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Secular Stagnation, Debt Overhang and Other Rationales for Sluggish Growth, Six Years On

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ABSTRACT

There is considerable controversy over why sluggish economic growth persists across many advanced economies six years after the onset of the financial crisis. Theories include a secular deficiency in aggregate demand, slowing innovation, adverse demographics, lingering policy uncertainty, post-crisis political fractionalization, debt overhang, insufficient fiscal stimulus, excessive financial regulation, and some mix of all of the above. This paper surveys the alternative viewpoints. We argue that until significant pockets of private, external and public debt overhang further abate, the potential role of other headwinds to economic growth will be difficult to quantify.

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More than six years after the onset of the financial crisis, there is considerable controversy over why growth remains so sluggish across many advanced economies. Theories include a sustained lack of aggregate demand ("secular stagnation"), slowing innovation (implying a downward shift in aggregate supply), adverse demographics, lingering uncertainty, post-crisis political fractionalization, debt overhang, insufficient fiscal stimulus, and excessive financial regulation.

In many ways, the deep recession and slow recovery has appeared in the mold of previous recessions following deep systemic financial crises, with many countries broadly tracking the quantitative markers for depth and duration detailed by Reinhart and Rogoff (2009a,b). These include markers for housing, equity markets, unemployment, and public debt accumulation, as well as for the steep decline and subsequent slow recovery in output growth. However, long-term secular challenges may have begun in advanced economies even before the crisis; it therefore is unclear where the level and growth rate of the economy will eventually settle down since underlying secular factors may still be at play, although obscured by the events of the financial crisis.[1]

Given the wide range of opinion on growth underperformance, the diverse range of opinions on how policy should be tuned is hardly surprising. There are some areas of broad agreement, including the need for greater public spending on high-return infrastructure projects and on improving the quality of education at all levels. There is, however, far less agreement on debt restructuring, fiscal stimulus, redistribution and structural reform. Hence,

[1] The fact that growth had already moderated prior to the crisis is not at all unusual, either, as Reinhart and Rogoff (2008) show.

understanding the fundamental drivers of the economic slowdown may prove crucial in evaluating potential policies.

In the first part of this paper, we review a wide range of alternative explanations for lingering slow growth in many advanced economies. In the following section, we proceed to ask whether remaining post-financial crisis debt overhang (including public, household, corporate, financial and external debt) might be continuing to impede recovery, and whether the time to recovery is prolonged by a negative feedback loop between debt overhang, deleveraging and growth.[2] We review evidence that is suggestive of the importance of debt overhang.

In the final section, we survey the literature on whether governments have historically raised primary surpluses (reduced deficits) in response to large sudden debt buildups, particularly those accumulated in response to wars or deep systemic financial crises. Although interpretation of the primary evidence is made difficult by the fact that major events are relatively infrequent and clustered across countries, earlier researchers (e.g., Bohn 1998, 2008, and Mauro et al., 2013) have interpreted the results as consistent with the hypothesis that, controlling for wars and recessions, countries have tended to run larger primary surpluses (smaller deficits) when public debt levels are high. We extend these results to incorporate more recent data, finding that the reaction coefficient of the primary surplus to public debt falls considerably, although incorporating bank loans (in line with Obstfeld 2013) gives a larger reaction to total debt for some countries. The results are generally suggestive of fiscal prudence, which provides an intuitive mechanism for the fundamental channel through which

[2] We build particularly on recent contributions by Buttiglione, Lane, Reichlin and Reinhart (2014) and the IMF (including the April 2014 World Economic Outlook, Global Financial Stability Report, and Fiscal Monitor).

debt affects growth: in the course of deleveraging, countries may eventually opt to lower the trajectory of expenditures or raise the trajectory of taxes., either of which may have negative impact on economic growth. To the extent that deleveraging has been a common experience across advanced countries post-financial crisis, fiscal reactions to debt may be important in understanding the subsequent slowdown of growth.

In the conclusions, we suggest that, even if the period of fierce deleveraging is past, the post-financial crisis debt overhang may still be weighing on the recovery, and hence it is difficult to definitively discern the effects of different long-term trends on growth.

1. Explanations for Slow Post–Financial Crisis Growth

A variety of explanations have been offered for why post–financial crisis growth has been exceptionally low.

Secular Deficiency of Aggregate Demand

In a speech to an International Monetary Fund conference, Summers (2013) argued that today's advanced-country growth suffer from a secular deficiency in aggregate demand, dating back to at least the early-2000s era of the Greenspan "conundrum" (of why long-term rates were so low.) Summers noted that US long-term rates remained low even as the economy was apparently overheating from the credit boom that eventually resulted in the financial crisis.[3] There are indeed a number of plausible reasons why the global aggregate demand curve might

[3] It is not clear if the low pre-crisis real interest rates were necessarily such a puzzle. Before the crisis, the United States was borrowing heavily from the rest of the world, with its current account deficit reaching 6% of GDP at times. The role of foreign lending in keeping interest rates low is exactly what Ben Bernanke (2005) pointed to in his famous "global savings glut speech." Bernanke, of course, was following a framework first laid out by Dooley, Folkerts-Landau and Garber (2004).

have been trending downward. Growing inequality of income, at least within countries, implies reducing relative spending power for low-income households with high propensity to consume. Conversely, *increasing equality* across the world as a whole, powered by the transformation of India and China, might have also lead to a downward shift in demand, as fast-growing countries with underdeveloped capital markets spin off savings to diversify risk. Indeed, the IMF (2014a, ch. 3) concludes that fast growth in emerging markets was a major explanation of low interest rates before the crisis, both because of lower aggregate demand, and due to the official sectors' strong portfolio preference for safe assets.

Secular Stagnation Due to Slowing Innovation

There are limits to how far one can push the idea of aggregate demand driving long-term growth, since in the long run, output is determined by aggregate supply. Indeed, in the canonical Solow growth model, a higher propensity to save pushes down interest rates, thereby leading to higher investment and ultimately higher per capita income. Delong and Summers (2012) argue that hysteresis effects on employment may translate slow aggregate demand into lower job skills and a fall in long-run supply. Whether this argument is empirically plausible is unclear, especially since there is the counterbalancing consideration that recessions breed Schumpeterian creative destruction, which strengthens the underlying economy.

If aggregate supply growth is truly falling, a more fundamental explanation relies on the assumption that the technological frontier is no longer expanding as fast as it once did. Therefore productivity growth, the ultimate engine of per capita output growth, is fading.

The innovation stagnation explanation of slow advanced-country growth has been championed independently by Robert Gordon (2012) and by Garry Kasparov and Peter Thiel

(2012). Their argument goes beyond the usual one (e.g., David 1991) that individual transformative technologies have a finite life cycle. Instead, they advance the stronger proposition that the cumulative growth effect of the computer/internet revolution is likely to prove far more modest than that of earlier transformative technologies such as the steam engine, running water and electricity.

The Gordon-Kasparov-Theil argument that innovation may have run its course is intriguing and may be right, but there are reasons to be skeptical. Mokyr (2013) argues that the fundamentals for innovation are as strong as ever, including the rate of development of new scientific instruments, access to technology, and the strength of pro-growth institutions. Brynjolfsson and McAfee (2011) argue that even if the recent slump could be attributed to the lag in adoption of technologies into the economy, the problem need not persist.

Perhaps a more plausible twist on the innovation dilemma is offered by Jorgenson, Ho and Samuels (2014), who point out that for the innovation leader, the United States, labor quality is no longer rising as rapidly as it once was. An implication is that even if underlying scientific innovation is evolving as rapidly as ever, the ability of the workforce to adopt and implement new technologies may not be keeping pace.

One piece of evidence that might be interpreted as broadly consistent with the sluggish innovation hypothesis is the sharp global fall in investment since the financial crisis. Indeed, the IMF (2014a, ch. 3) points to a sharp drop in global investment as being the driving force behind the post-crisis sharp drop in global real interest rates that were already low before the crisis.) Nevertheless, for the moment, Occam's razor would still point to the economic and financial disruptions of accompanying the financial crisis itself as the more likely explanations of low

investment, especially given the crisis otherwise broadly follows the Reinhart-Rogoff markers for many countries, particularly the United States .

Demographics

Declining birth rates are another important supply-side factor that may have afflicted post–financial crisis growth (Stock and Watson 2012, Congressional Budget Office 2014.) Slowing population growth affects medium-run income growth for many reasons, particularly in a demographic transition in which there may temporarily be a disproportionately large number of retired persons. The period of transition may be characterized by a reduced influx of new workers coupled with the increasing costs of old-age retirement and healthcare needs.

The usual thinking (oft-mentioned by Chairman Greenspan, for example) is that long-anticipated demographic changes cannot possibly be the explanation of the relatively rapid declines in global real interest rates before the crisis, much less the sharp drop afterwards. Demographic trends are highly predictable and aging populations should come as no surprise to markets.[4]

This conventional argument that demographics cannot be the major driver the low real interest rate "conundrum" is a good one, but far from decisive. Many modern economic models feature multiple equilibria that can be quite fragile. Thus, it is might be possible to develop a framework in which low population growth exposes the global economy to a shift in sentiment that could lead to self-fulfilling drops in global interest rates and investment. Relatedly, demographic shifts may lead to political shifts that reinforce the growth effects of aging rather than ameliorate them. For instance, the relatively rapid and severe demographic shift that

[4] It might be noted that if aging populations are truly a major driving force of slowing growth, this is perhaps one of the only rationales where the case for greater infrastructure investment becomes somewhat less compelling.

Japan experienced is considered by some researchers to be a central turning point underlying Japan's lost decade[5]; a demographic shift could similarly be potentially be quite important in aging Europe today. While further research is needed, many models point toward the importance of demographic shifts in contributing to slowing economic growth trends.

Heightened Policy Uncertainty

Baker, Bloom and Davis (2013) suggest that heightened political uncertainty can hold back investment and growth. Their empirical work accords well with the political economy analysis of Frieden (2014), which analyzes a long cross-country history of post-financial crisis episodes. Frieden argues that political paralysis often follows financial crises as the conflict of various parties over how to apportion the losses generates even greater deadweight loss. Mian, Sufi and Trebbi (2012) similarly find that political fractionalization increases after financial crises. The idea that the financial crisis might have produced greater political polarization and therefore policy paralysis has some appeal for both the case of the United States and continental Europe. Whether policy uncertainty remains as high today as it was two years ago is unclear—Baker, Bloom and Davis's index indicates that whereas uncertainty has decreased since the height of the crisis, the world has yet to hit pre-crisis levels.

Slow Growth Due to Policy Errors

So far we have discussed a variety of explanations for slow growth that trace to technology, preferences, and uncertainty. Some commentators, however, place a significant share of the blame on policy decisions that, according to these commentators, made the post–financial crisis recession far deeper than it had to be. Given the lack of counterfactuals, these

[5] See, for example, the literature discussed in Shirakawa (2012).

are arguments are difficult to evaluate.[6] It is also dangerous to assess policies on an ex post basis without taking into account ex ante risks about which policymakers might have been legitimately concerned, but that did not materialize. For example, at various stages of the crisis, the risk of another bank failure and the collapse of the euro were concerns that weighed heavily on policymakers. Of course, even where past policies might have represented a balance of growth and risk, the debate is still relevant to policies going forward.

For example, some critics argue that an overshooting in post-crisis financial sector regulation forced many financial institutions to aggressively shrink their balance sheets, shutting out many weaker borrowers, particularly small and medium size businesses. This argument is difficult to assess in part because lending to small and medium-size businesses tends to suffer in normal recessions as well. These firms are more reliant on banks and do not have the same ability to tap capital markets as large firms. Nevertheless, a number of researchers, including De Bondt, Maddaloni, Peydró and Scopel (2010), have argued that the regulatory demand for higher bank capital combined with tightening credit standards has been a major obstacle to the resumption of normal growth in Europe.

Another explanation of slow growth is excessive fiscal austerity. This is a complex and often highly polemic critique. For one thing, it is absurd to lump the periphery of Europe, which lost market access, with countries such as the UK, Germany and the United States, which enjoyed unfettered access. Governments in the periphery of Europe engaged in austerity programs for the usual reasons that face IMF program countries when they face sharply reduced market access and official rescue funds are insufficient to completely bridge the gap.

[6] Summers (FT, 2012) argues compellingly that the UK's approach to closing its deficit over time constituted a real world natural experiment in austerity, the eventual outcome of which ought to affect economists' priors.

Of course, the constraints that periphery countries faced were profoundly affected by Northern Europe's reluctance to allow restructuring of private debts, even in cases where sustainability was deeply in question. Even where official funds were injected, they often ended up largely being used to pay off short-term private creditors, rather than provide the problem debtor with short-term fiscal space. (Perhaps a better approach might have been to, at a minimum, force private creditors to roll over short-term debt and extend maturities.) In countries that retained market access, the issues are entirely different, albeit far more complex than the polemic debate allows. The case of the UK, in particular, highlights potential complexities, with the country's strong rebound defying many dire predictions.

It is somewhat puzzling that countries with market access were not able to engage in more aggressive infrastructure spending, given low interest rates and a presumably low cost to hiring unemployed construction workers. Aside from the apparently attractive cost-benefit analysis, there is a fairly convincing theoretical argument that fiscal multipliers ought to be larger than usual when monetary policy is constrained by the zero bound, though admittedly the empirical evidence on magnitudes is thin, and one suspects that the exact form of the government spending or tax cuts is quite important (as emphasized in Barro's 1997 textbook treatment of fiscal policy). More generally, standard Keynesian analyses fail to take into account risk management issues that were at the forefront of policy in the period immediately following the crisis. By many measures, the advanced countries as a whole engaged in what has been the largest peacetime stimulus in history. Of course, there is still a legitimate debate on whether it should have been larger, even if the implication is long-term expansion of the size of government (if it later proves politically difficult to reduce spending once it has increased).

Indeed, points of view on fiscal policy seem to be heavily colored by views on the optimal size and role of the government. Those who view government spending as too low anyway naturally do not worry that temporary government expenditure hikes sometimes become permanent.

Rightly or wrongly, many governments were concerned with rapid large buildups.[7] As we shall see in section 3 of this paper, highly indebted governments arguably reacted in a similar way to their predecessors, with a view to having a long-run exit plan from stimulus, and to eventually restoring fiscal space. They might have valued preserving fiscal space so as to retain the option value of being able to issue large amounts of government debt in response to unforeseen catastrophes, as often occurred in the past (per the discussion in Reinhart, Reinhart and Rogoff, 2014). Whether such efforts were misguided or unnecessary is far from obvious. One can argue that Germany might have done more for its neighbors by undertaking a much more aggressive stimulus policy, though simulation analyses do not necessarily suggest large spillover effects of German fiscal policy to the periphery of Europe (IMF, 2013b). But on the other hand, it is not at all clear how much better Germany's own long-term growth performance would have been. We have already reviewed DeLong and Summers' argument that any attempt to moderate the post-crisis government spending surge is counterproductive as long as growth remains weak.

Of course, on the other side of the debate is Alesina and Ardagna (2009), who argue that in a country with an overly large government, spending consolidation can actually be pro-

[7] Obviously, there is no a priori reason to view debt buildups as pro-poor and debt workouts as mainly bad for the rich, as some polemicists seem to argue. Who benefits from debt buildups depends on how tax cuts and expenditure hikes are allocated, and who loses from high debt similarly depends on policy. Indeed, as debt crises tend to be catastrophic for poverty, it is hard to argue that taking into account debt buildup risks is somehow anti-poor.

growth. Relatedly, Cecchetti et al (2011) argue that because very high public debt levels appear to be associated with lower growth, governments should aim to reduce their debt/GDP ratios where possible. Our own long-standing view is that during a deep recession, it is very hard to contemplate policies aimed at short-term debt stabilization, must less reduction. However, it is more than reasonable for governments to lay out a very long-term exit strategy.[8]

Obviously, properly designed structural reforms are typically very helpful for a country emerging from a financial crisis, though at the same time ill-considered policy changes can be counter-productive. [9] Cole and Ohanian (2000), for example, argue that New Deal policies adopted during the Great Depression to weaken anti-trust law might well have led to a marked decline in long-run trend output.

Summing up the diverse range of ideas presented in this section, we can say that there is a surplus of plausible explanations for sluggish post–financial crisis growth, and a paucity of decisive evidence. We next turn to debt overhang and other post-crisis issues as a possible cause of slow post-crisis growth.

2. Debt Overhang Six Years after the Financial Crisis

In our view, the leading candidate explanation for why growth has taken so long to normalize is that pockets of the global economy are still experiencing the typical sluggish

[8] Reinhart and Rogoff (2010a,b), and Reinhart, Reinhart and Rogoff (2012) do not contain any policy recommendations, and do not comment in any way, explicitly or implicitly, on the policy recommendations that are made by Alesina and Ardagna (2009) or Cecchetti et al (2011). Reinhart and Rogoff (2014, presented 2012) instead argue for debt restructuring and other heterodox policies where public and or private debt levels are unsustainable.)

[9] There are admittedly examples where structural reforms can be counterproductive in the short run by lowering long-run price expectations (e.g., Eggertsson, Ferrero and Raffo 2013), though it is not clear that these are empirically compelling, or that the short-run costs outweigh the long-run gains in any event.

aftermath of a financial crisis (Reinhart and Rogoff, 2009a,b).[10] The experience in advanced countries is certainly consistent with a great deal of evidence on leverage cycles, for example the empirical work of Schularick and A. Taylor (2012), who examine data for a cross-section of advanced countries going back to the late 1800s and find that the last half-century has brought an unprecedented era of financial vulnerability and potentially destabilizing leverage cycles. Moreover, focusing on more recent events, Mian and Sufi's (2014) estimates suggest that the effects of U.S. household leverage might be large enough to explain the entire house price decline and decline in durable consumption.

The idea that high leverage can be a harbinger of underlying forces working against the health of the economy dates back to at least Fisher's 1933 theory of debt-deflation. Fostel and Geanakoplos (2008) build a theoretical model in which increases in credit supply can directly increase asset prices, which would then create a potentially important—if unhealthy—feedback cycle. Others have also recently developed work on the role of leverage in worsening financial crisis outcomes; while varied in approach and focus, most if not all this work has pointed to the importance of limiting leverage in stabilizing the macroeconomy.

Given the potential role of leverage in financial crises, one might suspect that an important marker of a complete end to the crisis is a significant unwinding of the excess pre-crisis leverage. Indeed this is exactly what Schularick and Taylor (2012) and Reinhart and

[10] See also Cerra and Saxena (2008) who focus on output across a large mix of countries. Reinhart and Rogoff's historical analysis, while suggestive that credit-driven housing booms and busts have played an important role in post–World War II systemic financial crises, should not be interpreted as demonstrating that financial crises are causal. Indeed, they also show that initial growth slowdowns may occur in the run-up to the crisis, although the exact timing is difficult to establish. Presumably, however, a central factor in boom and bust is the run-up of private leverage that ultimately collapses.

Reinhart (2011) find: leverage tends to fall significantly before the crisis ends, often unwinding entirely.

Figures 1 to 3 show the striking growth of public, private and external debt burdens from (at least) 1970 to 2010. As Reinhart and Rogoff (2010a,b) suggest and as Reinhart, Reinhart and Rogoff (2012) strongly underscore, these debt burdens need to be analyzed in an integrative manner in order to assess the extent of an economy's vulnerability to crisis or, in the case of advanced economies, the impact of higher debt on potential growth. Indeed, Bornhorst and Arranz (2014) find that the impact of debt on growth in any given sector—whether it is government, household, or corporate—is worsened when other sectors also hold high debt. [11] Therefore, an economy's overall debt level and composition matter, both because private defaults can create contingent liabilities for the government and because there can be amplification mechanisms across sectors that exacerbate the negative effect of debt on growth. (For example, if private sector defaults lead to weaker growth, this affects the sustainability of government debt; if households are suffering debt problems, this can lower demand and can lead to strains in corporate debt, etc.).[12]

Figures 1 to 3 are suggestive of potential worries of debt as a whole across advanced countries. The average statistics across 22 advanced countries suggest that recent years have seen a sharp increase in public debt, private domestic credit, and external debt, all as a

[11] As Reinhart, Reinhart and Rogoff (2012, 2014) emphasize, the correlation between debt and growth after wars is very different because of postwar mobilization, the introduction of wartime technological innovations into civilian goods, high returns to postwar reconstruction, etc.

[12] Reinhart and Rogoff (2010b) point out that a big difference between the debt overhang after World War II and today is the enormous increase in private sector debt over the interim. As they clearly state in their analysis of public debt overhang effects, a differences in averages (over growth rates) does not imply a sharp break any more than a speed limit of 55 miles per hour implies that cars going at 54 mph are safe and at 56 mph will have accidents, or that persons with a cholesterol level of 201 are far more likely to have heart disease than persons with a cholesterol level of 199.

percentage of GDP. Sector-level data on the country level demonstrate the gravity of the situation. Figure 5 looks across a range of advanced countries, disaggregating debt into public debt, household debt, non-financial corporate debt, and financial sector debt. Particularly in the Euro area, many of these figures indicate that debt levels remain elevated relative to their 2008 levels. Gross government debt has risen for our entire sample. Financial institution debt has actually risen for Japan and the Euro area since 2008. In many countries, households maintain as high debt levels as they did before the crisis, with only the US (and to a lesser extent the UK) experiencing a significant household deleveraging. Overall, across the board, the figures indicate that high leverage is still a headwind six years after the crisis, and the potential issues are not confined to just one sector or one country.

Figure 6, based on IMF (2014b), illustrates that there remain a large number of vulnerabilities across different sectors and different countries, according to the IMF's assessment.[13] While financial sector leverage has generally improved, it has come at the cost of increasing public indebtedness in recent years, often to peak levels. Corporate debt overhang in some countries (notably in Europe) has resulted in a growing stock of nonperforming loans, which in turn limits banks' profitability and capacity to provide credit, which in turn proves detrimental to the overall financial sector. Corporate debt remains high – and in many cases has increased in recent years – suggesting that the effects of debt overhang may be far from over. Especially with government debt continuing to trend upward, there are reasons to worry that the consequences of persistent levels of debt have yet to fully manifest in the economy.

[13] The IMF (2014b) denotes potential areas of concern by calculating the highest quartile of debt levels in the cross-country sample since 2009. These potential areas of concern are denoted on the figure by a red box.

Many factors complicate the interpretation of summary measures of overleveraging. First, private debt measures have steadily trended upwards since World War II, and now six years after the financial crisis, it is unclear what a return to "normal" would be. The sustained low level of global interest rates reduces carrying costs, though at the same time slow growth undercuts debt sustainability. Any assessment of debt overhang or the degree of overleveraging necessarily involves judgments on time paths and risks surrounding growth and interest rates. For example, given the relatively recent experience of the financial crisis, credit may still be constrained by the risk of a return to higher interest rates in the future, a risk that could certainly materialize despite low recent asset price volatility.[14]

The IMF (2014b) assessment is sober, but the assessment of Buttiglione, Lane, Reichlin and Reinhart (2014) is darker. These authors arrive at similar overall assessment of deleveraging progress to date, but have a grimmer take on the prospects for further deleveraging going forward. Their basic point is that many countries are potentially caught in a vicious circle between debt overhang and deleveraging. Debt overhang implies slower growth, which makes deleveraging more difficult, feeding back into continued slow growth. Buttiglione et al. point to many sectors where growth considerably lags interest rates on debt, implying that further adjustments of some form may be needed to achieve sustainability.[15]

[14] Buttiglione et al. offer an analysis in the spirit of Fostel and Geanakoplos (2008) on the dynamics and consequences of debt and deleveraging. The buildup of leverage is sparked by innovation which induces individuals and firms to borrow against their future income to fuel their increased consumption and investment. Their fundamentals-based optimism fuels growth and asset markets. At some point, however, the innovation is absorbed into the economy, and if the optimism does not recede in parallel, the economy becomes overly leveraged relative to its growth prospects, and the decrease of credit necessary to restore a sustainable equilibrium has the potential to lead to crisis.

[15] If deleveraging can be painful, why don't governments establish checks and balances against "over-leveraged" sectors? The problem is that the cycle can be very difficult to judge since, for example, creditworthiness depends on growth prospects, and yet growth prospects depend on the accessibility of credit. A country is in a better

Might Rich Countries' Deep Pockets in Crisis Exacerbate the Subsequent Recession?

To the extent that debt overhang is impeding faster growth, one might ask whether lagging post–financial crisis growth is a cost of the bailout policies that helped minimize the risk of a much deeper initial recession. It is interesting to contrast the experience of rich countries and emerging markets. Reinhart and Rogoff (2009b) find that in a surprising number of respects, the aftermath of financial crisis in advanced countries is similar quantitatively to emerging markets across a number of macroeconomic indicators. However, the average cumulative decline (from peak to trough) in output is lower in advanced economies. One might conjecture that because advanced countries have a greater capacity to backstop the private sector, default rates are lower, but then there is less workout of debt overhang. The Asian financial crisis of 1997–98 is the canonical example of a steeper fall but a more V-shaped recovery.

Policies to achieve smooth private sector deleveraging are beyond the scope of this paper. Mian and Sufi (2014) survey a broad range of ideas, arguing in favor of great resort to write-downs. Rogoff (2008) argued at the outset of the crisis for temporarily higher inflation targets, in part to facilitate private sector deleveraging (six years later, such a policy would likely be far less effective).[16]

3. Deleveraging government debt: theory and empirics

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position to handle the risks posed by the credit cycle when its outstanding obligations are of long maturity, denominated in its own currency, issued on its own jurisdiction, and owned by nonresidents with little influence in the political process. We might add that debt markets would be far more robust if a far greater share of debt were state contingent, for example mortgage debt indexed to general house price levels, country debt indexed to growth, etc.

[16] Rogoff (2014) considers the possibility of phasing out physical currency and replacing it with an entirely electronic currency, which would eliminate the zero bound that now constrains monetary policy from cutting interest rates below zero to fight deflation.

How have governments historically dealt with high debt levels? During a financial crisis, of course, government debt deleveraging is seldom desirable, even if it were feasible.[17] Governments typically can and do allow public debt to soar after a financial crisis; Reinhart and Rogoff (2009a,b) show that for earlier postwar systemic financial crises, public debt increased by an average of over 80% within three years, a mark hit by many that experienced deep systemic financial crisis in the recent Great Recession, including the United States, the United Kingdom, and several other countries. There is a question, however, of how governments react over the longer run, as they delever to possibly reserve fiscal space for future crises, wars and catastrophes. Some have argued that advanced country governments can rely on having growth outstrip interest payments, so that a patient government can simply wait for debt to GDP ratios to fall.[18] Understanding how governments react to debt is central in understanding the overall potential for debt overhang in the economy in the very long run, since government reaction to debt serves as a link from high debt to potentially decreased expenditure, possible financial repression, and other factors that may contribute further to decreased growth. Of course, government reaction functions presumably allow for significant fiscal expansion during deep recessions and spells of high unemployment, where fiscal space permits.

A number of researchers, including Bohn (1998, 2008), Mendoza and Ostry (2008), and Mauro et al. (2013) have argued that in the past, advanced country governments have not

[17] We note again that Alesina and Ardagna (2009) and Cechetti et al (2011) have argued that in some cases austerity may be pro-growth, whereas Reinhart and Rogoff (2010a.b) and Reinhart, Reinhart and Rogoff (2012) focus exclusively on long term post-crisis debt overhang, public, private, external and pension.

[18] The menu of options available to governments that wish to pare down high debt levels is analyzed in Reinhart and Rogoff (2014) and Reinhart, Reinhart and Rogoff (2014). The first paper shows that advanced countries have in the past adopted many heterodox strategies for dealing with high debts, including inflation, outright default and financial repression. The second extends the analysis to consider other options for dealing with high debt, including passively waiting for a period of sustained high growth in excess of the interest rate.

waited out high debt levels – in the sense of passively allowing economic growth to decrease the stock of debt relative to GDP – but rather have reacted proactively. This has implied either bringing down debt through primary surpluses, or by using heterodox measures such as default, inflation and financial repression.

The canonical model can be traced to Bohn (1998) who explores an empirical model motivated by Barro (1979). Bohn starts from the observation that, in practice, it is very difficult to test for the stationarity of government debt-to-GDP ratios because the data is dominated by debt buildups during the world wars as well as the occasional deep systemic financial crisis. Figure 4 shows the debt/GDP ratio for the United States, marked by huge debt buildups surrounding WW I and WW II and, more recently, the Great Recession. Formal tests for stationarity, indeed any econometric tests, are so dominated by the fluctuations around the wars so as to be very difficult to interpret. The same problem plagues similar tests for other advanced economies. Bohn's approach is to estimate an equation

$$s_t = \rho d_t + \alpha_0 + \alpha_G \cdot GVAR_t + \alpha_Y \cdot YVAR_t + \varepsilon_t$$

where s_t is the surplus/GNP ratio, d_t is the debt/GNP ratio, $GVAR_t$ is some measure of expenditure deviation from trend, and $YVAR_t$ is the output gap.[19]

In Barro's tax-smoothing model, the path of income and government spending are treated as exogenous, and it is assumed that, in any given period, tax distortions—which represent losses to output—are proportional to the income tax rate. The government chooses the path of taxation to minimize the present value of distortions, which involves smoothing tax

[19] Bohn (1998) uses the GVAR and YVAR variables given in Barro (1986), but Bohn's (2008) paper instead uses the deviation of military expenditure from its trend value (as estimated by a rolling regression that accounts for two lagged values of military expenditure) and the deviation of output from its Hodrick-Prescott–filtered series.

rates over time. The basic model yields some strong predictions, which are most easily described under the assumption that the interest rate at which the government borrows is equal to the growth rate.[20] In this case, the government will run deficits whenever Y-G is below its "permanent" value, where we use "permanent" in the sense of Milton Friedman's permanent income model. When Y-G is exceptionally low because of massive wartime military buildup, or because of a recession or a catastrophe, the government borrows so it does not have to sharply raise marginal tax rates in a short period. To pay the resulting debt, it must raise tax rates in future periods, but by stretching the response over time, it can smooth tax distortions.[21]

When the government is *not* in the midst of deep recession or catastrophe, it is typically running a surplus because during quiescent periods Y-G is above its permanent value. This logic underlies the long-standing policy advice of the IMF and OECD that, outside exceptional circumstances, advanced countries today should avoid running sustained large deficits, because rapidly aging populations imply a potentially large future burden.

Importantly, once one controls for the deviation of Y-G from its permanent level (and other factors such as interest rate deviations, etc.), then the level of debt (relative to income) does not affect the primary balance. In the baseline case, just as in the permanent income model of consumption, shocks to government debt are permanent. Blanchard (1984), however, argues that it is unrealistic to assume that governments can tax an arbitrarily large share of

[20] Barro (1995) shows how to modify the analysis when interest rates are temporarily low (again implying a surplus), etc.

[21] Barro (2006) estimates that catastrophe probabilities for advanced economies are around 2% per annum if catastrophes are marked by a 15 percent cumulative fall in output. Barro and Ursúa (2008) look at a larger data set and use a 10 percent threshold in which case the probability of catastrophe roughly doubles.

income, so at some point a maximum is reached. This constraint in turn can give the government a precautionary motive for higher saving as debt rises relative to income.

More generally, the Barro model assumes the government faces no risk of being shut out of capital markets. In reality, especially during wars and severe catastrophes when the ability to borrow is most critical, the government may very well face upper limits on its borrowing capacity imposed by markets. The need to preserve the option value of being able to raise debt during catastrophes is another reason a government might be cautious in allowing its debt level to follow a random walk as in the baseline Barro (1979) permanent-income type model.[22]

The basic Bohn regression essentially tests the Barro permanent-income type model with the debt level added, to capture this notion that governments may wish to maintain "fiscal space". The results for the Bohn-style regression, along with an update, are reported in Table 1.

The first column reflects our take of Bohn's (2008) regression, although with some small differences, since we use calendar-year rather than fiscal-year measures. As in Bohn, the coefficient of the reaction of the primary surplus to the level of debt is approximately 0.10, reflecting that a one percentage point increase in debt (relative to GDP) results in about a 10 basis point increase in the primary surplus (also relative to GDP). Extending the sample to end in 2012 rather than 2003 as in Bohn (2008), the updated results suggest that the reaction to debt might have become more subdued in recent years. This point is clearer upon breaking the sample down into "historical" and "recent" periods: from 1793–1950, the reaction to debt was

[22] Reinhart, Reinhart and Rogoff (2014) consider the implications of precautionary saving by governments against catastrophic risk.

about 0.10 as in the original estimation, and indeed the policymakers seemed to react nonlinearly to higher levels of debt (with a significantly positive quadratic term appearing in column 5). In contrast, from 1950–2012, the reaction to the level of debt was much lower, at 0.02 (column 8), although this is driven by large outliers during the recent recession; estimation up through 2007 gives a coefficient of about 0.08, closer to the rest of the sample, albeit still suggestive of a slightly subdued fiscal reaction to debt. Of course, in such a simple regression, it is difficult to capture factors such as how, after World War II, growing pressures for social protection programs, deepening capital markets, and fading fears of conventional war might have induced governments to put less priority on maintaining fiscal space. (Obsfeld (2013) is among many who question the wisdom of taking this strategy too far.) Still, our estimates suggest that the contribution of the primary surplus to debt is significant: a decomposition of the variance of debt into its components suggests that changes in the primary surplus account for approximately one-third of the variance in debt, in line with the estimates of Mauro et. al (2013).

Mauro et al. (2013) follow Mendoza and Ostry (2008) in extending the Bohn approach to a large cross-country data set spanning more than a century. Table 2 lists our take on their core cross-country results, with countries listed at the top, for 1950-2007.[23] Like Bohn, Mauro et al. find that the level of debt exerts an influence; that is, as debt rises, governments tend to run larger primary surpluses (controlling for other factors). That, together with the fact that the longest stretches of high debt levels tend to come in the years after a major catastrophe (mainly war or financial crisis), implies that governments overall are more likely to be running

[23] We use the same data as Mauro et al and, although our overall qualitative story is similar, due to choices in modeling, such as choice of control variables and de-trending methods, our numerical results are not identical.

primary surpluses (or smaller primary deficits) when debt is high, which is consistent with the finding in most of the growth and debt literature that high debt implies lower growth.

Finally, in table 3, we include the change in leverage as an additional variable in the core Bohn regression, and in some cases (Canada, Japan, Norway, Sweden, and the US) it enters significantly with a positive coefficient. This possibly implies that governments internalize the possible costs of later bailing out the private sector. Another potential interpretation is that increases in leverage occur during good times when governments are more likely to be expanding fiscal space anyway, in which case our measured effect on leverage may simply be a metric of economic strength above and beyond what our business cycle variable captures.

Naturally, these empirics are insufficient to capture the complex nature of true fiscal reaction functions. One could imagine that governments react differently over time: sometimes by inflating away the debt; sometimes by reducing expenditures; sometimes not reacting at all—if, for example, they expect a higher economic growth rate than interest rate, or if they simply are not fiscally prudent for a particular snapshot of time. Moreover, governments may face particular political pressure to reduce their debt if their creditors view their growth trajectory as below trend. Indeed, the potential political ramifications of being fiscally irresponsible would be nearly impossible to capture in a numerical exercise: presumably the threat point of facing relatively high interest rates is an off-equilibrium path event that is therefore unobservable to the econometrician.

Nevertheless, as noted in Reinhart and Rogoff (2010b) and Reinhart, Reinhart and Rogoff (2012), the frequency distribution of debt/GDP levels across advanced countries points strongly to very high debt levels (over 90 or 100%) being outliers, especially if one accounts for

the special case of the UK in the 1800s and early 1900s (where one must take account of the direct and indirect benefits of empire) and similarly for the Netherlands during periods where it received vast revenues from its colonies in Indonesia, as documented by Madison (1989). Hence, there is evidence that debt is stationary, in the sense that high debt levels have not persisted, so debt/GDP has not historically sustained an explosive path. Moreover, the estimates of the fiscal reaction functions we have discussed are suggestive of active – and historically prudent – management of government debt. While prudent fiscal policy is necessary for long-run sustainability, of course this does not necessarily imply cutback in expenditures during recessionary periods. Rather, the level of public debt may affect the extent to which the government perceives fiscal space, with high debt corresponding with increased government aversion to increased expenditures or decreased taxes. This could be the case in the aftermath of the recent crisis: the IMF's WEO (2013a) shows that, among advanced economies, government expenditure injections after the Great Recession were rather low relative to the trend of the previous recessions (1972, 1982, 1991), although countries with more fiscal space reacted more aggressively.

More work remains to be done here, but maintenance of a "fiscal buffer" seems to offer many advantages, such as preventing the need for deleveraging in already painful times, offering capacity to backstop private and financial debt collapses, as well as allowing for opportunistic fiscal expenditures when multipliers are high.

CONCLUSIONS

There are many plausible reasons why global growth remains relatively sluggish six years after the default of Lehman Brothers. Sorting out the various theories may take another decade or more of data. Indeed, slow growth itself is hardly a fait accompli. There are conflicting signals from markets, with global stock markets seeming to embody high-growth expectations even as global debt markets appear to embody much lower ones, even adjusting for risk, liquidity and safety factors. One reason it is too soon to sort out the alternative viewpoints is simply that the pace of deleveraging remains modest or nonexistent in many sectors around the global economy, implying that debt overhang may still be a significant impediment, even if debt crisis risks have receded for the moment. Thus exploring ways to continue advancing private sector deleveraging, without excessively eroding the capacity of the public sector to backstop the system and handle catastrophes, remains an important challenge in restoring growth.

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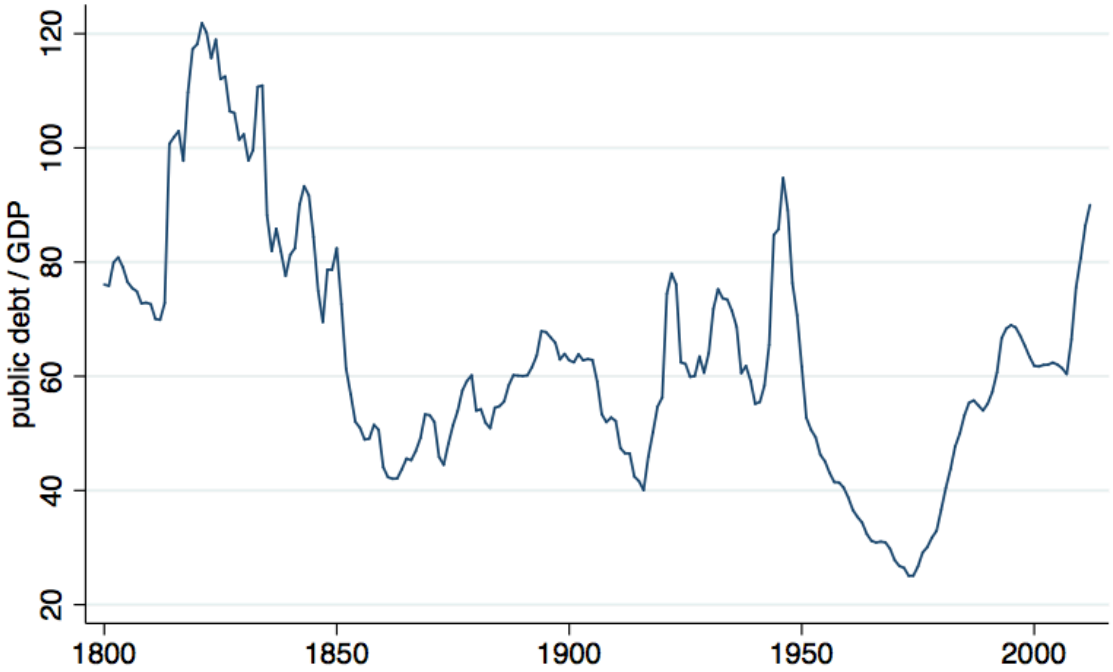
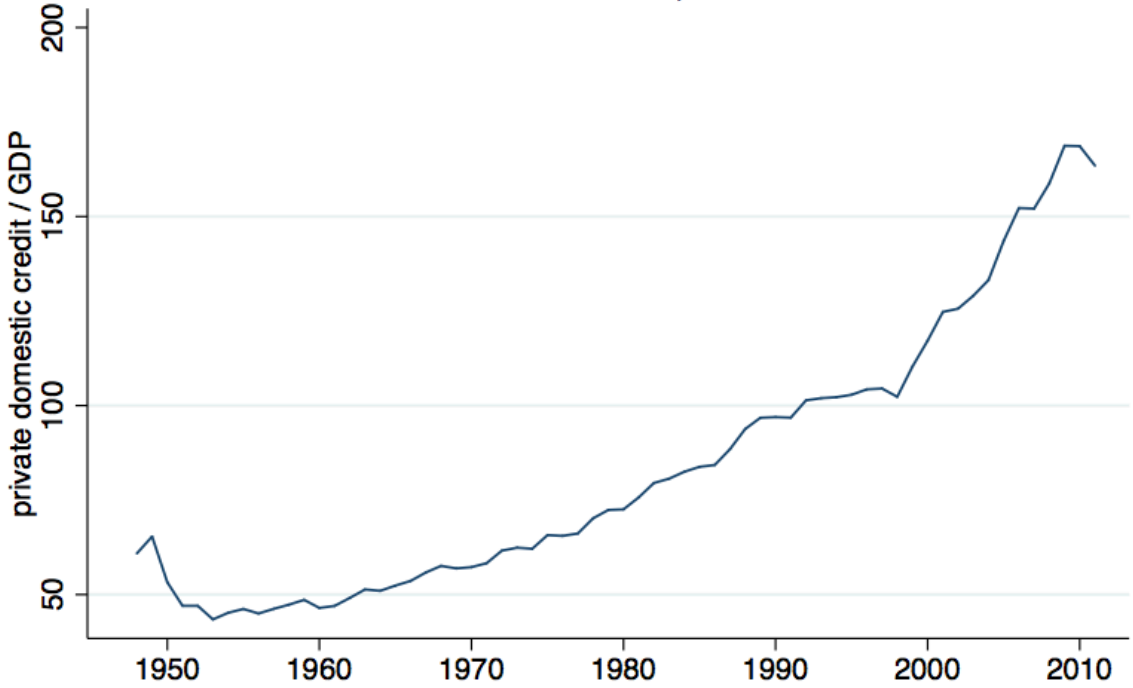
FIGURE 1: Public Debt / GDP, Advanced Economies



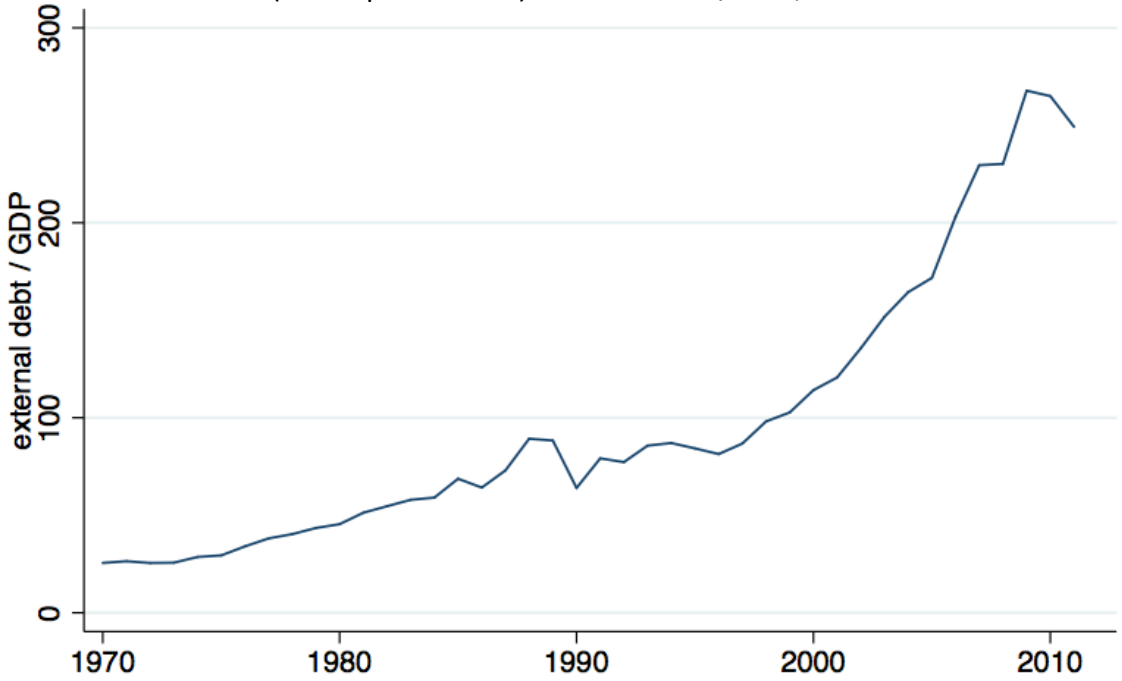
Source: Unweighted average of 22 countries; data from Reinhart, Reinhart, and Rogoff (2012).

FIGURE 2: Private Domestic Credit / GDP, Advanced Economies



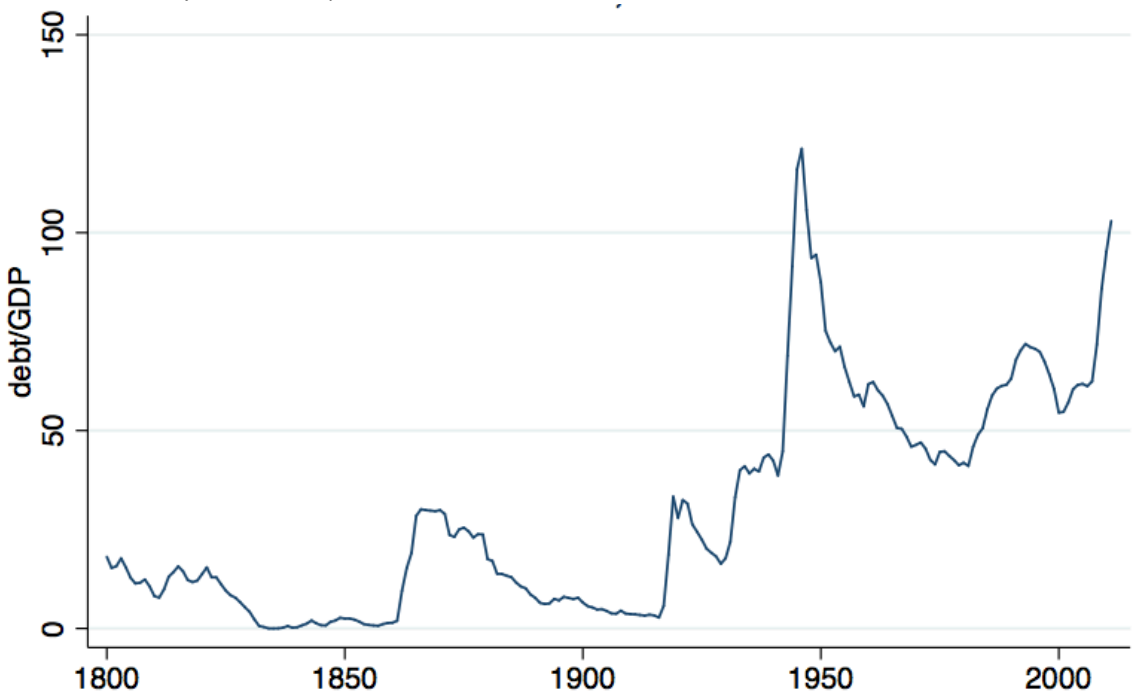
Source: Unweighted average of 22 countries; data from Reinhart, Reinhart, and Rogoff (2012).

FIGURE 3: Gross Total (Public plus Private) External Debt / GDP, Advanced Economies



Source: Unweighted average of 22 countries; data from Reinhart, Reinhart, and Rogoff (2012).

FIGURE 4: Debt/GDP Ratio, United States



Source: IMF, Public Finances in Modern History Database

FIGURE 5: Gross Government Debt, Household Debt, Corporate Debt, and Financial Institution Debt: Trends Across Selected Countries
Sources: Eurostat; Federal Reserve; IMF Financial Statistics; Bank of Japan; Statistics Canada

FIGURE 5a: Gross Government Debt, % of GDP, index 2008 = 100

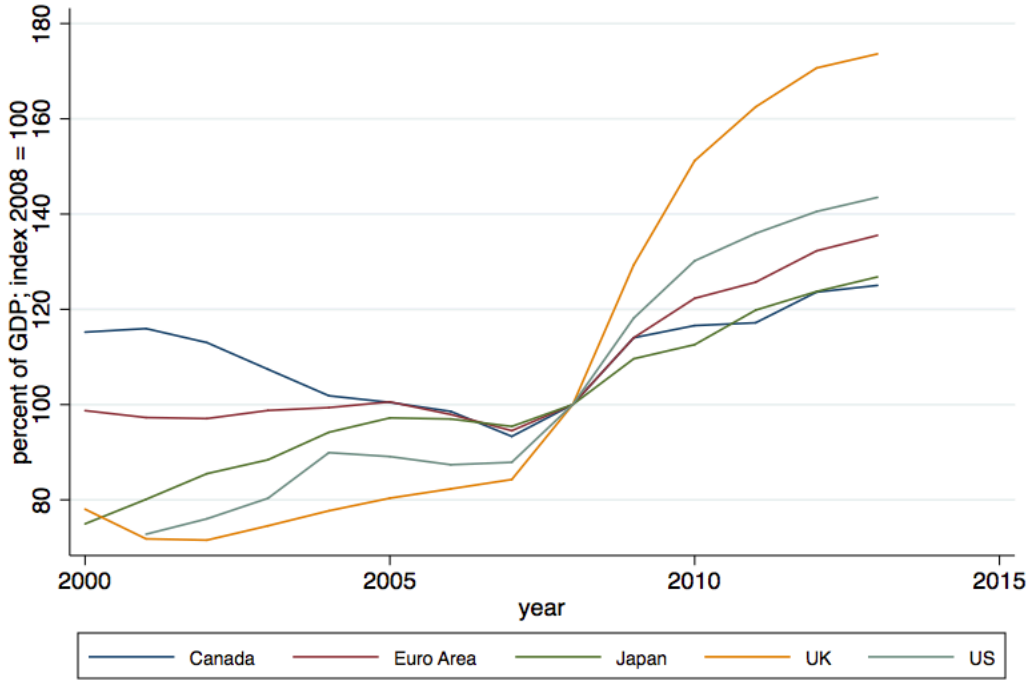


FIGURE 5b: Household Debt, % of GDP, index 2008 = 100

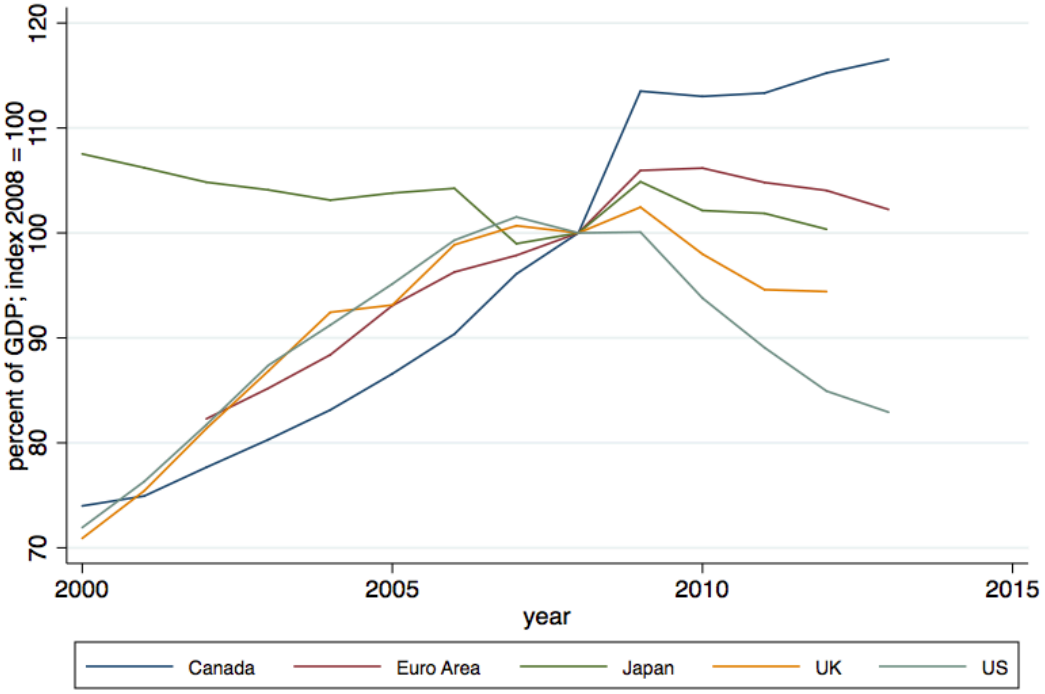


FIGURE 5c: Nonfinancial Corporate Debt, % of GDP, index 2008 = 100

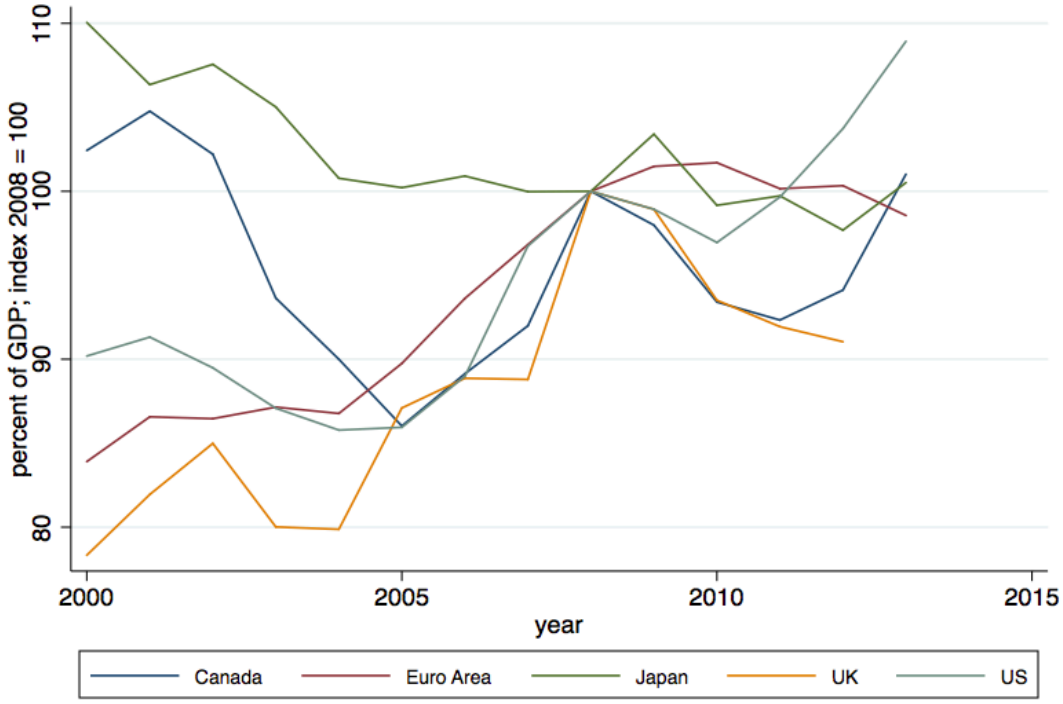


FIGURE 5d: Financial Institution Debt, % of GDP, index 2008 = 100

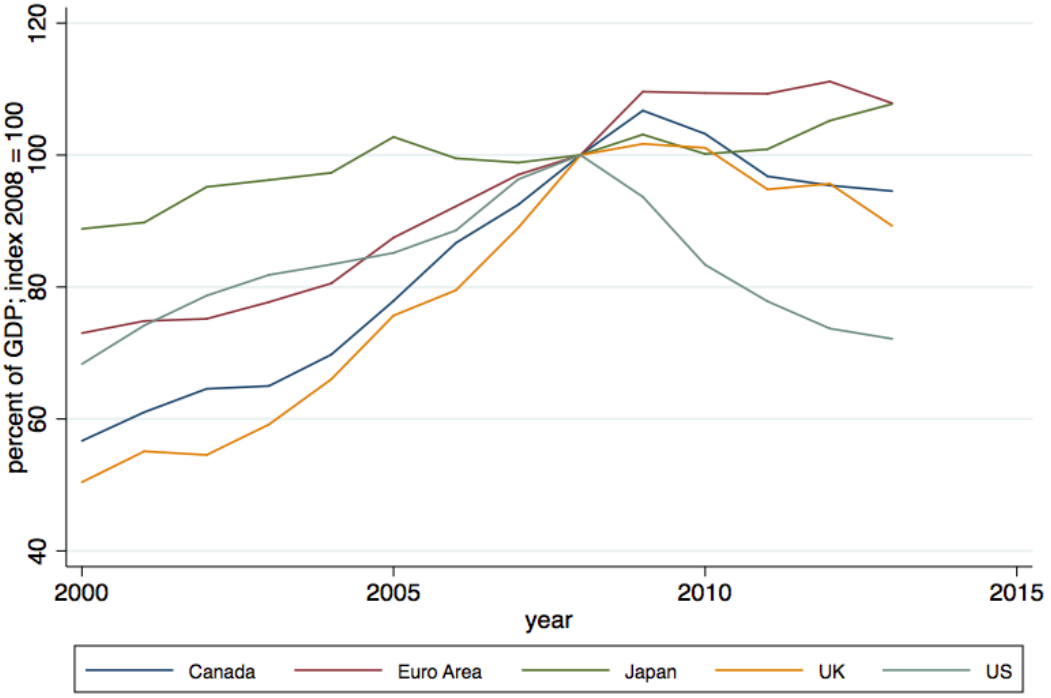
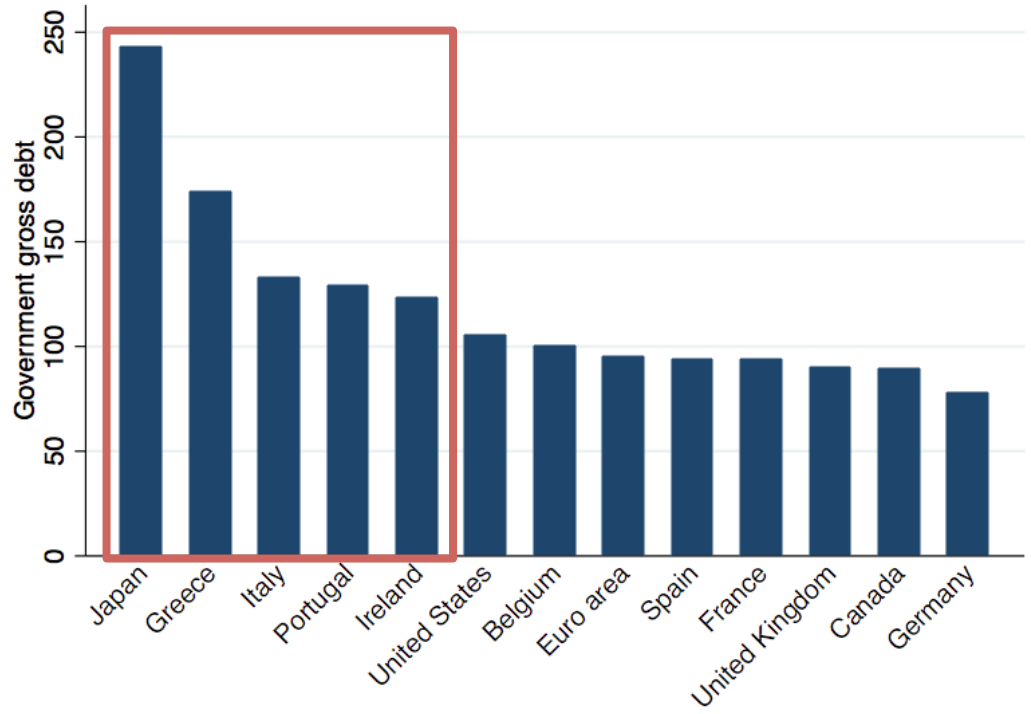
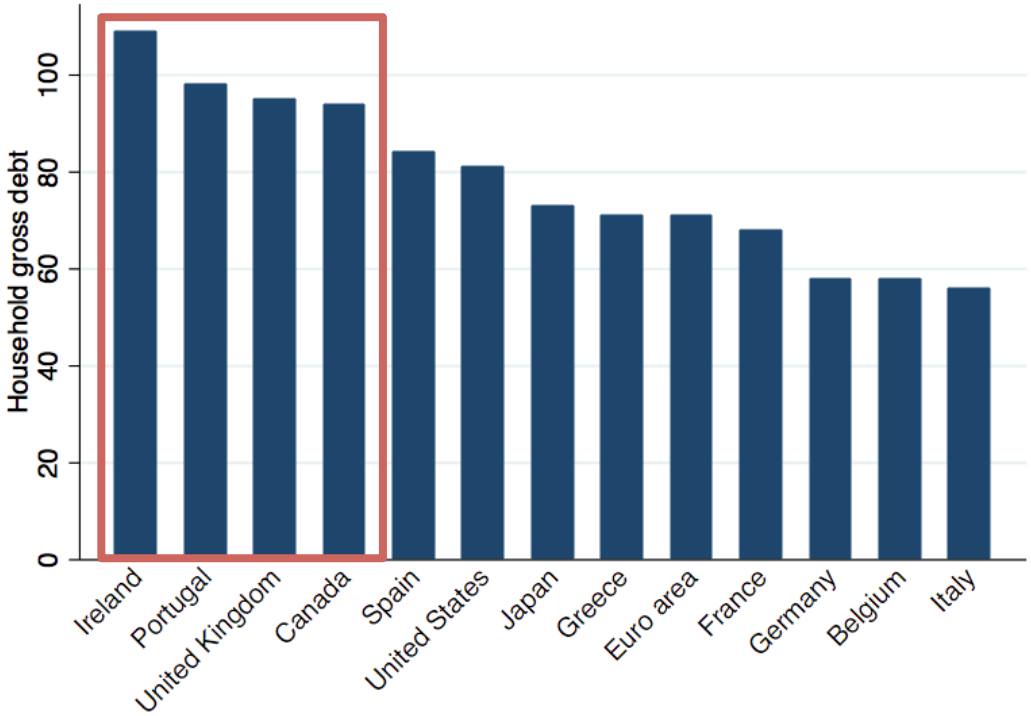


FIGURE 6a: Indebtedness of Select Advanced Countries, Government gross debt (%/GDP), 2013



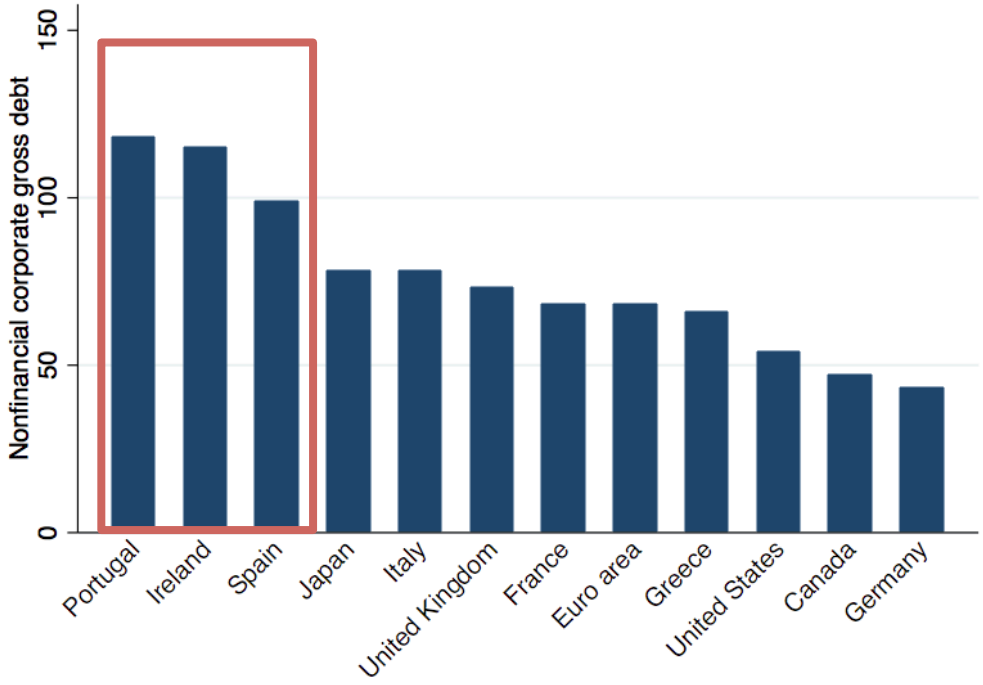
Source: IMF (2014b). Red box denotes countries with potentially concerning levels of debt.

FIGURE 6b: Indebtedness of Select Advanced Countries, Household gross debt (%/GDP), 2013



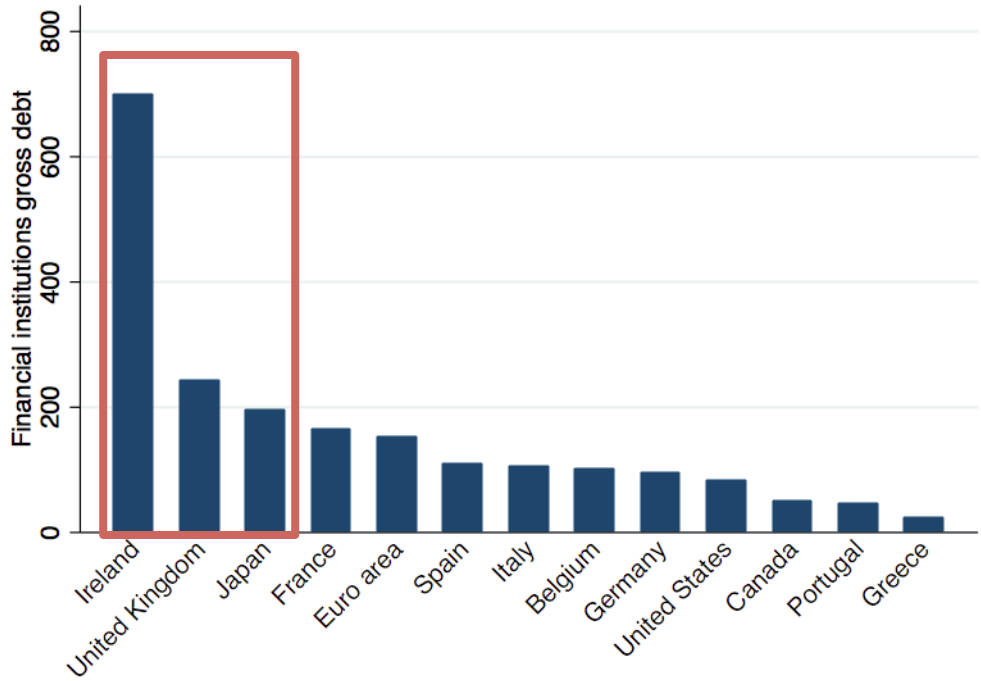
Source: IMF (2014b). Red box denotes countries with potentially concerning levels of debt.

FIGURE 6c: Indebtedness of Select Advanced Countries, Nonfinancial corporate gross debt (%/GDP), 2013



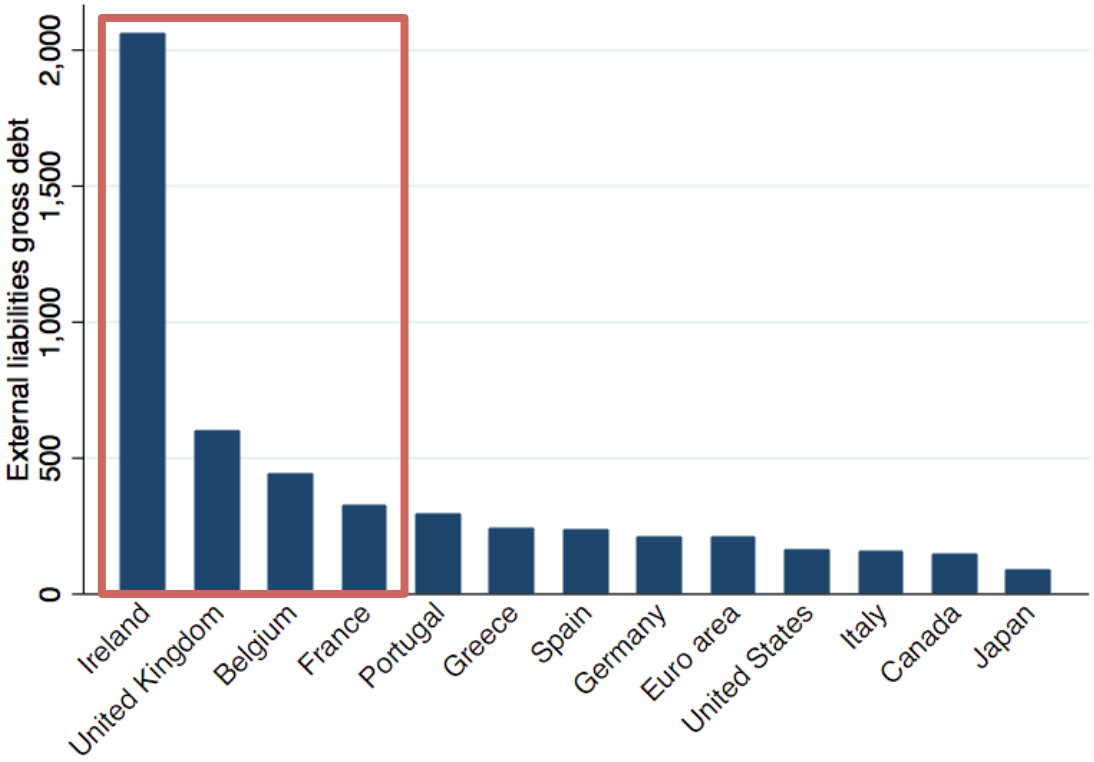
Source: IMF (2014b). Red box denotes countries with potentially concerning levels of debt.

FIGURE 6d: Indebtedness of Select Advanced Countries, Financial institution gross debt (%/GDP), 2013



Source: IMF (2014b). Red box denotes countries with potentially concerning levels of debt.

FIGURE 6e: Indebtedness of Select Advanced Countries, External liabilities gross debt (%/GDP), 2013



Source: IMF (2014b). Red box denotes countries with potentially concerning levels of debt.

TABLE 1: Fiscal reaction function of the United States. Dependent variable: primary surplus / GDP

	(1) 1793-2003	(2) 1793-2012	(3) 1793-2012 (2)	(4) 1793-1950	(5) 1793-1950 (2)	(6) 1950-2007	(7) 1950-2007 (2)	(8) 1950-2012
debt	0.114**	0.0948**	0.0756**	0.0977**	-0.00593	0.0791**	0.100+	0.0164
	(8.05)	(5.75)	(3.91)	(6.27)	(-0.30)	(5.89)	(1.71)	(0.48)
output deviation	7.285	7.120	7.089	13.00*	13.99**	25.41**	24.83*	36.15*
	(1.53)	(1.54)	(1.55)	(3.25)	(4.26)	(3.64)	(3.40)	(2.80)
expenditure deviation	-81.62**	-77.78**	-78.22**	-95.35**	-99.96**	-15.00+	-14.80+	9.086
	(-10.17)	(-9.17)	(-9.16)	(-16.13)	(-20.66)	(-1.81)	(-1.81)	(0.68)
debt sq.			0.000265		0.00134**		-0.000229	
			(1.27)		(6.39)		(-0.41)	
constant	-3.030**	-2.758**	-2.565**	-3.513**	-2.691**	-2.384**	-2.848*	-1.117
	(-7.87)	(-6.49)	(-6.85)	(-10.35)	(-10.32)	(-5.40)	(-2.21)	(-1.10)
Observations	211	220	220	158	158	58	58	63
Adjusted R^2	0.670	0.597	0.597	0.839	0.881	0.302	0.290	0.076

t statistics in parentheses

+ p<0.10, * p<0.05, ** p<0.001

Source: Bohn (2008), Correlates of War database, authors' calculations.
Note: Column (6) and (8) calculate the reaction function through 2007 and through 2012, respectively, yet the estimates of the coefficient on debt change drastically. This is due to major outliers in the 2008-2012 period following the Great Recession.

TABLE 2: Estimation of the Fiscal Reaction to Debt across Select Advanced Countries, 1950-2007

	Canada	Denmark	Japan	Norway	Spain	Sweden	UK	US
debt	0.0869**	-0.0313+	-0.0343**	0.226**	0.0253+	0.0986**	0.0216*	0.0702**
	(5.39)	(-1.99)	(-3.19)	(2.76)	(1.96)	(2.72)	(2.30)	(4.86)
output deviation	64.04**	91.84**	26.39**	71.60**	28.65*	126.6**	48.24**	35.93**
	(4.31)	(5.44)	(3.45)	(2.99)	(2.67)	(5.73)	(3.24)	(4.38)
expenditure deviation	-0.517**	-0.0191	-0.0543	0.0660+	-0.228**	-0.232**	-0.0182	-0.122**
	(-4.85)	(-0.42)	(-0.63)	(1.90)	(-4.20)	(-4.36)	(-0.48)	(-10.12)
constant	-1.471	1.658**	0.607	-4.478*	-0.236	-1.939*	-3.897*	-1.924*
	(-1.18)	(3.28)	(1.61)	(-2.01)	(-0.54)	(-2.32)	(-2.26)	(-2.26)
Observations	57	54	56	57	57	57	57	57
Adjusted R^2	0.446	0.447	0.523	0.363	0.373	0.411	0.241	0.665

t statistics in parentheses

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

Source: IMF Public Finances in Modern History database, Correlates of War database, authors' calculations. Positive values of the "output deviation" correspond to higher-than-trend output. Denmark observations limited to 1954 onward due to debt data limitations in the early 1950's. Japan limited to 1952 onward due to lack of previous military expenditure data, which is used here to compute the "expenditure surprise".
Note: The result for the US differs slightly from Table 1 due to differences in calculation of control. Table 1 uses Bohn's (2008) methodology with military expenditure de-trended using an AR(2) process. The results shown here instead, for simplicity, use military expenditures as a percentage of GDP, although the coefficients are similar when the series is de-trended via an HP filter.

TABLE 3: Fiscal Reaction from 1950 to 2007, including leverage (bank loans / broad money). Dependent variable: primary surplus/GDP

	Canada	Japan	Norway	Spain	Sweden	UK	US
debt	0.0752*	-0.0296*	0.259*	0.0224	0.121*	0.0256*	0.0747*
	(3.18)	(-2.62)	(3.16)	(1.36)	(3.37)	(2.73)	(4.41)
output gap	-58.91*	-32.04	-31.38	-9.846	-150.4*	-70.68*	-17.95*
	(-2.97)	(-1.67)	(-0.83)	(-0.91)	(-3.18)	(-3.28)	(-2.64)
expenditure surprise	-0.478*	-0.0224	0.0437	-0.209*	-0.249*	-0.00426	-0.122*
	(-3.62)	(-0.26)	(1.19)	(-3.14)	(-4.63)	(-0.11)	(-10.29)
change in log(leverage)	15.28*	13.33*	20.35*	-2.168	9.008+	6.626	12.29*
	(3.36)	(2.58)	(2.79)	(-0.50)	(1.78)	(1.27)	(2.39)
constant	-1.413	0.0178	-5.410*	-0.169	-2.245*	-4.380*	-2.330*
	(-0.93)	(0.04)	(-2.46)	(-0.34)	(-2.98)	(-2.56)	(-2.44)
Observations	57	52	57	57	57	57	57
Adjusted R^2	0.343	0.517	0.359	0.228	0.209	0.229	0.609

t statistics in parentheses

$^+$ $p < 0.10$, * $p < 0.05$

Source: IMF Public Finances in Modern History database; Schularick and Taylor (2010); Correlates of War database, authors' calculations. Regressions are for 1950-2007 except for Japan and Spain, which instead are from 1966-2007 due to limits of the interest rate data from the IMF database. We exclude Denmark due to lack of leverage data.