FISCAL ANALYSIS IS DARNED HARD*

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1 INTRODUCTION

After decades of neglect, the global financial crisis and recession of 2008 have brought fiscal policy analysis to the forefront of researchers' and policymakers' minds. The reasons are several-fold. First, the crisis rapidly drove monetary policy interest rates down close to their lower bound, which led central banks to undertake large-scale asset purchases as a means to further stimulate economies. Some aspects of those purchases bore striking resemblances to fiscal actions. And with central banks out of interest-rate ammunition, fiscal authorities felt more pressure to adopt stimulative policies. Second, many countries that did adopt large fiscal expansions, within only a few years, reversed course to implement equally large fiscal consolidations. Third, beginning in 2010 and extending to present day, several European countries developed severe sovereign debt troubles whose consequences were felt throughout Europe.

These dramatic fiscal developments led researchers and policymakers alike to realize how little we know about the macroeconomic effects of fiscal actions, a realization that is producing large and growing literatures on nearly every aspect of fiscal policy. Euro Area countries, which have been most buffeted by go-and-stop fiscal policies and sovereign debt crises, have been at the vanguard of reforming fiscal institutions in the hope of delivering better analysis and policy decisions.

Each country in the European Union must now create a fiscal council with a mandate to serve as an independent assessor of fiscal developments. Councils also must have a public voice with which to speak out on public finances. While fiscal councils can, and have, elevated public discourse on fiscal policy, they are a complement to, but not a substitute for, fresh analytical and empirical work designed to provide inputs to policymaking.

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1.1 SEVEN REASONS This essay argues that fiscal analysis is intrinsically hard—darned hard—for a variety of reasons.[1] Many of these reasons either do not apply to or are glossed over by monetary policy analyses to make fiscal analysis *harder* than conventional monetary analysis.[2] To be concrete, I offer seven reasons:

1. Fiscal policy generates confounding dynamics so that fiscal actions affect the economy at both business-cycle and much lower frequencies. Most central banks maintain—in both their communications and their formal models—that the Phillips curve is vertical in the long run, so that a type of long-run neutrality obtains. In new Keynesian models, for example, the natural rates of output and employment are independent of monetary policy shocks and monetary policy's choice of rule. This permits monetary analysis to focus on "short" horizons of a few years and on small fluctuations around a steady state that is invariant to monetary policy. Changes in tax rates and government infrastructure and human capital investments can have permanent impacts. Even fiscal-financing decisions can have very long-lasting effects [for example, Leeper, Plante, and Traum (2010), Uhlig (2010), or Leeper, Traum, and Walker (2015)]. When fiscal actions operate at all frequencies, it can be difficult to disentangle their effects in time series data.

2. Heterogeneity plays a central role in transmitting fiscal changes. Heterogeneity comes in several guises. Economies are populated by many kinds of agents who react differently to fiscal policy changes. Policy instruments themselves are heterogeneous, with many types of government expenditures and taxes. Each instrument is likely to trigger different macroeconomic dynamics, raising the question of what thought experiment underlies statements about the effects of "increasing taxes" or "cutting spending."

3. It is well understood that fiscal impacts depend on the prevailing monetary-fiscal policy regime and on expectations about future regimes. This argues that fiscal analyses must integrate monetary policy and think through the consequences of beliefs about alternative future policy regimes.[3] It also argues that fiscal analysis that abstracts from monetary policy behavior can yield misleading interpretations and predictions.

4. Fiscal variables are strongly endogenous. Endogeneity arises from "automatic stabilizers" built into tax codes and spending programs, but also from macroeconomic stabilization

[1] To limit the scope of the essay, I focus primarily on the *macroeconomic* implications of aggregate fiscal choices.

[2] To be clear, "harder" in my context means that some of the simplifying assumptions that render monetary policy analyses tractable cannot plausibly be maintained when studying fiscal policy. Faust (2005) formalizes the concept of "hard" and applies it to monetary policy.

[3] In the euro zone, one might argue that European Central Bank decisions are exogenous with respect to a given country's fiscal choices, which permits some degree of simplification. But reflecting on the ECB's role in the sovereign debt crisis and its large-scale asset purchases, this argument carries some important caveats.

efforts—which create countercyclicality—and political economy considerations—which create procyclicality. With endogenity comes identification problems that have not been satisfactorily resolved in the empirical literature.

5. Fiscal actions carry with them inside lags, between when a new policy is initially proposed and when it is passed, and outside lags, between when the legislation is signed into law and when it is implemented.[4] That institutional structure informs the nature of fiscal information flows. When agents react to fiscal news before the news appears in fiscal variables, conventional econometric methods will deliver misleading inferences. The key to solving this problem lies in nailing down agents' information sets [see Leeper, Walker, and Yang (2013)]. Forward guidance of monetary policy can create similar issues, but the problems are less severe because in this respect monetary signals, whose information flows are not institutionally enforced, are noisier than fiscal signals.[5]

6. Supranational policy institutions influence fiscal decisions in many countries. Because those institutions often have significant leverage, their influence is out-sized and frequently decisive. As we witnessed in the wake of the 2008 recession, the International Monetary Fund's fiscal advice fluctuated from year to year. And many countries adopted fiscal policies that also fluctuated. It is less common for these institutions to apply pressure on central banks.

7. Fiscal choices are inherently political because they have direct distributional consequences and are taken by elected legislative bodies. Analyses that abstract from political economy considerations, perhaps by solving the conventional Ramsey problem for optimal policy, are likely to have difficulty matching observed behavior. They also tend to offer policy advice that is politically difficult to follow. Monetary policy has been more insulated from political pressures with the institution of independent central banks endowed with specific—and generally narrow—objectives. No analogous narrowing of fiscal objectives appears to be on the horizon.

These factors conspire to make fiscal analysis darned hard. And analyses that do not confront that hardness are often of little help in reaching sound fiscal decisions.

I draw on the experiences of many countries to illustrate the difficulties of fiscal analysis. The experiences include actual analyses, actual fiscal outcomes, and actual fiscal policy advice. I'll then sketch a broad analytical framework within which to study fiscal issues and cite examples within that framework that have borne fruit.

[4] I modify the language in Friedman (1948).

[5] Rondina and Walker's (2014) heterogeneous beliefs, when applied to agents' expectations of fiscal actions, introduce an additional source of confounding dynamics.

This chapter's critiques have a constructive goal. By pointing out the shortcomings of existing fiscal analyses, the chapter aims to provoke researchers to improve upon these methods to create more useful frameworks for fiscal policy analysis.

2 SEVEN ILLUSTRATIONS

This section is intentionally provocative. It uses examples torn from the economic headlines that suggest a need to develop approaches to fiscal analysis that can provide more informative inputs to policymakers—inputs that shed light on the tradeoffs that decision makers face.

2.1 LONG-TERM GOVERNMENT DEBT PROJECTIONS

Fiscal sustainability studies tend to be more akin to accounting exercises than to economic analyses. It is not a caricature to describe the exercises as following these steps: (1) establish the current state of government indebtedness; (2) arrive at a view about what current tax and spending policies—or past policies—imply about how fiscal deficits depend on the state of the economy; (3) posit paths for economic variables on which deficits depend—output growth, unemployment, interest rates, inflation, and so forth; (4) use a fiscal accounting identity to recursively derive the path for government debt given the information contained in steps (1) to (3).

Because this procedure takes the path of the economy as evolving independently of any fiscal developments, it is commonplace for projections to show an exploding path for debt-GDP, while the rest of the economy evolves benignly. Figure 1 is a typical example. The top panel plots actual U.S. debt as a percent of GDP, along with the Congressional Budget Office's long-term projections in its 2010 and 2015 projections. In 2010 (dashed line) the CBO ran projections out to 2083, with the ratio reaching over 900 percent at the end of the projection period; by 2015 (dashed-dotted line) the CBO truncated its projection in 2054, noting that beyond that year the ratio exceeds 250 percent.

Figure 1's bottom panel graphs the paths that the 2010 projection assumes for the unemployment rate, real interest rate, GDP growth rate, and inflation rate. After recovering from the 2008 recession, these series settle in at 4.8 percent, 3.0 percent, 2.2 percent, and 2.0 percent. But CBO's narrative belies the benign assumed paths for the macroeconomic variables. A small sampling from Congressional Budget Office (2015, p. 4): "At some point, investors would begin to doubt the government's willingness or ability to meet its debt obligations, requiring it to pay much higher interest costs to continue borrowing money"; "The large amounts of federal borrowing would drain money away from private investment.... The result would be a smaller stock of capital, and therefore lower output and income..."; "The large amount of debt would restrict policymakers' ability to use tax and spending policies to respond to unexpected challenges, such as economic downturns or financial crises."

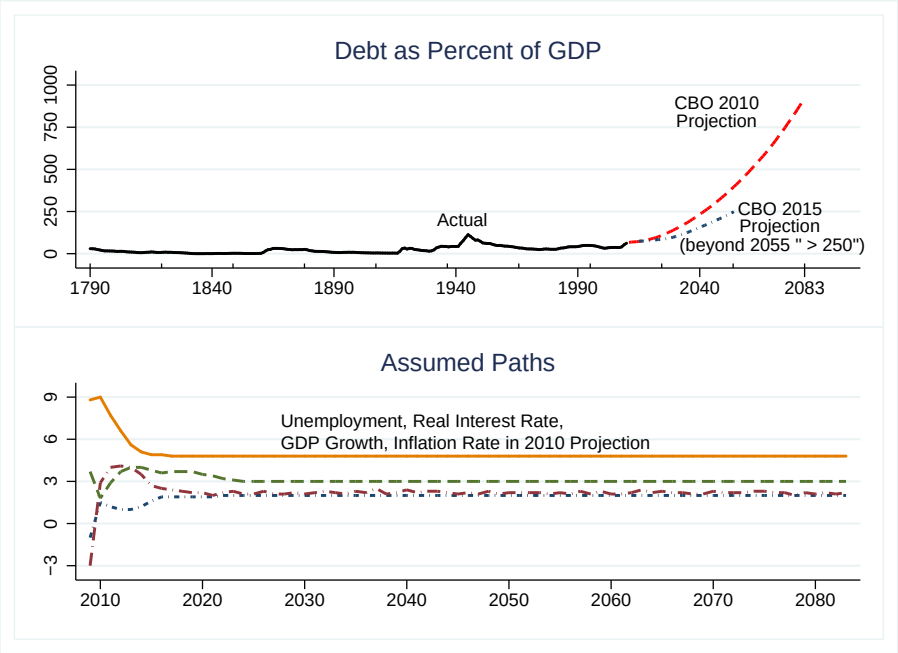

Figure 1: U.S. Congressional Budget Office projections in 2010 and 2015 of debt-GDP ratio (top panel) in percent and underlying assumptions (bottom panel) about the paths of unemployment rate (solid line), real interest rate (dashed line), real GDP growth rate (dashed-dotted line), and consumer price inflation rate (short dashed-dotted line) in annual percent. Source: Congressional Budget Office (2010, 2015).

Because none of these outcomes are depicted in the CBO's reported projections, policymakers are left to conjecture about the economic mechanisms that underlie the dire macroeconomic predictions and speculate about the tradeoffs that those mechanisms create. In a phrase, policymakers need *economic analysis*, rather than accounting exercises.[6]

Conventional long-term fiscal projections violate Stein's (1989, p. 1) law: "If something cannot go on forever, it will stop." Simply acknowledging that law points us in the right direction. It forces us to ask what might happen once the unsustainable policies stop. Of course, no one *knows* what future policies will be adopted, but we *do know* that current policies will not persist. We can also deduce, within the context of a formal economic model, the class of future policies that are

[6]Long-term fiscal projections like those in figure 1 are not unusual. The Bank for International Settlements, for example, conducted a similar analysis for a range of advanced economies, reporting very similar figures [Cecchetti, Mohanty, and Zampolli (2010)]. Although the CBO has regularly performed analyses that include the budgetary feedback of macroeconomic effects, that analysis has not featured in baseline projections like those in figure 1. With the passage of the concurrent resolution on the budget for fiscal year 2016, the CBO is required "…to the greatest extent practicable, to incorporate the budgetary impacts of macroeconomic effects into its 10-year cost estimates for 'major' legislation…[Congressional Budget Office (2016)."

Remarkably, this "dynamic scoring" requirement has been extremely controversial because it needs the analyst to specify a complete macroeconomic model, which necessarily carries with it many assumptions about economic behavior. This argument is specious: static scoring also carries many (usually implicit) assumptions, most of which are utterly implausible [see Leeper and Yang (2008)].

sustainable. With additional work, we might be able to whittle the sustainable policies down to a set of policies that, if economic agents today believed they would be implemented, are consistent with the equilibrium we now observe. Policymakers could then assess how alternative future resolutions to the long-run fiscal stress that figure 1 reflects would feed back to the present to pose decision makers with tradeoffs.[7]

Some readers may object that the research program I propose requires modelers to ponder the imponderables about alternative future policies. This is true. But any dynamic economic analysis requires analogous assumptions about the future. The CBO's projections take a stand both on future policies—they will be whatever current policies are—and on future transmission of fiscal choices to private behavior—there is none. There is no way to avoid making bold assumptions in long-run analyses. It makes sense to examine a broad range of plausible alternative policies.

2.2 LATVIA'S FISCAL CONSOLIDATION

In the recent financial crisis, Latvia became the symbol either of "successful crisis resolution" [Ålund (2015)] or of a "Depression-level slump" [Krugman (2013b)]. That observers can come to such diametric conclusions underscores a difficulty of fiscal analysis.

During the financial crisis, all three Baltic countries opted for internal, rather than external devaluation, but only Latvia implemented severe cuts in government spending. Between 2008 and 2010, Latvian government consumption fell by 20 percent in real terms and by almost a third in nominal terms [Di Comite, Giudice, Lendvai, and Toming (2012)]. As Prime Minister Dombrovskis later commented to Bloomberg: "It's important to do the [fiscal] adjustment, if you see that adjustment is needed, to do it quickly, to frontload it and do the bulk already during the crisis" [McLaughlin (2012)]. This argument is buttressed by political economy reasoning: "Hardship is best concentrated to a short period, when people are ready to sacrifice" [(Åslund and Dombrovskis, 2011, p. 3)]. But another rationale often invoked is credibility: because it is difficult for fiscal policy to pre-commit, credible policy requires rapid implementation, rather than gradual phase-in.

Latvian government consumption expenditures grew relatively rapidly during the boom years before the crisis [figure 2]. Despite that growth, government debt had fallen to 10 percent of GDP by 2008 (top panel), well within the Maastricht treaty limit for admission to the Euro Area.[8] But, as it did in most countries, the recession brought with it rapidly growing debt, particularly as a share of declining GDP. Without getting into the timeline of events, prodded by IMF demands for deficit reduction, in December 2008 the Latvian government undertook substantial fiscal reforms: real public spending was cut by 25 percent; public wages were reduced by 25 percent in nominal terms; local governments were compelled to implement similar wage cuts; value-added taxes

[7] Examples of research that takes a step in this direction is Davig, Leeper, and Walker (2010, 2011) and Richter (2015).

[8] The Euro Area Council approved Latvia's admission on 9 July 2013.

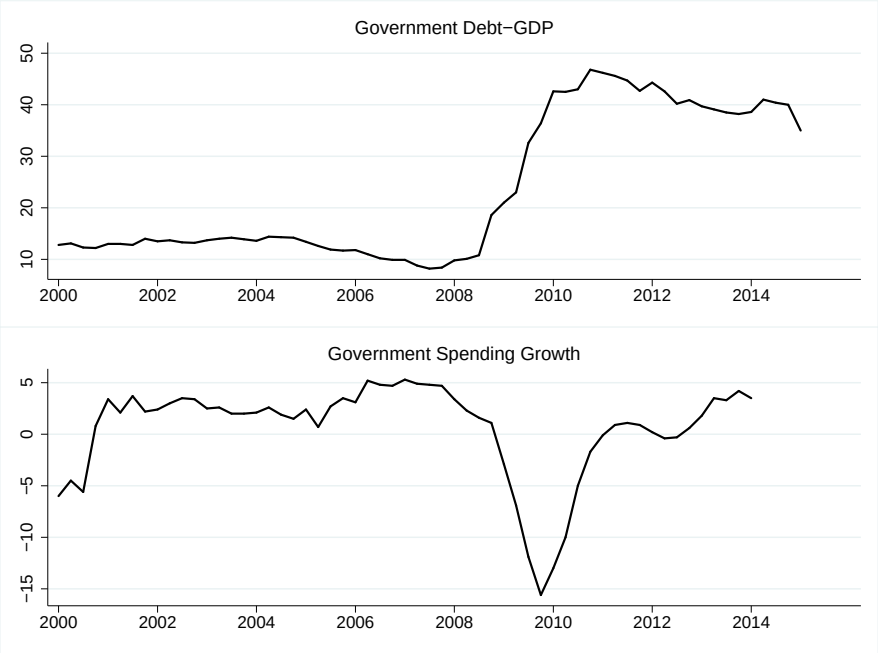

Figure 2: Latvian central government consolidated gross debt as a percent of GDP (top panel); percentage change in final consumption expenditures of general government (bottom panel). Source: Central Statistical Bureau of Latvia.

were increased from 18 to 21 percent. Left untouched were pensions, though they were frozen in nominal terms at 2009 levels, and the flat income tax and low corporate profit tax rates were maintained.[9]

The outcomes for the real economy are striking. Figure 3 reports the levels of real GDP for the three Baltic countries, along with a 19-country Euro Area aggregate and the United States for comparison. The economic downturn was evidently far more severe and prolonged in Latvia than in the other areas. As of the second quarter of 2015, Latvian real GDP remained five percent below its 2007 level, while in the Euro Area and Estonia the level has recovered; Lithuania is almost six percent higher and the United States is nearly 10 percent above 2007 levels.

My purpose is not to assess whether Latvia adopted "good" or "bad" policies; there is plenty of debate about that already.[10] Instead, I want to highlight two key aspects of the arguments in favor of severe fiscal consolidation. First is the claim that frontloading is essential. Conventional optimal policy would call for smooth and gradual adjustment of government expenditures, just as it calls for gradual adjustment of tax rates. Of course, optimal policy prescriptions usually do not

[9]Excellent accounts of the timeline of events and other details appear in Åslund and Dombrovskis (2011), Di Comite, Giudice, Lendvai, and Toming (2012), and Blanchard, Griffiths, and Gruss (2013).

[10]An assessment of policies seems to hinge on immeasurables, like Latvia's potential output, as well as on seemingly innocuous assumptions, such as the choice of base year for the real GDP index in figure 3. See Blanchard, Griffiths, and Gruss (2013) and the discussions of that paper by Forbes (2013) and Krugman (2013a).

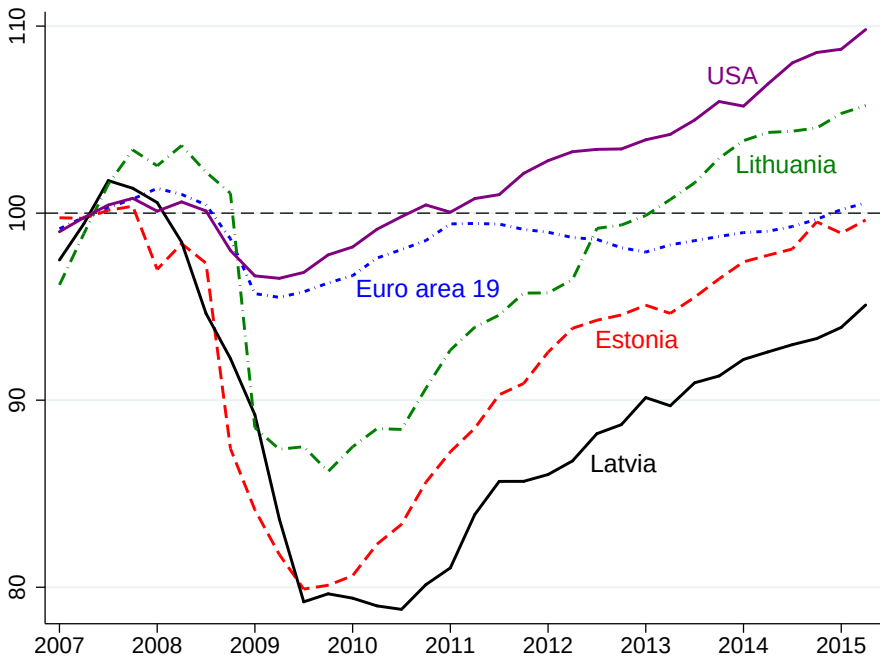

Figure 3: Real GDP index, 2007=100, chain-linked reference year 2010. Source: Eurostat and U.S. Bureau of Economic Analysis.

incorporate the typically short-lived nature of governments, particularly in parliamentary systems. It would be instructive to learn what kinds of political dynamics imply that frontloading fiscal adjustment is optimal.

Second is the closely related and oft-touted assertion that fiscal authorities cannot pre-commit, so reform-minded governments have little choice but to take drastic actions over short horizons. I think this assertion overstates the pre-commitment problem, which can lead policymakers to treat frontloading as a *fait accompli*. Many features of conventional fiscal policy entail substantial pre-commitment: the structure of the tax code is typically given until it is changed, social safety-net programs may be indexed to inflation, pension systems—particularly defined benefit programs—commit to payouts, and multi-year infrastructure spending projects commit to expenditure flows, to mention just a few. Each of these *requires an explicit legislative action* to undo, so the default is to maintain the previous commitment. These are all elements of the social contract between the "government"—writ large—and the "people," a contract that transcends the particular group of individuals currently in power.

Monetary policy also faces a pre-commitment problem, as Kydland and Prescott (1977) and Barro and Gordon (1983) have neatly shown. Central banks could mimic fiscal authorities and respond to this problem by, for example, raising or lowering the policy interest rate by 500 basis points at a time, on the grounds that future monetary policy committees might opt not to follow through. Of course, central banks don't do this because drastic swings in interest rates are

rarely optimal. Instead, we have created institutional conditions—central bank independence—and constraints—clearly articulated objectives and accountability—designed to deliver consistent monetary policies.

Fiscal rules to which policymakers are held accountable could go a long way toward alleviating time-inconsistency problems. And fiscal policy councils have arisen to hold policymakers' feet to the fire when they seem inclined to go astray. But we could also imagine more fundamental institutional reforms that might be more effective, such as placing some aggregate aspects of fiscal choices in the hands of technocrats, rather than elected officials, as Leeper (2011) suggests.

2.3 LOW INFLATION IN SWEDEN AND SWITZERLAND

There is a tendency, among both academics and policymakers, to treat monetary policy in isolation from fiscal policy. This tendency led a number of countries to adopt inflation targets for monetary policy without imposing compatible restrictions on fiscal behavior. Few inflation targeting countries have asked, even *ex post*, whether their fiscal policy behavior is consistent with their adopted inflation target.

In recent years two prominent inflation targeters—Sweden and Switzerland—have had a hard time getting their inflation rates *up* to their targets. Sweden aims to keep inflation around two percent, while Switzerland shoots for two percent or less. Figure 4 reports that since the financial crisis, both countries have experienced persistently below-target rates of consumer price inflation (top panel).[11] By the end of 2015, the two central banks had aggressively pursued monetary stimulus through interest-rate policy: Sveriges Riksbank set its repo rate at -0.35 percent and the Swiss National Bank set a range for its three-month libor rate at between -1.25 and -0.25 percent.

But these countries stand out in another way as well: in the wake of the global recession, when most countries saw government debt as a share of the economy rise sharply, Swedish and Swiss fiscal policies engineered either flat or declining debt-GDP ratios. This pattern of debt is still more surprising because in 2009 real GDP fell by 5.3 percent in Sweden and 2.3 percent in Switzerland [OECD data].

Governments in the two countries will argue that they were simply following their fiscal rules—a surplus target in terms of net lending in Sweden and a debt break in Switzerland.[12] Viewed through that narrow prism, presumably fiscal policies have been successful. But that prism does not refract the light that emanates from the central bank's inflation target. Questions that aren't being asked by policymakers in the two countries include: Can the two central banks even achieve their inflation targets in the face of these fiscal rules? Is there any causal connection between the

[11] The figure reports annual CPI inflation rates for all items, not core inflation, because both countries couch their inflation targets in terms of broad inflation. Swedish inflation is particularly sensitive to interest-rate movements that transmit directly into this measure of inflation and both countries' rates vary with energy prices.

[12] In principle, rules of this sort ensure fiscal sustainability and free fiscal policy to pursue other objectives, at least in the short term. In practice, the rules effectively take fiscal policy off the table as a factor in macroeconomic stabilization.

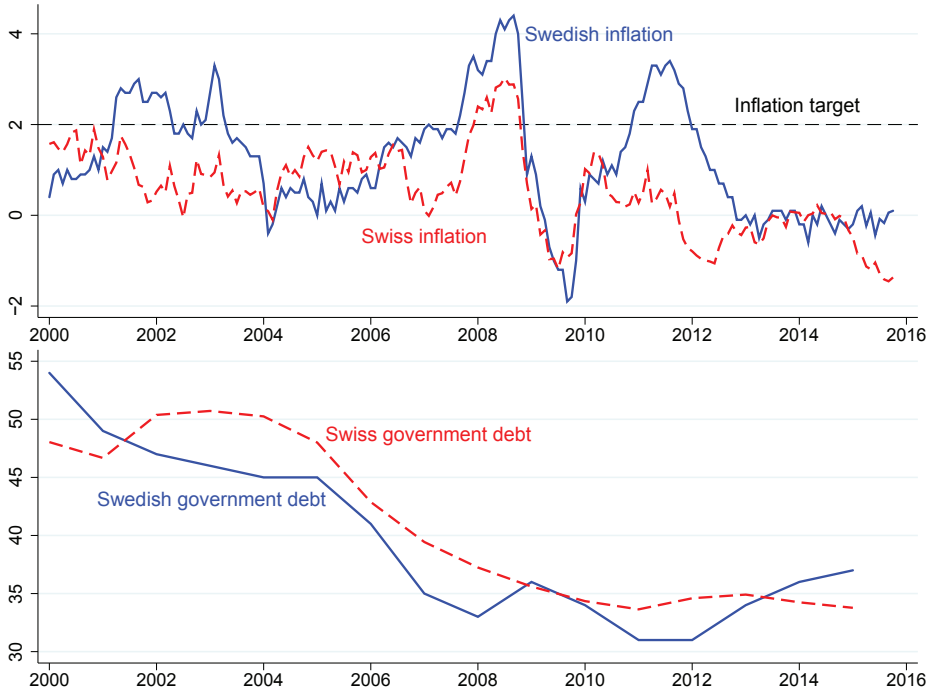

Figure 4: Swedish and Swiss consumer price inflation (top panel), annual rates; Swedish and Swiss central government debt as percent of GDP. Sweden has a 2 percent inflation target and Switzerland aims for 2 percent or below. Source: Statistics Sweden, Swedish National Debt Office, and Swiss National Bank.

low levels of government debt and the chronically low inflation rates?

2.4 JAPAN'S CONFUSED PRIORITIES

Japan has become the poster child for inconsistency in macroeconomic policies, inconsistencies that have been well documented [Hausman and Wieland (2014), Ito (2006), Ito and Mishkin (2006), and Krugman (1998) for example]. Japan's economic performance reflects this: since 1993, inflation has averaged 0.21 percent, economic growth has averaged 0.84 percent, and government debt has risen from 75 to 230 percent of GDP. Abenomics was heralded as the end of stop-and-go policies and the beginning of policies designed to re-inflate the economy through monetary expansion, fiscal stimulus, and structural reform.

To partially address concerns about fiscal sustainability, Japan raised the consumption tax from 3 to 5 percent in 1997. This did little to retard growth in government debt. Despite decades of economic malaise in Japan, the IMF applied substantial pressure on the country to move forward with planned tax hikes. April 2014 saw the consumption tax rise to 8 percent. Figure 5 records the consequences. Consumption, which had been growing at 3 percent, plummeted to -3 percent, and stopped falling only late in 2015 (top panel). GDP followed a similar pattern. Meanwhile, after a year or two of positive inflation in consumer prices, prices have stopped rising (bottom panel).

An IMF country report from July 2014 continued to beat the fiscal austerity drum:

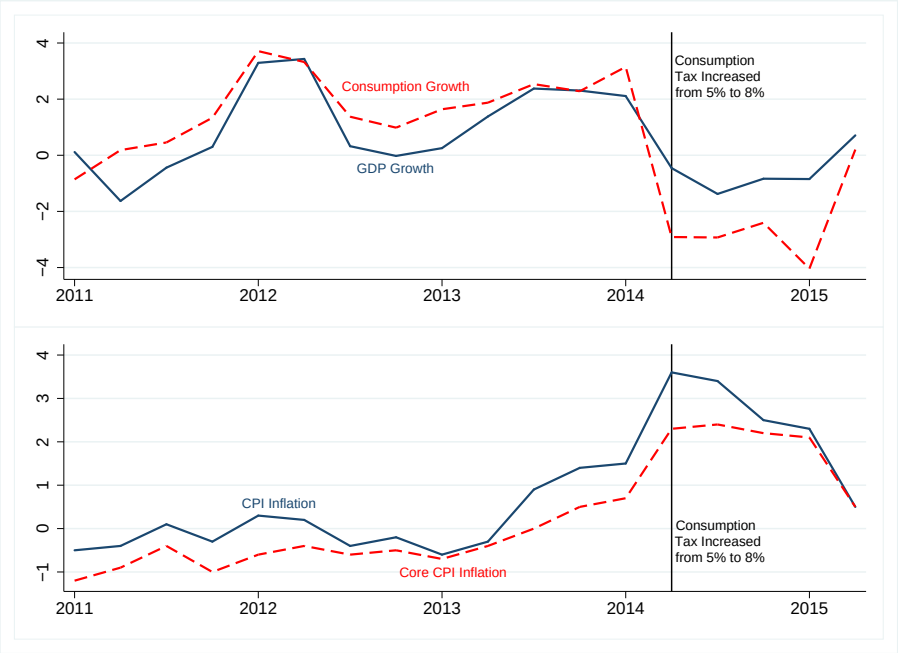

Figure 5: Japanese real GDP, expenditure approach, (top panel, solid line) and private final consumption expenditures, (top panel, dashed line); Japanese consumer prices, all items (bottom panel, solid line) and consumer prices, all items non-food, non-energy (bottom panel, dashed line). All data are growth rates compared to same quarter of previous year, seasonally adjusted. Source: OECD.Stat.

> The consumption tax rate increase in April to 8 percent was a major achievement, but is only a first step toward fiscal sustainability.... The second consumption tax rate increase in 2015 to 10 percent with a uniform rate should be confirmed. Raising the tax rate further at a moderate pace would help establish fiscal policy credibility.... A post-2015 fiscal consolidation plan is urgently needed.... Options... include gradually increasing the consumption tax to at least 15 percent.... [International Monetary Fund (2014b, pp. 14–15)]

In the event, Japan postponed the scheduled 2015 tax hike until 2017.

Apparently, the policy objectives of Japan and of the IMF conflict. While the Abe government seeks to fight deflation and escape secular decline, the IMF's concern centers on debt reduction. Conflict as fundamental as this screams out for careful study.

Obsession with the level of Japanese government debt is puzzling. There are no clear signs that the high levels have caused any economic problems—interest rates and inflation remain low and the Japanese government has no difficulty selling new debt.[13] More important, Japanese debt is denominated in yen and Japan—unlike countries in the Eurozone—controls its own monetary

[13] Although production of investment goods for manufacturing in Japan has been flat or declining since 1990.

policy. Japan need not face a tradeoff between fiscal stabilization and fiscal sustainability because it can address both its deflation and its high level of government debt simultaneously: the government needs to convince its people that there are no plans to raise taxes or cut spending to back new debt issuances. If Japanese bond holders, most of whom are Japanese institutions and people, are persuaded that future primary surpluses will not rise, Japanese bonds will become less attractive. As bond holders substitute out of bonds and into buying goods, aggregate demand will rise, bringing with it current and future price levels. Higher price levels, together with the associated lower bond prices, reduce the real market value of outstanding debt.[14]

To shift expectations in this way, the Japanese government must be consistent in both its communication and its actions. Consistency would constitute a substantial change from past policy behavior.

2.5 SPANISH SOVEREIGN RISK

The increase in sovereign risk premia on Spanish government debt that began in 2010 took many observers by surprise. Greece, after the realizations of the true state of public finances, seemed understandable—it was clearly in trouble. But Spanish government debt had been on a downward trajectory for more than a decade, reaching a mere 35.5 percent of GDP in 2007 before the financial crisis [Eurostat]. As in most countries, it rose with the crisis, to hit 60 percent in 2010, still a level that seems manageable.

One story behind the run-up of risk premia in Spain is "contagion," a term with many possible meanings. One policymaker defines it as

> . . . financial contagion refers to a situation whereby instability in a specific market or institution is transmitted to one or several other markets or institutions. There are two ideas underlying this definition. First, the wider spreading of instability would usually not happen without the initial shock. Second, the transmission of the initial instability goes beyond what could be expected from the normal relationships between markets or intermediaries, for example in terms of its speed, strength or scope. [Constâncio (2010, p. 110)]

Constâncio (2010) goes on to say that contagion entails an externality that cannot be well-priced by financial markets.

Beirne and Fratzscher (2013, p. 2) define "contagion" as ". . . the *change* in the way countries' own fundamentals or other factors are priced during a crisis period." These fundamentals may be observable—risk premia in neighboring countries—or unobservable—herding behavior by market participants.

[14] This is merely an application of the fiscal theory of the price level [see Leeper (1991), Sims (1994), Cochrane (2001), and Woodford (2001)]. See section 3.3 for further discussion.

The first definition would seem to call for policy authorities to intervene, if possible, to force the responsible parties to internalize the externality. But the authors of the second definition are more circumspect about the normative implications of their notion of "contagion."

Section 3.2 on the *fiscal limit* discusses a type of fundamental that is largely unexamined in the sovereign risk literature, so I shan't explore that concept in detail here. Instead I'll present a broader set of data than is typically studied that, together with the fiscal limit, may point to a reason for the increase in Spanish risk premia.

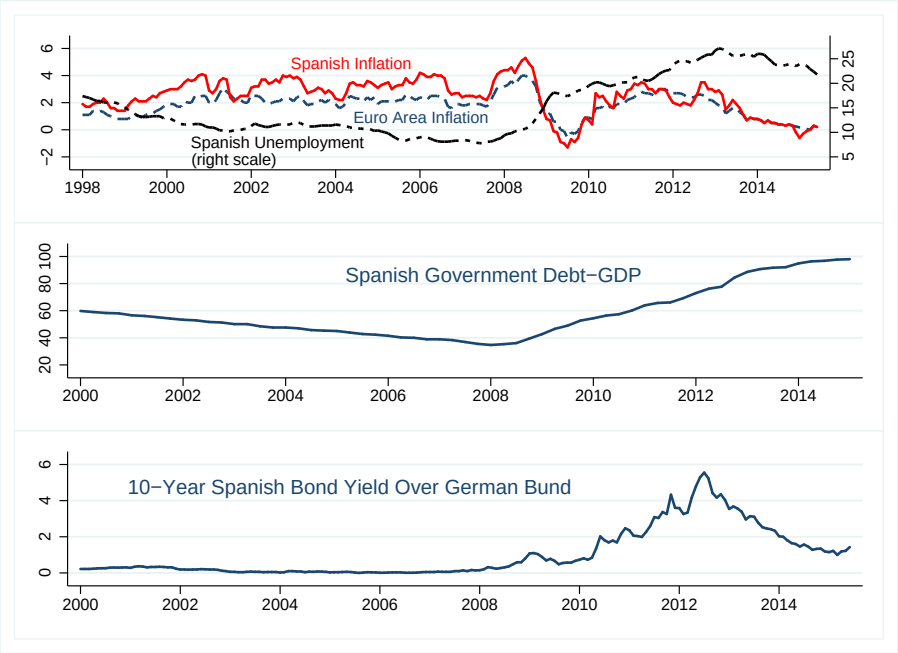

Figure 6: Spanish (top panel, solid line) and Euro Area (top panel, dashed line) Harmonized Index of Consumer Prices, growth rate over same month of previous year, not seasonally adjusted; Spanish harmonized unemployment rate (top panel, dashed-dotted line), total, ILO definition, not seasonally adjusted; Spanish central government debt as percent of GDP (middle panel), Maastricht definition; yield spread is the difference between Spanish and German long-term interest rates for convergence purposes (bottom panel), 10-year yield. Source: Eurostat and European Central Bank.

The top panel of figure 6 records Spanish and Euro Area inflation rates (left scale) and Spain's unemployment rate (right scale) from 1998 through the middle of 2015. For reference, the middle and bottom panels of the figure show Spanish government debt as a percent of GDP and the yield spread between 10-year Spanish and German government bonds. From 1998 through 2008, Spanish inflation consistently exceeded Euro Area inflation, with the difference averaging one percentage point over the period. It is reasonable to posit that in the face of this chronic difference, investors might grow concerned about Spain's competitiveness going forward. Reduced competitiveness would bring with it weak economic growth, lower revenues and higher government

expenditures. So fears about Spain's competitive position would translate into an expectation of lower Spanish primary surpluses. All else constant, a shift down in the expected present value of surpluses would reduce Spain's capacity to support government debt.

Then the crisis hit. Spanish unemployment rose dramatically and with it came a higher debt-GDP ratio. At the same time that the country's ability to support debt fell, the level of debt rose. In any model of sovereign default, this would raise the probability of default and raise Spanish bond yields.

As it happened, the global recession also brought Spanish inflation in line with the Eurozone. Coupled with a decline in Spanish unemployment beginning in 2013, the improvement in competitiveness and growth prospects reduced the yield spread over German bunds.

This is by no means a rigorous analysis. But it highlights interactions among nominal developments, real economic activity, and fiscal outcomes that do not feature in conventional sovereign risk analyses.

2.6 WAFFLING POLICY ADVICE An unusually large degree of uncertainty accompanied the financial crisis, uncertainty about both the sources and the macroeconomic consequences of the crisis. That uncertainty flowed into policy actions and policy advice. Nothing illustrates the degree of policy uncertainty that prevailed between 2009 and 2013 more clearly than the see-sawing fiscal advice that the IMF proffered to countries.

A chronology of IMF fiscal advice tells the story:

October 2008: Called for "timely" and "targeted" fiscal stimulus, always with a reminder to "safeguard the medium-term consolidation objectives." [International Monetary Fund (2008, p. xvii)]

July 2009: "Fiscal policy should continue to support economic activity until economic recovery has taken hold (and, indeed, additional discretionary stimulus may be needed in 2010). However, the positive growth impact of fiscal expansion would be enhanced by the identification of clear strategies to ensure that fiscal solvency is preserved over the medium term." [Horton, Kumar, and Mauro (2009, p. 3)]

November 2010: The IMF's *Fiscal Monitor* bore the self-explanatory title "Fiscal Exit: From Strategy to Implementation." [International Monetary Fund (2010)]

June 2011: "The pace of fiscal adjustment is uneven among advanced economies, with many making steady progress, others needing to redouble efforts, and some yet to begin." [International Monetary Fund (2011, p. 2)]

January 2012: "Given the large adjustment already in train this year, governments should avoid responding to any unexpected downturn in growth by further tightening policies, and should instead allow the automatic stabilizers to operate, as long as financing is available and sustainability concerns permit. Countries with enough fiscal space, including some in the Euro Area, should reconsider the pace of near-term adjustment." [International Monetary Fund (2012, p. 1)]

October 2014: "Hesitant recovery and persistent risks of lowflation and reform fatigue call for fiscal policy that carefully balances support for growth and employment creation with fiscal sustainability." [International Monetary Fund (2014a, p. ix)]

April 2015: "Countries with fiscal space can use it to support growth.... Countries that are more constrained should pursue growth-friendly fiscal rebalancing...." [International Monetary Fund (2015, p. ix)]

In the course of writing this, I came across an independent evaluation of the IMF's fiscal advice by Dhar (2014). That evaluation, which is much broader and more detailed than my synopsis, draws on many IMF sources different from those cited above, but arrives at similar conclusions. It more diplomatically states: "[The IMF] had been urging countries to plan for such stimulus starting in early 2008.... [T]he IMF in 2010 endorsed the shift from fiscal stimulus to consolidation that was initiated in the United Kingdom in 2010, the United States in 2011, and recommended that each Euro Area economy including Germany engage in fiscal consolidation by 2011 at the latest, inter alia to enhance investor confidence. The call for fiscal consolidation turned out to be premature.... In 2012, the IMF began to reassess its views on fiscal policy and subsequently called for a more moderate pace of fiscal consolidation if feasible [Dhar (2014, p. vii)]."

Of course, the IMF is not the only policy organization that waffles about fiscal policy. The American Recovery and Reinvestment Act (ARRA), implemented in 2009, was a fiscal stimulus spread over a decade of about 5.6 percent of GDP and comprised a mixture of tax reductions and spending increases, particularly on infrastructure. Within six days of signing the act into law, President Obama was pledging to reduce the fiscal deficit by a half by the end of his first term in office [Phillips (2009)].

The pattern seems to be to undertake fiscal stimulus and then immediately promise to reverse it. Economic theory tells us that this is likely to be counterproductive. Theory instructs that policy should either stimulate or not. Fiscal expansions that are *not* backed by promises of reversals have large and persistent impacts in economies that issue nominal debt and control their own monetary policy [see Leeper, Traum, and Walker (2015) for estimates using U.S. data].

Missing from both the IMF statements and President Obama's pledge is an appreciation of the role of expectations in fiscal dynamics. Cutting taxes today and promising to raise them tomorrow

anchors expectations on a Ricardian experiment: in some models this policy is neutral; in all models the reversal attenuates the stimulus's effects. In practice, it's hard to tell how private-sector fiscal expectations are anchored, particularly when it is commonplace for policymakers to send these kinds of mixed messages [see discussions in Leeper (2009, 2011)].

This issue highlights the poorly understood tension between fiscal stabilization and fiscal sustainability. If people believe that fiscal finances are sufficiently feeble, is it even possible for fiscal actions to stabilize the macro economy? Faced with this tradeoff, most policymakers and advisors opt for sustainability as the safest route to follow, removing fiscal policy as a player in macroeconomic stabilization.

2.7 DEMOGRAPHICS AND POLITICAL ECONOMY

Nearly all the world's countries are aging. But demographics differ sharply across countries. The top panel of figure 7 plots old-age dependency ratios for China, Japan, Western Europe, and the United States.[15] Japan is the oldest country by this measure, but Western Europe is close behind. Today the United States is older than China, but that relationship reverses in about two decades.

Many economic implications flow from an aging population, including persistent shifts in saving rates, real interest rates, the composition of consumption, and relative prices.[16] But a robust consequence of these demographic shifts is that older citizens have a much higher propensity to vote than do younger citizens.[17] Because different age cohorts have different preferences over tax and spending policies, demographic changes are likely to generate slowly-evolving changes in fiscal rules and outcomes.

Figure 7's bottom panel illustrates that democracies do not always operate smoothly. The figure graphs the voting distance between the two major political parties in the United States across Congresses from 1879 to 2014 for both houses of Congress. Voting distance is a measure of political polarization. During the Great Depression and World War Two, the parties came together to find common cause, but polarization has grown since the 1960s and in recent years has reached all-time highs.[18] Political polarization can make it more difficult for governments to reach consensus on fiscal agendas, increasing fiscal uncertainty.

The political economy dynamics that the data in figure 7 imply are too often absent from analyses of fiscal policy. It is impossible to understand Eurozone monetary and fiscal policies without grasping the underlying political economy. The 2012 "fiscal cliff" and 2013 government shutdown

[15] Old-age dependency is the population over 64 years old as a percentage of working-age population, which is ages 15-64. It roughly reflects the number of aged people that each worker supports.

[16] See Faust and Leeper (2015) and references therein for further discussion.

[17] For example, File (2014) reports that the 2012 U.S. presidential election produced turnout rates of 45.0 percent (ages 18–29), 59.5 percent (ages 30–40), 67.9 percent (ages 45–64), and 72.0 percent (ages 65 and above).

[18] McCarty, Poole, and Rosenthal (2006) is the underlying source for the data, which are available for download at http://voteview.com/political_polarization_2014.htm.

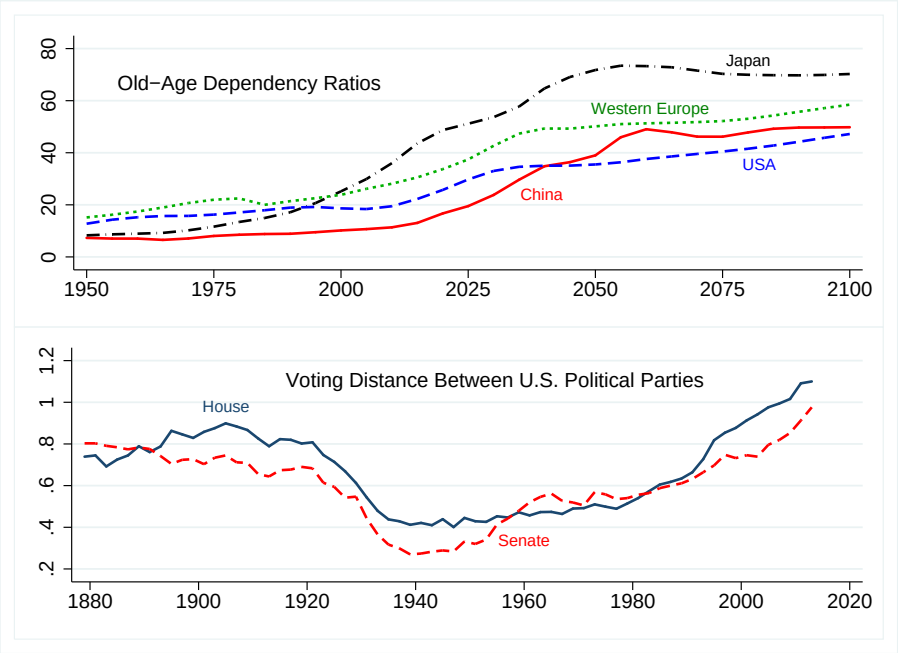

Figure 7: Old-age dependency ratios in various countries/regions (top panel), population older than 64 years as a percentage of working-age population, ages 15-64, medium variant projections and U.S. political polarization (bottom panel), difference in party means derived from voting data. Source: United Nations Population Division's World Population Prospects and http://voteview.com/political_polarization_2014.htm.

in the United States were political, rather than economic decisions. Optimal policy prescriptions that fail to take account of demographics are likely to seem sterile and irrelevant, which is unfortunate because some of the logic of optimal policy transcends political considerations. Fiscal analysis could be made more relevant—and hence be more influential—if it were to integrate and impose political constraints, in addition to the usual economic constraints.

3 A FISCAL RESEARCH AGENDA

The preceding illustrations are intentionally chosen to induce researchers to ask, "Can we do better?" I think we can do better and, in fact, there are examples in the literature that contain some of the ingredients that are essential to more useful fiscal analysis.

In this section, I sketch a research agenda for improving fiscal analysis. The agenda includes three overriding criteria:

- rigorous analytics and tight connections to data;
- full integration of monetary and fiscal policies and perhaps also financial policies;
- incorporation of the sources of disparate confounding dynamics that section 2 highlights.

Because I am fantasizing about this agenda, I will not feel constrained by tractability.

3.1 ESSENTIAL INGREDIENTS Any model that is useful for macro policy analysis must be **general equilibrium**. I say this fully acknowledging the limitations that this imposes. General equilibrium should be taken to mean that the elements deemed to be critical for understanding how fiscal policy transmits to the aggregate economy are derived endogenously. For example, the analysis that section 2.1 discusses, which simply posits paths for output, interest rates, and inflation does not satisfy this definition of general equilibrium.

Fiscal sustainability can quickly become a bugaboo in any fiscal analysis, getting invoked as an unmodeled rationale to "do more" (or less) on the fiscal front. To grapple with this bugaboo, models of fiscal policy need to include an explicit **fiscal limit** that yields insights into the tradeoffs between stabilization and sustainability. There are many ways to model the fiscal limit, and in section 3.2 I discuss one way that is well-grounded in theory.

To date, the vast majority of macroeconomic fiscal analyses have employed representative-agent models or environments in which there is some, often trivial, form of **heterogeneity**.[19] In contrast, micro-oriented public finance places distributional consequences of fiscal changes front and center. Dynamic models of fiscal policy often adopt an overlapping-generations framework to incorporate intragenerational heterogeneity [for example, Auerbach and Kotlikoff (1987) or Altig, Auerbach, Kotlikoff, Smetters, and Walliser (2001)]. While this setup captures important aspects of heterogeneity, it tends to do so by restricting attention to deterministic models, making it impossible to address the central issue of uncertainty. Recent advances in computational techniques open the door to handling both heterogeneity and uncertainty [Holter, Krueger, and Stepanchuk (2015) and McKay and Reis (2015) to mention two examples].

As section 2.7 suggests, **demographic** developments have potentially very large and persistent impacts on fiscal analysis. Modeling demographics requires heterogeneity, but this is an area where important progress is being made in fiscal analysis [Ferrer (2010) and Katagiri, Konishi, and Ueda (2015)]. Section 2.7 also highlighted the **political economy** repercussions of demographic change, phenomena that are not yet well understood.

It goes without saying that a full understanding of fiscal policy requires modeling the **many different fiscal instruments** that government employ. The list includes multiple types of taxes—labor, capital, consumption, profits—and many kinds of spending—consumption, investment, transfers. As obvious as this ingredient is, many macro models base their fiscal analyses on a single income tax rate or government spending that is completely wasteful, restrictions that are important for policy implications.

[19] For example, positing that a fixed fraction of households live hand-to-mouth or that two groups of agents differ only in their rates of time preference. Todd Walker has proposed to me a useful metric for the degree of heterogeneity in a dynamic model: the number of distinct saving functions across agents in a model.

In most macro models, government debt serves merely as a vehicle for private saving and tax smoothing. In actual economies, **government debt serves additional roles**: liquidity, collateral, and maturity transformation [see, for example, Yun (2011), Williamson (2014), and Eiben (2015)]. U.S. treasuries are a critical source of collateral in repurchase agreements, giving fiscal financing a direct role in credit creation, and figuring into the financial crisis in an important way [Gourinchas and Jeanne (2012) and Gorton and Ordoñez (2013, 2014)]. This line of work suggests that modeling the economic roles that government debt plays can fundamentally alter our understanding of the fiscal transmission mechanism by highlighting the linkages between fiscal policy and financial stability.[20]

Eventually, we will want to include interactions between fiscal policy and **financial stability**. In addition to the considerations just discussed, the fiscal authority is, after all, the lender of last resort, which is the ultimate financial stability tool. But the use of fiscal policy for these purposes can have political economy consequences, as we have seen in many countries in the aftermath of the financial crisis. Those consequences will interact with the government's ability to harness fiscal tools for macro stabilization purposes.

I now selectively elaborate on these ingredients.

3.2 THE FISCAL LIMIT

A government's decision to honor its debt obligations is most often more about its *willingness* than about its *ability*, as Eaton and Gersovitz (1981) emphasize. Eaton and Gersovitz spawned a literature in which the government makes a strategic decision to default, weighing costs of default against the benefits of not having to repay. Recent work aims to quantify the default decision [Aguiar and Gopinath (2006) and Arellano (2008), to name early examples].

Although among academics strategic default has become the dominant approach to sovereign debt studies, for policymakers the line of work is not terribly helpful. Policymakers are interested in answers to questions like, "If policy continues on the current track, will government debt become risky?" or "What sorts of fiscal reforms can reduce the riskiness of government debt and provide fiscal policy with room to engage in stabilization actions?" Strategic default models, as currently specified, cannot address these questions for obvious reasons: those models do not include specifications of fiscal behavior—tax and spending rules—which can be intervened upon to predict the consequences of alternative rules.

The IMF has developed the idea of "fiscal space," defined as the distance between current debt and a computed debt limit. Ghosh, Kim, Mendoza, Ostry, and Qureshi (2012) estimate reduced-form fiscal rules, following Bohn (2008) and Mendoza and Ostry (2008), and then ask: if countries were to continue this past behavior indefinitely, what is the maximum level of debt that can be

[20] Gourinchas and Jeanne (2012), for example, argue that shortages of safe assets like short-term government bonds can create financial instability and Eiben (2015) shows that increases in the supply of government bonds can improve the efficiency of capital allocation to raise welfare.

sustained? Ghosh, Kim, Mendoza, Ostry, and Qureshi (2012) deliver point estimates for fiscal space—172.2 percent for Australia, 81.3 percent for France, 50.8 percent for the United States and "unsustainable" for Greece, Iceland, Italy, Japan, and Portugal[21]—and then computes probabilities of a given amount of fiscal space by using the standard errors from the estimated fiscal reaction functions.[22] Like the CBO approach discussed in section 2.1, the IMF's procedure is essentially an accounting, rather than an economic, exercise. And like the strategic default literature, the exercise cannot address the questions that most press on policymakers.

Bi's (2012) concept of the *fiscal limit* offers the modeling flexibility to provide useful inputs to policymakers. Whereas the IMF and the CBO approaches focus on the "backward" representation of debt—as the accumulation of past deficits—Bi's idea emphasizes the "forward" representation: the value of debt depends on the expected present value of primary surpluses. This provides an immediate link between sovereign debt risk-premia, which reflect debt's current value, to expected economic fundamentals that affect revenues and spending in the future.

Bi (2012) and Bi and Leeper (2012) employ formal non-monetary models in which labor is productive and is taxed at a proportionate rate. Private-sector decisions are optimal and expectations are rational. The model implies a Laffer curve and revenues are maximized at the state-dependent tax rate that pushes the economy to the peak of the curve. Government transfers fluctuate between stationary and non-stationary regimes to reflect the rapid growth in old-age benefits associated with aging populations and periodic fiscal reforms. In the non-stationary regime, transfers grow as a share of GDP, a state that cannot persist indefinitely, but contributes to rapid debt accumulation and an increase of the tax rate toward the peak of the Laffer curve. Fiscal reform is a move from the non-stationary to the stationary transfers regime.[23]

The fiscal limit answers the question, "Given the economic environment, what is the distribution of government debt that can be supported without significant risk premia?" The fiscal limit distribution emerges from the distribution of the expected discounted value of future maximum primary surpluses, where maximum surpluses come from driving tax revenues to the peak of the Laffer curve and driving expenditures to some minimum level.[24] The fiscal limit has several important features:

- Because it depends on realizations of shocks now and in the future, the fiscal limit is a

[21] "Unsustainable" presumably means that a country has negative fiscal space.

[22] As the discussion below argues, this is "uncertainty" associated with sampling error, but has little to do with uncertainty about future economic fundamentals.

[23] Those papers do not model how the transfers regime is determined, treating transfers as following a recurrent Markov chain with exogenous transition probabilities.

[24] Political economy considerations come strongly into play in the calculation of maximum surpluses. In many countries—the United States, for example—it is likely to be politically infeasible to reach the Laffer curve peak because of low voter tolerance for high tax rates. In other countries—Sweden, for example—substantially reducing social benefits might not be politically viable. Hatchondo and Martinez (2010) is a thoughtful discussion of the interaction between politics and sovereign default.

probability distribution. Uncertainty in the economy means that there is no magic threshold for debt that, when crossed, triggers sovereign default or economic collapse.

- The fiscal limit is forward-looking: it depends on expected future policies and how credible those policies are.
- It depends on private behavior—consumption-saving and labor-leisure choices—policy behavior—current and expected—and the fundamental shocks to the economy—possibly including disturbances emanating from the political process.

Sovereign default probabilities depend on the current level of debt *relative to the position of the fiscal limit distribution*. High current debt may be associated with minimal default risk if the fiscal limit distribution implies the economy can easily support still more debt. And low current debt may nonetheless carry with it substantial risk of default when the economy cannot generate sufficiently large future surpluses.

Figure 8 plots fiscal limit distributions and associated risk premia from a model in Bi and Leeper (2012) that was calibrated to Greek data. Vertical lines mark a debt-GDP level of 170 percent for reference. The top row of the figure shows the fiscal limit cumulative distribution function conditional on current productivity (left panel) and on the current transfers regime (right panel). Persistently high productivity raises current and future primary surpluses to shift the distribution to the right and reduce the probability of default at any given level of debt, while persistently low productivity brings the limit in to raise the default probability.

When transfers policy resides in the stable regime, and are expected to remain there for some period, the distribution lies to the right, permitting the economy to support high levels of debt. The opposite is true when transfers are currently unstable and expected to remain so for a while: growing transfers reduce the present value of surpluses to shift the limit in. As the lower row shows, risk premia rise the more the distribution lies to the left.

The figure highlights the state-dependent nature of the fiscal limit. Realizations of fundamental shocks today—technology and transfers regime in this case—can shift the distribution substantially which, when the prevailing level of debt is close to the limit, can have strong effects on risk premia.

Not only is the fiscal limit state-dependent, it is also highly country-dependent. If this model were calibrated to data in a different country, figure 8 could look quite different. Slovakia's fiscal council—the Council for Budget Responsibility—applied Bi's (2012) model to the Slovakian economy [Múčka (2015)]. A critical aspect of that application is the modifications of the model to accommodate features of the Slovakian economy: growth in transfers that corresponds to demographic dynamics in Slovakia, countercyclicality of transfers and procyclicality of government purchases, switches in the transfers process that reflect the political cycle in Slovakia, and, most importantly, a distribution for technology shocks derived from Slovakia's empirical distribution for

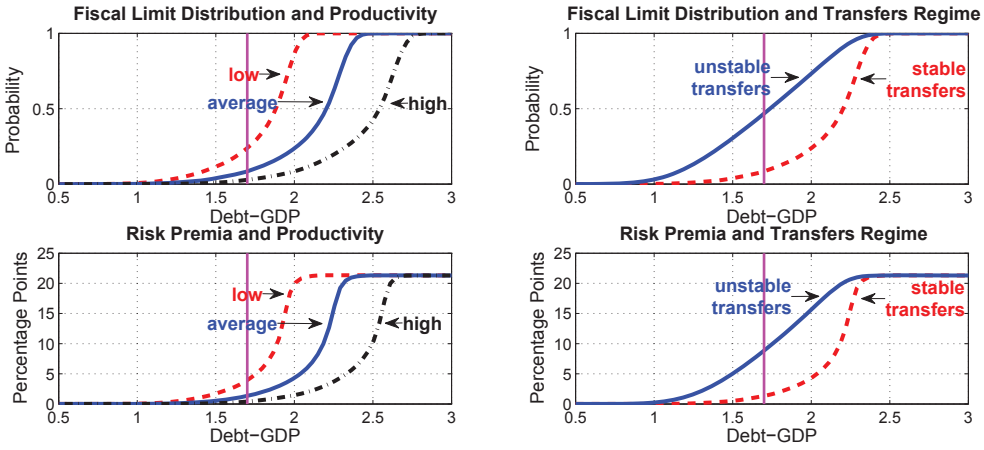

Figure 8: Fiscal limit cumulative density function (top panels) and mapping from debt-GDP to risk premia (bottom panels). Derived from peak of labor Laffer curve with constant government purchases, conditional on current transfers regime. Vertical lines at 170 percent debt-GDP. Source: Bi and Leeper (2012).

the output gap. That empirical distribution places substantial mass on large negative realizations of the gap. The Council used this setup to ask: "Is the Maastricht debt limit safe enough for Slovakia?" The answer: no. In normal times, the 60-percent limit is associated with a modest default probability of about 10 percent, but in the face of a bad draw from the lower tail of the technology distribution, that probability rises precipitously to around 40 percent. In light of this analysis, the Council recommends that the Slovakian government adopt a debt limit below the Maastricht level.[25]

Several useful extensions to Bi's (2012) model suggest themselves. Many countries, particularly in Europe, rely heavily on value-added taxes. Conventional models, like Trabandt and Uhlig (2011), do not impose a natural upper bound on tax revenues from such taxes, so an alternative to Bi's Laffer curve criterion needs to be applied. Consumption taxes, like capital taxes, introduce intertemporal considerations into the revenue consequences of changes in tax rates, considerations that also pose challenges to the Laffer-curve reasoning. To my knowledge, very little work examines the spending side to bring political economy dynamics into the fiscal limit calculus.

3.3 INTEGRATING NOMINAL CONSIDERATIONS

Despite the long-standing tradition of studying fiscal policy in isolation from monetary policy—and vice versa—we must confront the fact that we do not live in that compartmentalized world. To put a sharper point on this, *any predictions about the impacts of fiscal actions condition—often implicitly—on assumptions about monetary policy behavior*.[26] It is impossible to fully understand the Euro Area sovereign debt crisis without

[25] Bi and Traum (2012, 2014) take the fiscal limit idea to data to estimate fiscal limit economies for some European countries.

[26] The reverse is also true, as Wallace (1981) shows.

bringing the ECB into the picture [Panico and Purificato (2013) and Chang (2015)]. It is well-established that government spending multipliers depend on how aggressively the central bank adjusts interest rates in response to inflation [Christiano, Eichenbaum, and Rebelo (2011) and Leeper, Traum, and Walker (2015)]. The consequences of a debt-financed fiscal expansion hinge on whether fiscal or monetary policy adjusts to finance the debt [Gordon and Leeper (2006)].

The nature of the fiscal-monetary interactions depends on the composition of government debt between nominal and real (inflation-indexed) bonds. Because the vast majority of debt that governments issue is denominated in nominal units—euros, dollars, yen—it is important to understand the difference between real and nominal debt. Real debt is a claim to real goods, which the government must acquire through taxation. This imposes a budget constraint that the government's choices must satisfy. If the government does not have the taxing capacity to acquire the goods necessary to finance outstanding debt, it has no option other than outright default.

Nominal debt is much like government-issued money: it is merely a claim to fresh currency in the future. The government may choose to raise taxes to acquire the requisite currency or it may opt to print up new currency, if currency creation is within its purview. Because the value of nominal debt depends on the price level and bond prices, the government really does not face a budget constraint when all its debt is nominal. Some readers may object to the idea that a government doesn't face a budget constraint, but the logic here is exactly the logic that underlies fiat currency. By conventional quantity theory reasoning, the central bank is free to double or half the money supply without fear of violating a budget constraint because the price level will double or half to maintain the real value of money. The direct analog to this reasoning is that the government is free to issue any quantity of nominal bonds, whose real value adjusts with the price level, without reference to a budget constraint. Of course, by doing so, the government is giving up control of the price level.

Member nations of the European Monetary Union issue debt denominated in euros, their home currency, but because monetary policy is under the control of the ECB rather than individual nations, the debt is effectively real from the perspective of member nations. The United States issues indexed debt, but it comprises only 10 percent of the debt outstanding. Even in the United Kingdom, which is known for having a thick market in indexed bonds, the percentage is only about 20. Five percent or less of total debt issued is indexed in the Euro Area, Japan, Australia, and Sweden.

To clarify how nominal debt changes interactions between fiscal and monetary policies, it is helpful to establish some notation. Suppose there is a complete maturity structure for government bonds so that $B_t(t+j)$ is the nominal quantity of zero-coupon bonds outstanding in period t that matures in period $t+j$ whose dollar price is $Q_t(t+j)$. The bond-pricing equation is

$$Q_t(t+j) = \beta^j E_t \left(\frac{U_c(C_{t+j})}{U_c(t)} \frac{P_t}{P_{t+j}} \right) \tag{1}$$

where $0 < \beta < 1$ is the discount factor, $U_c(\cdot)$ is marginal utility, and P_t is the aggregate price level. Denote the real discount factor by $m_{t,t+j} \equiv \beta^j \frac{U_c(C_{t+j})}{U_c(t)}$. Let B_{t-1} denote the nominal value of the bond portfolio outstanding at the beginning of period t.[27]

Every dynamic model implies an equilibrium condition that links the market value of debt to expected discounted future primary surpluses:[28]

$$\frac{B_{t-1}(t)}{P_t} = E_t \sum_{j=0}^{\infty} m_{t,t+j} S_{t+j} \tag{2}$$

where S_{t+j} is the real primary surplus in period $t+j$. Cochrane (2005, p. 502) calls (2) "the valuation equation for government debt," to emphasize that debt's value depends, not only on expected backing through surpluses, but also on the current price level, current bond prices, and expected real discount factors.

In countries that both issue nominal debt and control their own monetary policy, an expansion in nominal debt can be *unbacked* by future surpluses. With no expected change in future taxes, households perceive that their higher debt holdings raise their financial wealth, which raises demand for goods. If prices are perfectly flexible, higher demand transmits directly into a higher current price level and lower bond prices—that is, higher expected inflation—which reduces the real value of debt to coincide with the expected present value of surpluses. This mechanism, dubbed the "fiscal theory of the price level," is explained in Leeper (1991), Sims (1994), Woodford (1995), and Cochrane (1999). When prices are sticky, higher demand transmits into a mix of real and nominal variables.

Bi's (2012) fiscal limit from section 3.2 can be generalized by embedding it in a broader DSGE model that includes monetary policy and some form of nominal rigidities so that purely nominal disturbances propagate to affect real variables. If a monetary policy expansion reduces real interest rates and real discount rates, then it raises the present value of a given stream of surpluses to shift out the fiscal limit. Even if the real effects of the monetary expansion are fleeting, so that real discount rates fall only in the short run, the impact on the position of the fiscal limit can be substantial.[29]

[27] The portfolio is defined as $B_{t-1} \equiv B_{t-1}(t) + \sum_{j=1}^{\infty} Q_t(t+j) B_{t-1}(t+j)$.

[28] Condition (2) may be derived either from the household's or the government's budget constraint by imposing the bond-pricing relationships, the household's transversality condition, and market clearing. See, for example, Woodford (2001) for a careful derivation.

[29] To see this, note that the discount factor $m_{t,t+j}$ may be written as

$$m_{t,t+j} = \beta \frac{U_c(C_{t+1})}{U_c(C_t)} \beta \frac{U_c(C_{t+2})}{U_c(C_{t+1})} \cdot \ldots \cdot \beta \frac{U_c(C_{t+j})}{U_c(C_{t+j-1})} = \frac{1}{1+r_t} \frac{1}{1+r_{t+1}} \cdot \ldots \cdot \frac{1}{1+r_{t+j-1}}$$

where r_t is the real discount rate between t and $t+1$. Because each $m_{t,t+j}$ that appears on the right side of (2) includes $1/(1+r_t)$, even a one-period decline in the real discount rate can change the present value a lot.

In the wake of the financial crisis, central banks around the world decreased policy interest rates dramatically and rates remained low for many years. Short-term real interest rates were negative in many countries. As interest rates "normalize" and return to historic levels, real discount rates will also rise back to historic levels. With fixed surpluses, the higher real discount rates will reduce the present value of surpluses and shift fiscal limit distributions in. In the Euro Area, this normalization of monetary policy may trigger further sovereign debt crises because member nations have no alternative but to raise surpluses yet again and reduce aggregate demand.[30] Their only alternative is to default on outstanding debt.

Outside the Euro Area countries have two options. They could choose to raises surpluses and reduce aggregate demand. But they could, instead, opt not to adjust surpluses. This would reduce the value of outstanding debt by raising inflation and bond yields. It is to this latter adjustment that section 2.4 alludes in the Japanese context because it solves both solvency and deflation problems.

Policy analysts are aware of this fiscal consequence of normalization. Congressional Budget Office (2014), for example, projects that net interest costs will quadruple from 2014 to 2024 to reach 3.3 percent of GDP in 2024. In the United States, the typical response of Congress when interest payments chew up a large fraction of expenditures is fiscal reform. But there is little about Congressional behavior in recent years that is "typical." And in the absence of fiscal reforms to finance higher debt service, the Federal Reserve's efforts to reign in inflation by raising interest rates is likely to be thwarted.

3.4 MODELING GOVERNMENT DEBT

Fiscal analysis that treats government debt as merely a saving vehicle that smoothes consumption and taxes is likely to miss important interactions among fiscal policy, monetary policy, and financial stability. One class of interactions arises from the maturity structure of government bonds. If bonds at different maturities generate different service flows, then the bonds will be imperfect substitutes and changes in the maturity structure will affect the macro economy. Despite new empirical research that tries to quantify the effects of the large-scale asset purchases in which major central banks engaged after the crisis, we have very little theory to guide those empirical explorations.

Recent theoretical work may help to fill this void. Williamson (2014) permits exchange to be facilitated by an array of assets, including government bonds, money, and credit. When asset market constraints bind, government bonds carry a liquidity premium and bonds bear a low rate of return. The constraint binds whenever government bonds are scarce. In his setting, fiscal policy sets the value of government debt exogenously and monetary policy determines the composition of that debt—between money and bonds—via open-market operations. The model delivers the striking conclusion that when the constraint binds, lower nominal interest rates reduce output,

[30] An equivalent "backward" way of describing the adjustment is that as interest rates rise, debt service increases, requiring higher taxes or lower spending to cover additional interest on the debt, if the level of debt is to remain fixed.

consumption, and welfare, so it is not optimal for monetary policy to move to the zero lower bound.

Eiben (2015) models the collateral role that government debt plays. This is designed to capture, without explicitly modeling, the essence of the repurchase market in which government securities are an important component of collateral on short-term loans between financial institutions. Government debt supplies liquidity services by overcoming financial frictions to facilitate portfolio reallocation. Plentiful government debt allocates physical capital to the highest productivity uses, raising welfare.

Yun (2011) shows that when roles such as these for government debt are embedded in an otherwise conventional new Keynesian model, conditions for determinacy of equilibrium can change from conventional wisdom. This suggests that monetary and fiscal policy design could change in important ways.

In most models used to study fiscal and monetary policy, a Modigliani-Miller irrelevance theorem holds for the maturity structure of government debt. Debt maturity matters, however, under the fiscal theory [Cochrane (2001)]. Long debt permits any inflationary consequences that arise from equilibrium condition (2) to be spread over the term of the debt, permitting debt to serve as a shock absorber. Sims (2013), Leeper and Zhou (2013), and Leeper and Leith (2016) find that in the presence of long debt, the optimal mix of monetary and fiscal policies always entails some adjustment in inflation rates to shifts in fiscal needs, overturning the standard result that there is no role for inflation in ensuring fiscal sustainability [Schmitt-Grohé and Uribe (2007), Kirsanova and Wren-Lewis (2012)].

One useful side effect of the financial crisis has been to push macroeconomists away from Friedman's (1956) sharp focus on money and monetary policy, which has found modern voice in the graduate textbooks by Woodford (2003) and Galí (2008). Instead, by considering an array of assets and explicitly modeling both monetary and fiscal policies, the new research is closer to Tobin's (1961) more nuanced views of macroeconomic equilibrium.

3.5 EMBRACING HETEROGENEITY

Perhaps the most exciting recent developments in macroeconomic modeling lie in the broad area of integrating heterogeneity into general equilibrium models with aggregate shocks. Advances in both analytical and computational methods have opened doors to studying welfare costs of business cycles, tax policy, firm heterogeneity, monetary policy, housing, information dispersion, household default, mortgage markets, and worker flows [Storesletten, Telmer, and Yaron (2001), Heathcote (2005), Bloom (2009), Gornemann, Kuester, and Nakajima (2012), Iacoviello and Pavan (2013), Rondina and Walker (2014), Gordon (2015), Guler (2015), and Michaud (2015)].

As section 3.1 mentions, demographic dynamics are an important source of heterogeneity for

fiscal analysis. Changes in birth rates, longevity, and dependency ratios have implications for saving rates, consumption patterns, labor market participation rates, relative prices, labor shares of income, real interest rates, and fiscal variables—government spending and revenues. Several papers have built on Gertler's (1999) life-cycle model to study the macroeconomic impacts of demographic dynamics in environments that treat demographics as deterministic [Carvalho and Ferrero (2014), Kara and von Thadden (2015), and Katagiri (2012)].

But demographic "news" seems to arrive periodically, with major consequences for fiscal variables, as Nishimura (2012) and Katagiri, Konishi, and Ueda (2015) demonstrate. Figure 9 plots actual and projected birth rates (top panel) and life expectancy (bottom panel) for Japan. Projections are from official Japanese agencies. Evidently, over a 30-year period, while the birth rate was steadily declining, forecasters continued to predict reversion toward the replacement rate. Although less pronounced, actual longevity consistently exceeds projections. Taking the difference between actual and projected as the "news," the figure implies that very substantial surprises arise from demographics. These surprises have both short-term implications for fiscal expenditures and long-term implications for labor productivity and consumption patterns to create what Faust and Leeper (2015) call "disparate confounding dynamics" that make it difficult to separate trend and cycle in macro variables.

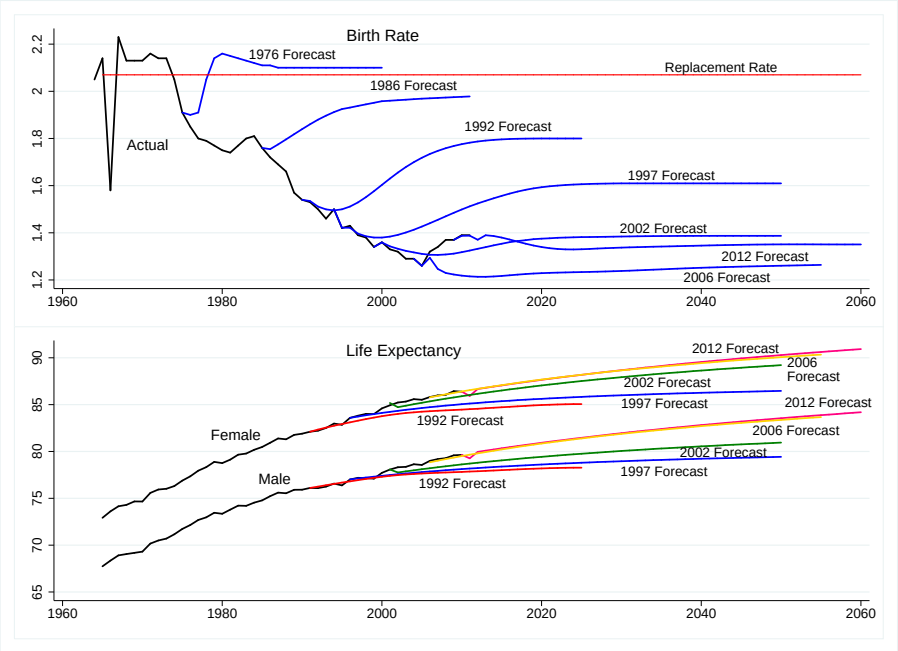

Figure 9: Actual and projected Japanese birth rate (top panel) and actual and projected Japanese life expectancy (bottom panel). Source: Japanese Ministry of Health, Labour and Welfare and National Institute of Population and Social Security Research, adapted from Nishimura (2012).

Economies subject to changes in fertility rates, retirement ages, and life expectancy carry broad

implications about which representative-agent models are silent. Marginal propensities to consume vary across age cohorts, to impart drift to aggregate consumption functions. Consumption bundles also vary over the life cycle, which cause relative prices between consumption components to change persistently. As the population ages, labor supply declines, reducing the marginal product of physical capital and returns to investment. At the same time, an aging population reduces aggregate saving and the population's willingness to absorb government debt. Policy and non-policy disturbances asymmetrically affect age cohorts to generate redistributive effects. Finally, an aging population can inject a negative trend into long-term real interest rates, with implications for monetary policy that is run off of the new Keynesian notion of the "neutral real interest rate." Each of these effects poses challenges to analysts and policymakers alike.

A potentially high-impact line of research would integrate heterogeneous demographic dynamics with DSGE models of monetary and fiscal policies. Such research would provide valuable inputs to long-term fiscal decisions.

4 RETHINKING OPTIMAL POLICY

In an environment that contains the ingredients I have sketched, it is no longer obvious how to conduct "optimal policy" analysis. Relative sizes of age cohorts evolve over time and with those evolving cohorts come gradual shifts in societal preferences. Before turning to what these shifts mean for optimal policy, let's first review what monetary and fiscal authorities state are their objectives.

4.1 MONETARY VS. FISCAL OBJECTIVES

Central banks typically have a short list of objectives, in addition to ensuring financial stability.[31]

Federal Reserve: "…maximum employment, stable prices, and moderate long-term interest rates."

Bank of England: "…price stability—low inflation—and, subject to that, support the Government's economic objectives…."

European Central Bank: "Without prejudice to the objective of price stability, to support the general economic policies of the Union…."

Reserve Bank of New Zealand: "…maintain a stable general level of price."

Among these central banks, with the exception of New Zealand, multiple mandates are the rule. While the Bank of England and the ECB seem to have lexicographically-ordered mandates, no particular weights are given to the components of the triple mandate under which the Fed

[31] Sources for the objectives of monetary policy can be found on the respective central banks' web pages.

operates. Nonetheless, it is clear that price stability and possibly real stability are the aims of monetary policy.

Fiscal authorities, in contrast, are all over the map. In addition to fiscal sustainability, their objectives can take up several pages.[32]

United States: "Maintain a strong economy and create economic and job opportunities by promoting the conditions that enable economic growth and stability at home and abroad, strengthen national security by combating threats and protecting the integrity of the financial system, and manage the U.S. Government's finances and resources effectively."

United Kingdom: "...maintaining a stable macroeconomic framework with low inflation; improving the quality and cost effectiveness of public services; increasing the productivity of the economy and expanding economic and employment opportunities for all, through productive investment, competition, innovation, enterprise, better regulation and increased employability; promoting a fair and efficient tax and benefit system with incentives to work, save and invest; maintaining an effective accounting and budgetary framework and promoting high standards of regularity, propriety and accountability; securing an efficient market in financial services and banking with fair and effective supervision; arranging for cost effective management of the government's debt and foreign currency reserves and the supply of notes and coins; promoting international financial stability and the UK's economic interests and ideas through international cooperation as a way of increasing global prosperity including seeking to protect the most vulnerable groups."

Sweden: "...to create as much welfare as possible by promoting high and sustainable economic growth and employment, welfare that extends to everyone, and stable resource utilisation."

New Zealand: "To address fiscal sustainability, governments must: achieve and maintain prudent public debt levels; ensure that, on average, Crown operating expenses do not exceed Crown operating revenues; achieve and maintain levels of Crown net worth to provide a buffer against shocks; manage fiscal risks facing the Crown prudently; consider the likely impact of fiscal strategy on present and future generations. To address economic stability, governments must: have regard to the interaction between fiscal policy and monetary policy. To address fiscal structure, governments must: when formulating revenue strategy, have regard to efficiency and equity, including the predictability and stability of tax rates; ensure that the Crown's resources are managed effectively and efficiently."

[32]This list draws on web pages from the U.S. Department of the Treasury (2007, 2015), HM Treasury (2009a,b, 2014), Swedish Government (2011), New Zealand Treasury (2003), New Zealand Government (2015), Australian Treasury (2008), Swedish Ministry of Finance (2008).

Various Governments: "...improve living standards; promote a sound macroeconomic environment; reduce labor market exclusions; encourage global economic growth; predict and prevent economic and financial crises; deliver conditions for business success; combat climate change; reduce poverty at home and abroad; equalize income distribution; build infrastructure; reduce smoking; minimize deadweight losses."

Whereas monetary policy objectives are narrowly focused and, for the most part, time-invariant, fiscal policy objectives cover tremendous ground and can vary with the government in power. Having many objective, whose internal consistency is unchecked, is equivalent to having no verifiable objectives.[33] While this is to be expected in democratic societies in which fiscal policies are highly politicized, it makes it quite difficult to hold fiscal decision makers accountable for their actions. A clear message from the vast list of stated fiscal objectives is that the connection between them and optimal fiscal policy exercises is, at best, tenuous.

A large fraction of optimal policy papers—including by the present author—solve an uninteresting problem. They posit a representative-agent model and then seek to choose policies to minimize fluctuations around a steady state—efficient or not—subject to consumer optimization, budget constraints, and market clearing. Lucas (1987) taught that the welfare gains from eliminating business cycle fluctuations in consumption are tiny, a quantitative result that extends to recent new Keynesian models. Despite this, many researchers in academia and at central banks continue to treat central banks as if they are solving this optimization problem.

I think it's clear that fiscal authorities are not solving a problem that looks anything like this canonical optimal policy problem. Aside from ensuring solvency and providing some automatic stabilizers, it's not obvious that fiscal authorities are solving *any* macroeconomic problem. Instead, fiscal choices appear to be driven by distributional considerations—income and wealth distribution, tradeoffs between supporting the aged and investing in the young, distortions induced by tax rates that land differentially on agents, and so forth. I have nothing to add to the distributional aspects of fiscal choices.

But I do want to raise the question of whether we can create an institutional environment in which fiscal policy can contribute to macroeconomic stabilization. At present, this doesn't seem to be the case. Sovereign debt troubles in the GIIPS countries have been used as an excuse to consolidate in *all* Euro Area countries, even ones that can't see their fiscal limits with a telescope. Arbitrary targeting rules for net lending or government debt and constitutional requirements to balance budgets have been adopted without much reference to macroeconomic objectives. What are the opportunity costs of such stringent rules?

[33] Leeper (2009, 2011) discuss the difficulty of anchoring fiscal expectations in an environment with time-varying and unverifiable fiscal objectives.

4.2 SOCIAL CONTRACTS

Modern societies are grounded in social contracts between the people and their government. It is the fulfillment of these contracts by both parties that hold societies together. To an extent that is underappreciated, fiscal policies are an essential aspect of social contracts. After all, through taxation, the people have acceded to turn over resources to the government. Of course, the contract specifies what the people receive in exchange for those resources.

Social contracts in many countries are under threat. The kinds of promised expenditures that underlie explosive debt projections in the United States and nearly every other advanced economy are being renegotiated. At the same time, investments in infrastructure and education that would benefit future workers are being reduced to accommodate payments to the elderly. Our societies do face long-run fiscal stresses. Those stresses have been met with too much political vitriol and too little economic analysis.

Alternative resolutions to long-run fiscal stress need to incorporate the potential costs of breaking or substantially altering the social contract. These costs are not typically embedded in formal models, but they are foremost in the minds of policymakers. Useful analysis will bring those concerns explicitly into the calculations.

Okun's (2015) classic essay on the tradeoff between equality and efficiency is a good place to start to think about how to bring the idea of social contracts into fiscal analysis. He points out that American society chooses to accept "far more inequality in the distribution of its economic assets than in the distribution of its sociopolitical assets [p. 118]." And a major cost of equalizing incomes and wealth is the sacrifice of some economic efficiency. Okun wrote this in the mid-1970s after two decades with little change in income distribution. As Picketty and Saez (2003) document for the United States and Alvaredo, Atkinson, Piketty, and Saez (2013) show for Australia, the United Kingdom, and Canada, the share of income going to the top one percent has followed a U-shape over the past century.[34] This shift in income distribution raises the question of whether the (implicit) social contract that Okun describes will begin to fray. Contracts are more likely to fray once we recognize that the potentially large fiscal changes to address long-run fiscal stresses will probably affect the lower deciles of the income distribution disproportionately.

5 CONCLUDING REMARKS

This is a daunting research agenda. But it is daunting only because fiscal analysis is darned hard. And the analysis is hard because fiscal actions affect every aspect of an economy and fiscal decision making is complex.

Much existing fiscal analysis is less helpful than it could be. This sad state of affairs is due in

[34] Data underlying these results are updated and available at https://eml/berkeley.edu/~saez and http://www.wid.world. Alvaredo, Atkinson, Piketty, and Saez (2013) point out that the pattern of income inequality is more L-shaped in continental Europe and Japan.

large part to the massive underfunding by governments of fiscal analysis. Central banks the world over have research staffs who are encouraged to make original contributions that are published in professional journals. Few ministries of finance have made similar investments. Fiscal policy councils, which have the potential to make valuable contributions to policymaking, are typically similarly underfunded and cannot maintain research staffs. Even large "fiscal councils," like the U.S. Congressional Budget Office, claim to have insufficient resources—and the remit—-to engage in original research. They also seem unable to incorporate the insights that academic research has to offer, as section 2.1 argues.

Although high-quality analysis does not seem to underlie macroeconomic fiscal choices, as it often does for monetary policy, there is reason for optimism. All of the *desiderata* that I list for useful fiscal analysis appear in one form or another in the academic literature. Over time they will be increasingly integrated into single frameworks to permit the kind of careful analysis that fiscal choices deserve.

Fiscal councils, even underfunded ones, can contribute to accelerating this process. Councils facilitate dialog between academic economists and policymakers. They can also encourage the use of frontier research methods to address practical policy problems. Compared to just a decade ago, the level of fiscal discourse in some countries operates on a higher intellectual plain. These are promising developments that confront the intrinsic difficulties in fiscal analysis to yield fresh policy insights.

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