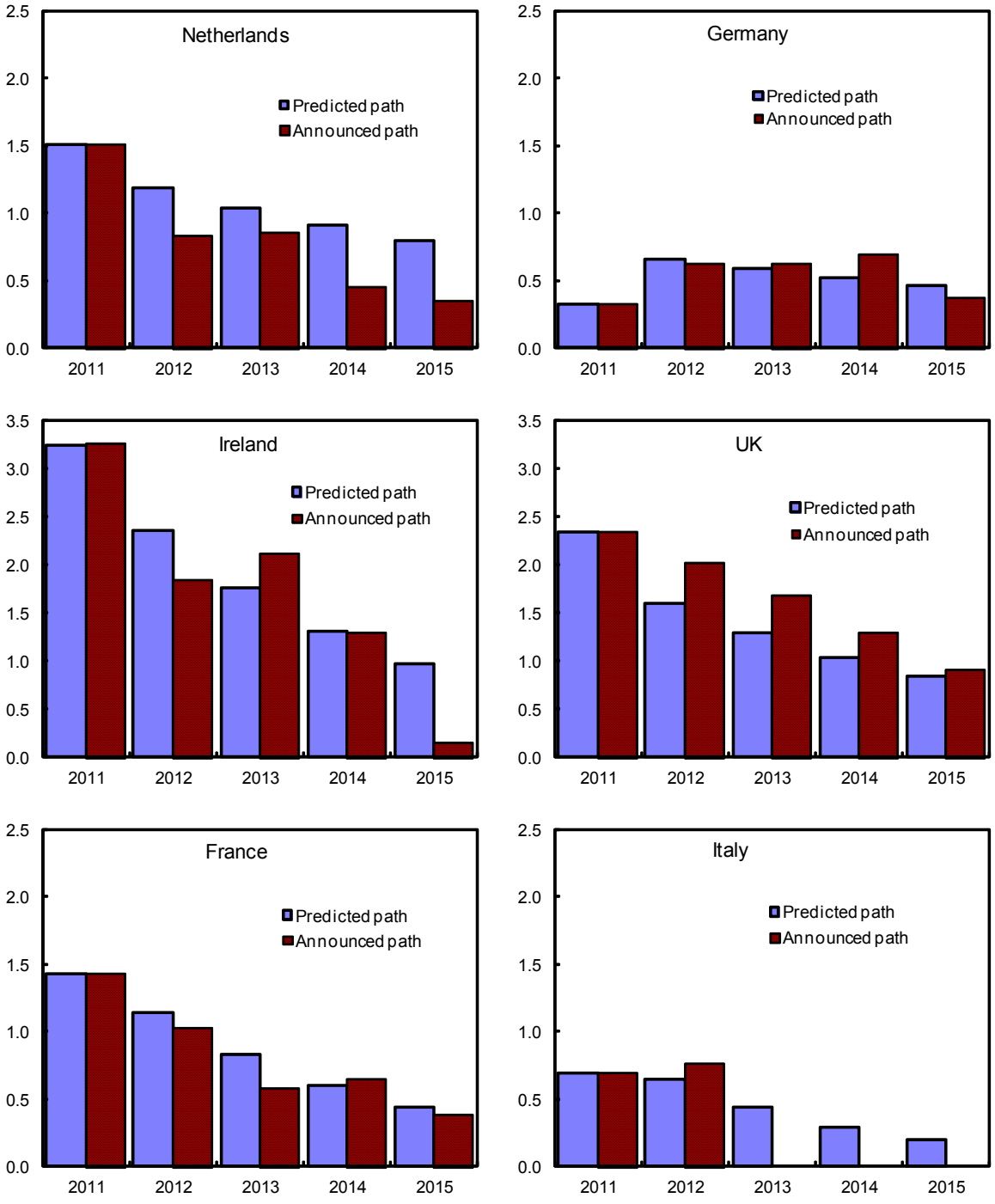
[8] For Germany, one issue that arises is that estimating the structural primary balance using the output gap (as in equation (6)) may bias downward our estimates of the annual structural fiscal adjustment, because labor market indicators showed significantly smaller economic slack than indicated by the size of the output gap. In that case, the value of alpha for Germany could be significantly smaller than estimated here. And for Ireland the 2011 budget also reflects discussions related to the Fund-supported program, which may affect the value of alpha.

[9] IMF staff projections are used for ease of comparability across countries. This could however introduce some bias to the results, as the projections are not exactly the same as the macro outlooks used by country authorities in arriving at their consolidation plans.

Figure 2. Comparison of Predicted and Announced Fiscal Consolidation, 2011-15
(in percent of GDP)



Source: WEO database, and author calculations.

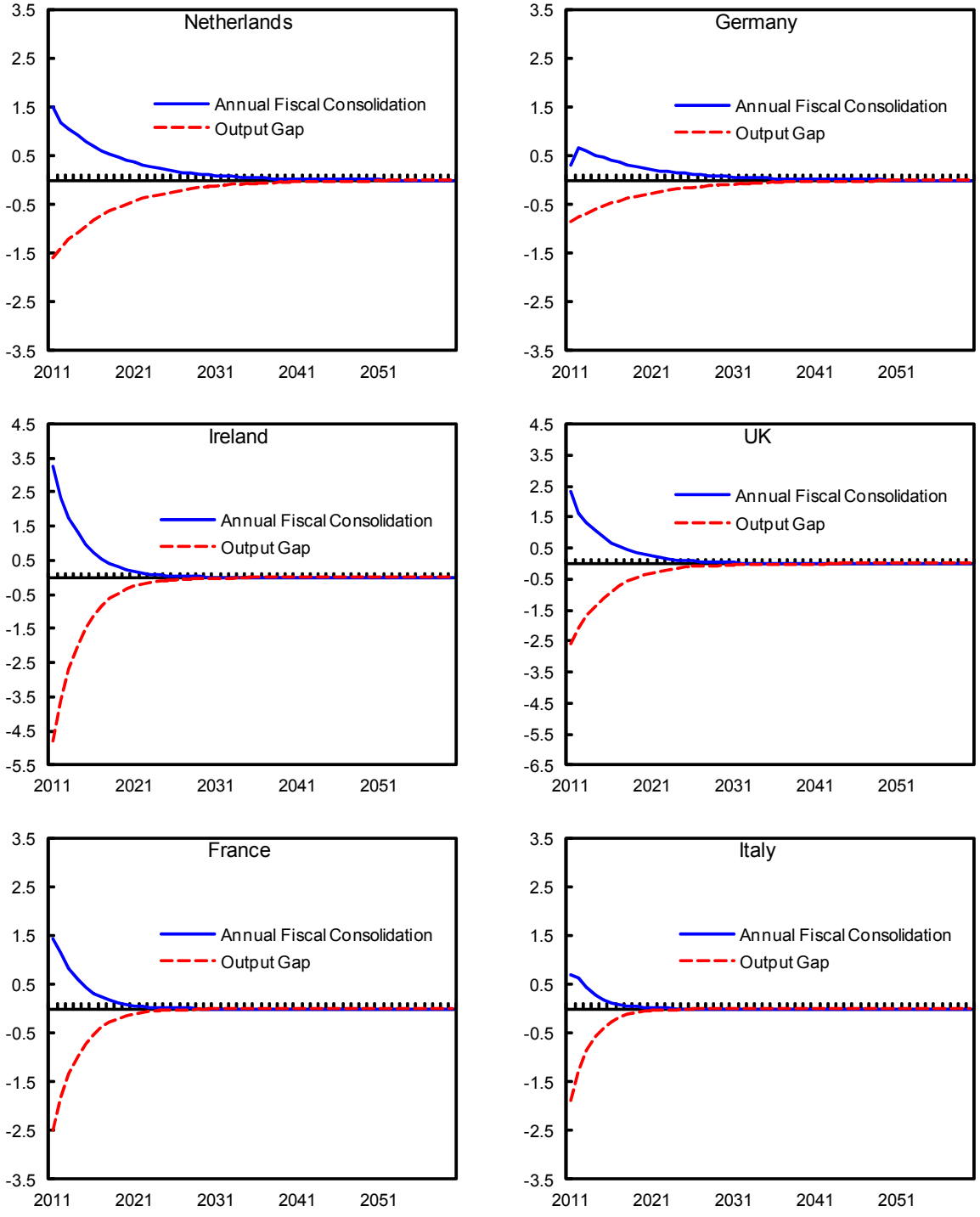
Deviations are modest, though for Netherlands there is a tendency for the announced consolidation to decline a bit faster than would be envisaged under the predicted path, while, on the other hand, for the U.K. there is a tendency for the announced consolidation path to be a bit more ambitious than would be envisaged under the predicted path. These deviations could reflect variations in the values of λ and the fiscal multiplier underpinning the decisions of different country authorities. For the Netherlands, the differences between predicted and announced path could reflect either a higher value of λ than the 0.5 used in our exercise—indicating a view that output gaps tend to be somewhat more persistent than our calibration suggests—or a concern that the fiscal multiplier may be larger than our calibrated value of 0.5. The opposite effect is observed for the U.K., and could indicate a view that the persistence of output gaps is somewhat less than what we have calibrated, since 0.5 is roughly the fiscal multiplier used in the UK budget. For the other countries there does not appear to be any systematic deviation between the predicted and announced paths, albeit that we only have two observations to compare for Italy.

Figure 3 presents the evolution of fiscal consolidation paths and the associated output gaps over 2011–60. As indicated above, in all cases there is front loading of adjustment, and also output gaps close smoothly over time, regardless of the starting point, which is to be expected given the authorities' preferences that are heavily weighted towards closing output rather than sustainability gaps.

Our model allows us to project how long it will take for the different countries to achieve fiscal sustainability, given the initial values for output and sustainability gaps, authorities' preferences, and the calibrated values of the other parameters of the model. Figure 4 presents those results, as well as the additional effort (above that indicated by the sustainability gap) required to achieve sustainability because of the delay in closing the sustainability gap. In general, as one would expect, the time period to eliminate the sustainability gap depends positively on the size of the sustainability gap, and negatively on the authorities' fiscal hawkishness. Thus, while Ireland has the highest sustainability gap it is projected to achieve sustainability after about 20 years, well ahead of Netherlands which comes to this point more than a decade later. The U.K. achieves sustainability slightly later than Ireland. And while Germany has a relatively modest sustainability gap, as a result of its preferences it achieves sustainability after a prolonged period—at about the same time as Netherlands. Italy and France are projected to have the shortest periods to achieve sustainability.

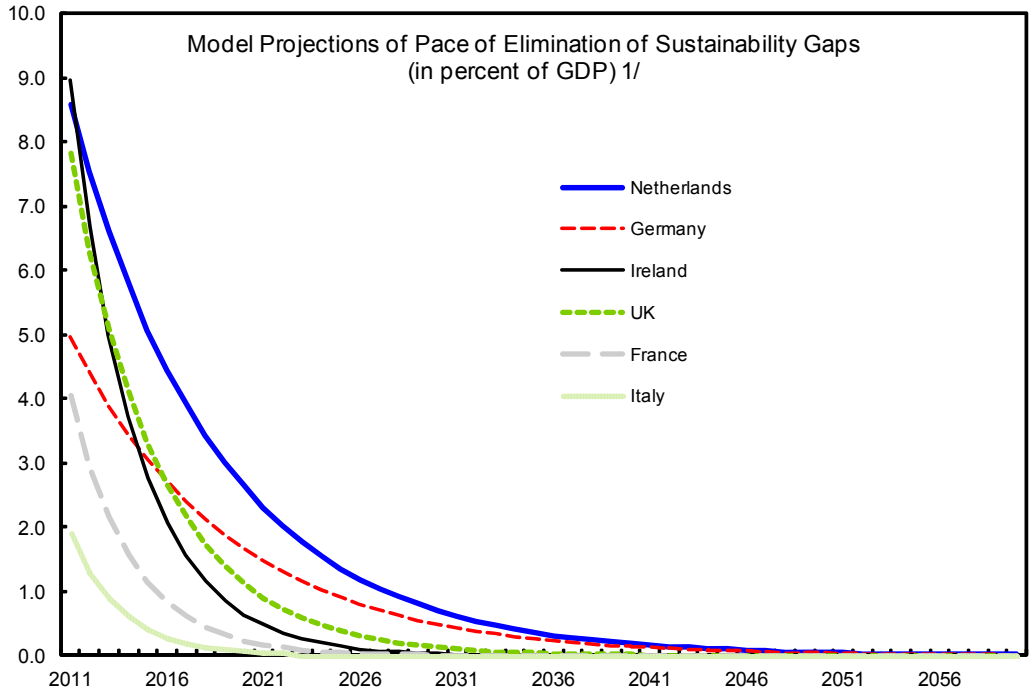
In general, Figure 4 indicates that the additional fiscal effort required due to the delay in achieving sustainability is quite moderate, particularly for the more hawkish countries, ranging from 0.1 percent of GDP for Italy to one percent of GDP for Netherlands. It is less than ½ percent of GDP for all countries but Germany (¾ percent of GDP) and Netherlands. These relatively modest costs of delay however also reflect the fact that the pace of consolidation is sufficiently aggressive to keep the sustainability gap on a strong declining path throughout. The cost of delay would be substantially higher if the delay were one where there is no adjustment effort at all for a number of years, followed by an attempt to catch up.

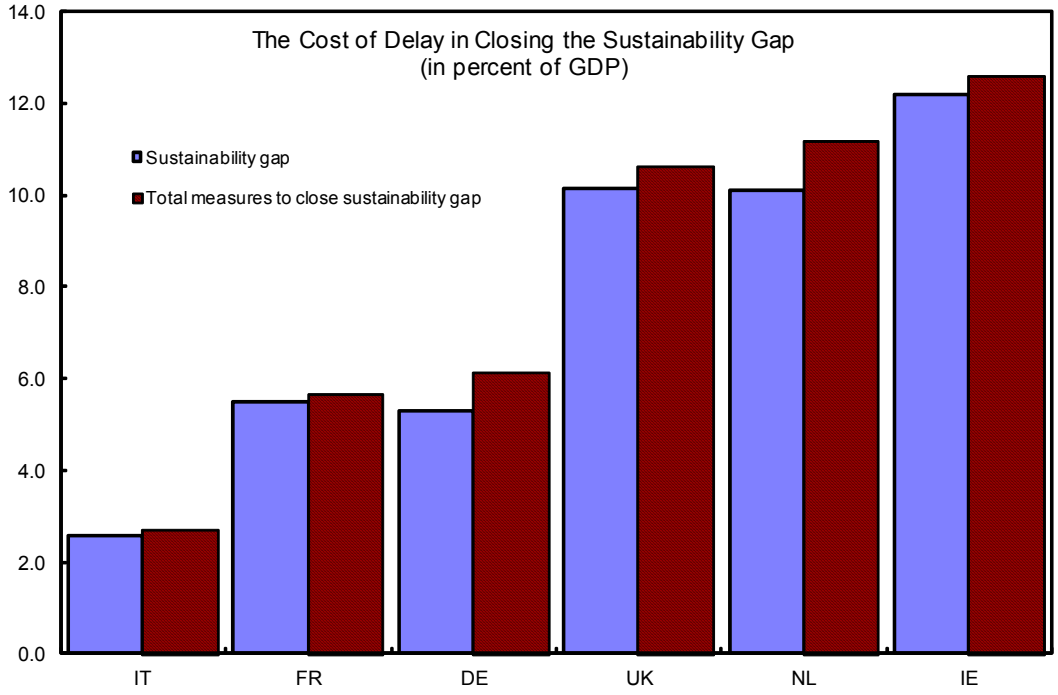
Figure 3. Predicted Fiscal Adjustment Paths and Associated Output Gaps, 2011-60
(in percent of GDP)



Source: Author's calculations.

Figure 4. Projected Paths for Closing Sustainability Gaps, and Costs of Delay





Source: Author's calculations.
1/ Projected path for the sustainability gap assuming the optimal fiscal adjustment is implemented in each year. The value of the sustainability gap for each year takes into account the measures taken in that year.

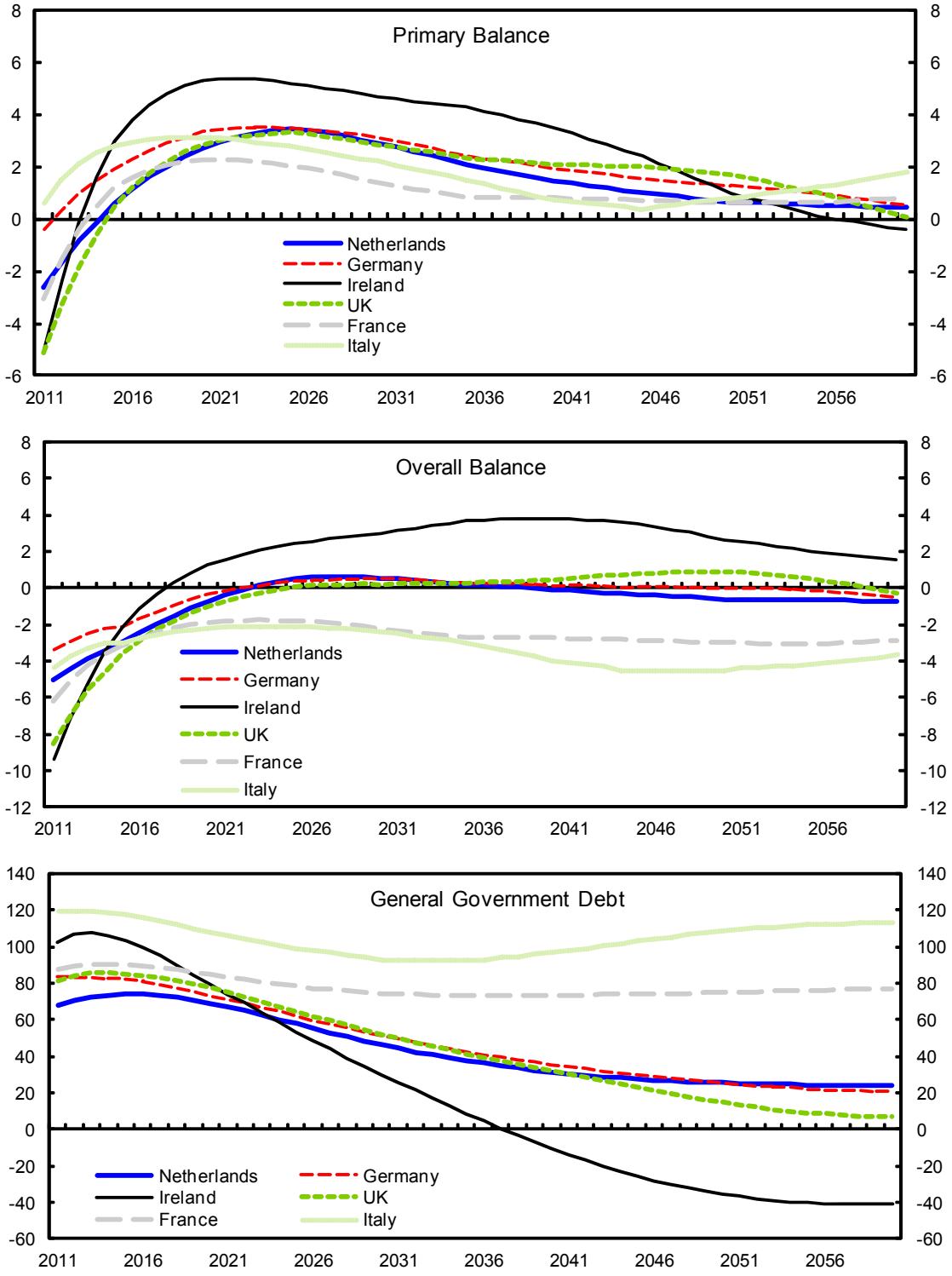
Finally, in view of ongoing discussions regarding the concern that the size of fiscal adjustment currently envisaged by some European authorities may be too large and could potentially undermine economic recovery, we do a sensitivity test to see how the predicted path might change if the fiscal multiplier turned out to be significantly larger than currently estimated. Indeed, the October 2010 WEO alludes to this by warning that with several European countries tightening fiscal policy simultaneously, spillover effects might significantly increase the size of the fiscal multiplier, increasing the negative impact on growth.

Figure 6 presents a comparison of announced fiscal consolidation with what the predicted path would be if the fiscal multiplier were increased from 0.5 to 0.75, all other things equal. The contrast between predicted and announced policy is stark in this case, particularly bearing in mind that when the fiscal multiplier in 0.5 the predicted and announced consolidation for 2011 are the same for each country. In all countries, the predicted adjustment for 2011 in particular is much smaller than currently envisaged, and for Germany a further fiscal loosening is actually indicated as the predicted policy.

This reflects the authorities' aversion to large output gaps, as evidenced by their preferences, as well as the fact that the larger fiscal multiplier affects the entire path of the output gap, with the size of this effect on the output gap largely determined by the size of the sustainability gap (which determines the scale of fiscal consolidation measures to be taken over time). Differentiating equations (18)-(20) with respect to the fiscal multiplier confirms that for the values of α observed in our country examples, raising the fiscal multiplier does indeed reduce the predicted amount of fiscal tightening in any given year. And the magnitude of this negative semi-elasticity depends heavily on the relative size of the initial sustainability gap in comparison with the initial output gap. Given the substantial response to the relatively modest increase in the fiscal multiplier used in this sensitivity exercise, it would appear that the concern about the size of adjustment in 2011 is warranted.

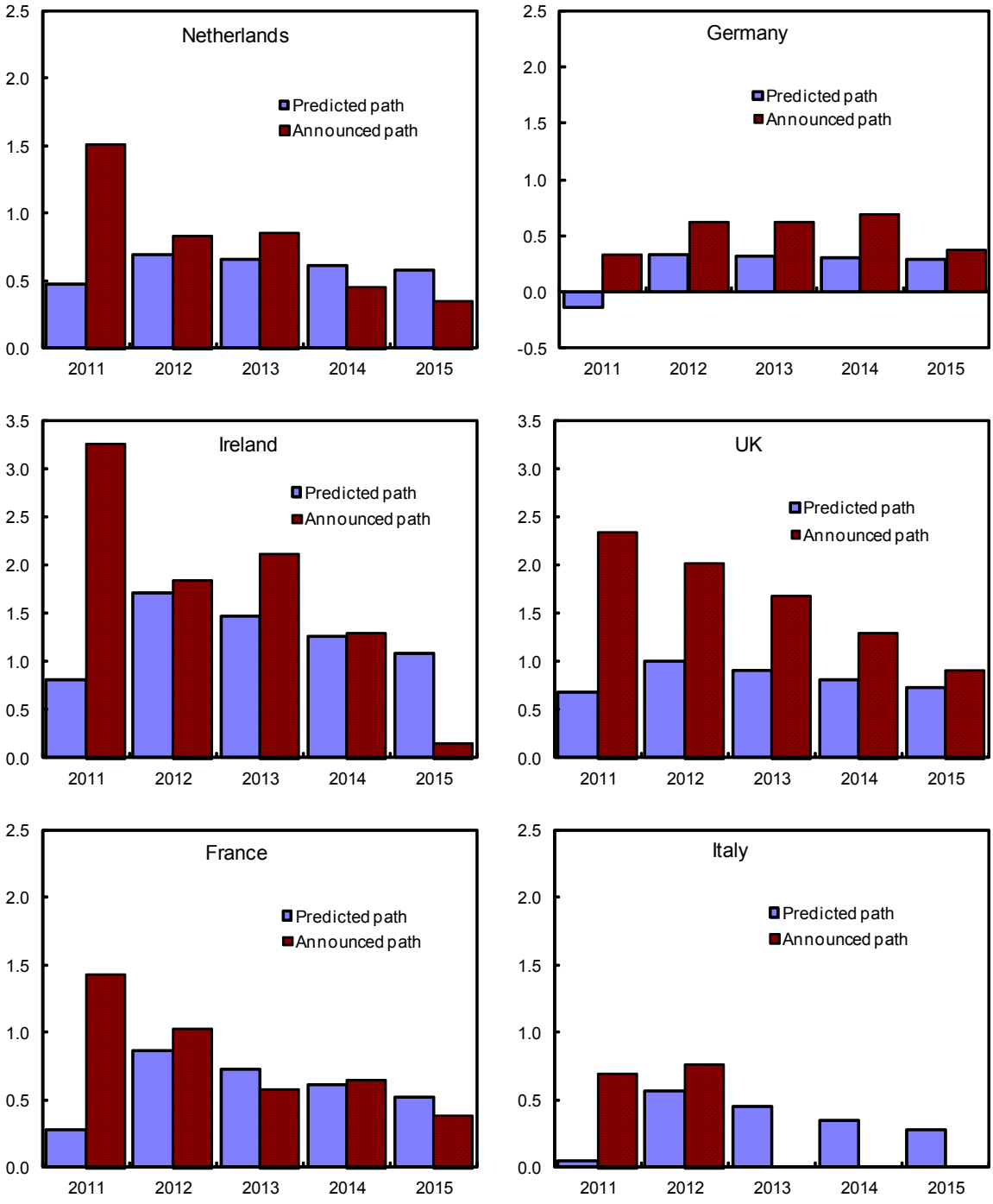
Figure 5 presents the associated primary and overall fiscal balances and public debt path given the consolidation paths in Figure 4. For all countries, there is strong initial improvement in the primary balance, which however is later partially offset as aging pressures kick in, leading to a gradual but sustained reduction in the primary balance. Interestingly, for Italy the primary balance starts to improve again after 2040 as the impact of pension reforms begins to bite strongly with the passing away of pensioners whose benefits were grandfathered during the reforms. This path, however, with the impact of pension reform back-loaded, has the consequence that Italian public debt does not decline much over 2011–60. Indeed as of 2060 Italian public debt is projected to be still well above 100 percent of GDP (but beyond that time horizon debt goes on a sustained declining trend as the benefits of the pension reform kick in). For other countries a sustained fall in public debt is projected over 2011–60, and in the case of Ireland debt even turns significantly negative, allowing for even a small primary deficit by 2060. For Ireland, however, given well known concerns with rising government bond yields, perhaps the ambitious path chosen also reflects a concern that the discount rate may prove higher than the 5 percent used in our calibration, and debt in that case would not decline as far as we have projected.

Figure 5. Projected Evolution of Fiscal Balances and Debt, 2011-60
(in percent of GDP)



Sources: WEO database, author's calculations.

Figure 6. Comparison of Predicted and Announced Fiscal Consolidation Assuming Fiscal Multiplier is 0.75, 2011-15, (in percent of GDP)



Source: WEO database, and author calculations.

V. Concluding Remarks

This paper presents a tractable inter-temporal model that helps us examine in detail issues related to country preferences and the pace of fiscal consolidation. The calibrated model is shown to give a reasonable approximation to announced fiscal tightening plans in a number of European countries, and the model provides useful insights into some of the key questions on the minds of policy makers as fiscal consolidation begins in earnest in many advanced countries.

In general, front-loading of adjustment is predicted by the model, but it is also the case that fully closing the sustainability gap takes place over a long horizon, with the focus appearing to be on making continuous progress in reducing the sustainability gap rather than on closing it in a limited time period. In all cases, authorities' preferences are heavily tilted in favor of closing output gaps rather than closing sustainability gaps, which also helps prolong the timing for elimination of sustainability gaps. The model also predicts that under current preferences, even modest increases in the fiscal multiplier would render current plans much too ambitious for the tastes of country authorities, and hence suggests that some reservations about the ambitious consolidation plans announced in a number of countries, particularly for 2011, may be warranted.

Of course, as with any long run projections, caveats apply, particularly with regard to the estimates of the sustainability gaps, which have wide error margins—and ironically this also argues for an approach based on a sustained credible reduction of the sustainability gap over a relatively long horizon, which allows for more clarity on the actual evolution of aging pressures, etc., over time.

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