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Public Debt Overhangs: Advanced-Economy Episodes Since 1800[†]

Carmen M. Reinhart, Vincent R. Reinhart, and Kenneth S. Rogoff

The recent financial crisis and recession has left a legacy of historically high and rising level of public indebtedness across the advanced economies. The central policy debate across Europe, Japan, and the United States now centers on how fast to stabilize soaring public debt/GDP ratios, given that post-crisis growth remains fragile. We bring evidence to bear on the issue by identifying the major public debt overhang episodes in advanced economies since the early 1800s. Following Reinhart and Rogoff (2010), we select stretches where gross public debt exceeds 90 percent of nominal GDP on a sustained basis. Such public debt overhang episodes are associated with lower growth than during other periods. Even more striking, among the 26 episodes we identify, 20 lasted more than a decade. The long duration belies the view that the correlation is caused mainly by debt buildups during business cycle recessions. The long duration also implies that the cumulative shortfall in output from debt overhang is potentially massive. These growth-reducing effects of high public debt are apparently not transmitted exclusively through high real interest rates, in that in eleven of the episodes, interest rates are not materially higher.

■ *Carmen M. Reinhart is Minos Zombanakis Professor of the International Financial System, Harvard Kennedy School of Government, Cambridge, Massachusetts. She is also a Research Associate, National Bureau of Economic Research, Cambridge, Massachusetts, and Research Fellow, Centre for Economic Policy Research, London, England. Vincent R. Reinhart is Chief U.S. Economist at Morgan Stanley, New York City, New York. Kenneth S. Rogoff is Professor of Economics and Thomas D. Cabot Professor of Economics, Harvard University, Cambridge, Massachusetts, and Research Associate, National Bureau of Economic Research. Their email addresses are ⟨Carmen_Reinhart@harvard.edu⟩, ⟨vincent.reinhart@morganstanley.com⟩, and ⟨krogoff@harvard.edu⟩.*

[†] To access the Appendix, visit
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In this paper, we use the long-dated cross-country data on public debt developed by Reinhart and Rogoff (2009) to examine the growth and interest rates associated with prolonged periods of exceptionally high public debt, defined as episodes where public debt to GDP exceeded 90 percent for at least five years. (The basic results here are reasonably robust to choices other than 90 percent as the critical threshold, as in Reinhart and Rogoff 2010a, b).[1] Over the years 1800–2011, we find 26 such episodes across the advanced economies. Previous studies of high public debt episodes have typically focused on the very small number of cases, including mainly the post-1970 or post-1980 cases. While data limitations may have prevented us from including every episode of high public debt in advanced economies since 1800, we are confident that this list encompasses the preponderance of such episodes. To focus on the association between high debt and long-term growth, we only cursorily treat shorter episodes lasting under five years, of which there turn out to be only a few. The long length of typical public debt overhang episodes suggests that even if such episodes are originally caused by a traumatic event such as a war or financial crisis, they can take on a self-propelling character.

Consistent with a small but growing body of research, we find that the vast majority of high debt episodes—23 of the 26—coincide with substantially slower growth. On average across individual countries, debt/GDP levels above 90 percent are associated with an average annual growth rate 1.2 percent lower than in periods with debt below 90 percent debt; the average annual levels are 2.3 percent during the periods of exceptionally high debt versus 3.5 percent otherwise. Of course, public debt overhang and slow growth are surely a simultaneous relationship: countries experiencing a period of slower growth may be more vulnerable to ending up with very high levels of public debt, and once the public debt overhang arises, countries with slower growth are going to take longer to escape it. As we shall discuss, a number of recent studies have concluded that the relationship cannot be entirely from low growth to high debt, and that very high debt likely does weigh on growth. Those who view the correlation from high debt to slower growth as mainly due to the cyclical effects of slowdowns on public finances will need to address certain aspects of the data. For example, why does the typical episode of high public debt last far beyond any plausible business cycle frequency—decades, not years? Also, if the debt-to-growth correlation is driven by business cycles, then why so little correlation between debt and growth below the 90 percent debt/GDP threshold, yet such a pronounced correlation above it?

Another contribution of this paper is to provide, to our knowledge, the first systematic evidence on the association between public debt overhang and real

[1] In Reinhart and Rogoff (2010a), the annual observations are grouped into four categories, according to the ratio of debt to GDP during that particular year, as follows: years when debt to GDP levels were below 30 percent (low debt); and years where debt/GDP was 30 to 60 percent (medium debt), 60 to 90 percent (high), and above 90 percent (very high). The main finding is that across both advanced countries and emerging markets, high debt/GDP levels (90 percent and above) are associated with notably lower growth outcomes. Much lower levels of external debt/GDP (60 percent) are associated with adverse outcomes for emerging market growth.

interest rates. The modern policy debate often presumes that the main cost of high public debt ultimately comes from sovereign default, with all its attendant disruptions and dislocations. However, we find that countries with a public debt overhang by no means always experience either a sharp rise in real interest rates or difficulties in gaining access to capital markets. Indeed, in 11 of the 26 cases where public debt was above the 90 percent debt/GDP threshold, real interest rates were either lower, or about the same, as during the lower debt/GDP years. This result is, for instance, consistent with the classic friction identified in Barro (1979) who, using a model where the government always pays in full, showed how ultimate debt stabilization requires raising distorting taxes or (in principle) adjusting expenditures, both of which potentially affect output.

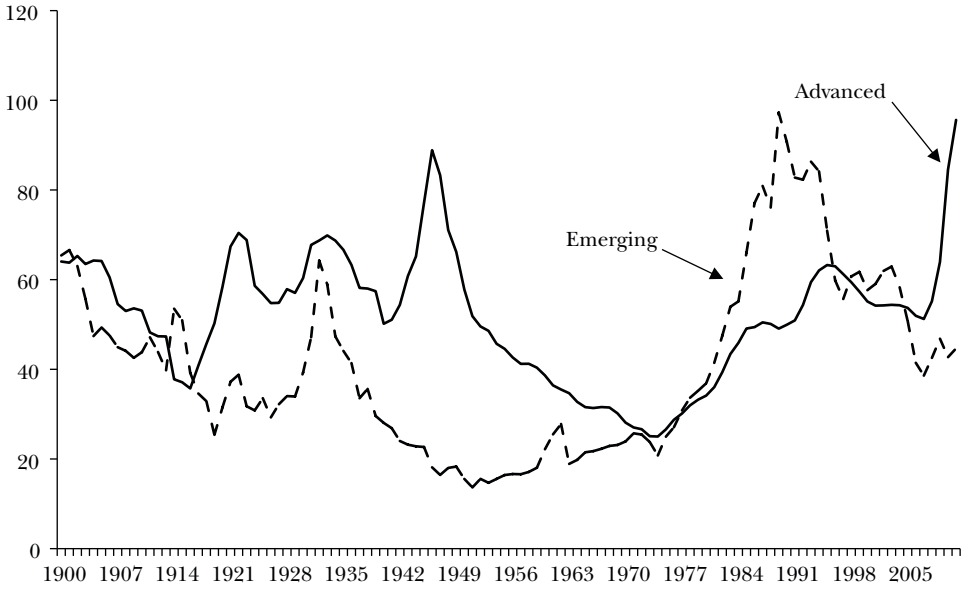
We begin with a brief tour of the concept of debt overhangs in the advanced economies, including both public and private debt, both in historical context and relative to developments in emerging market economies. We then look more closely at the 26 debt overhang episodes we identify. In the background of this discussion, of course, lurks the rapid growth in public debt that many advanced economies have experienced in the last few years in the aftermath of financial crisis and recession. The high level of public debt in Greece has already sparked a broader crisis in the European Union, with the public debt/GDP ratios of several other European economies also a cause for concern, especially when the imputed costs of future bank bailouts are taken into account. The U.S. government surpassed a 90 percent ratio of gross federal debt/GDP in 2010, with Japan at debt/GDP levels more than twice as high.

Our work suggests that the long-term secular costs of high debt need to be weighed against the short-term expediency of Keynesian fiscal stimulus. Our work also highlights the historical importance of default, debt restructuring, and a variety of debt conversions (encompassing both voluntary and involuntary episodes) in coping with debt overhangs. "Credit events" are not just an emerging market phenomenon; these were commonplace among the advanced economies prior to World War II.

Preamble: Varieties of Debt Overhangs

Although our primary focus here is on public debt overhangs, today's high debt burdens also extend to private debt, external debt (including both government and private debt owed to foreigners), and the actuarial debt implicit in underfunded old age pension and medical care programs. Although the data for these broader debt measures is far less comprehensive across time and countries than for public debt, it seems clear that the overall magnitude of the debt burdens facing the advanced economies as a group is in many dimensions without precedent. The interaction between the different types of debt overhang is extremely complex and poorly understood, but it is surely of great potential importance. For example, the lines between public and private debt often become blurred in a

Figure 1
Gross Central Government Debt as Percent of GDP: Advanced and Emerging Market Economies, 1860–2011
(unweighted averages)



Sources: Reinhart and Rogoff (2009) and sources cited therein.

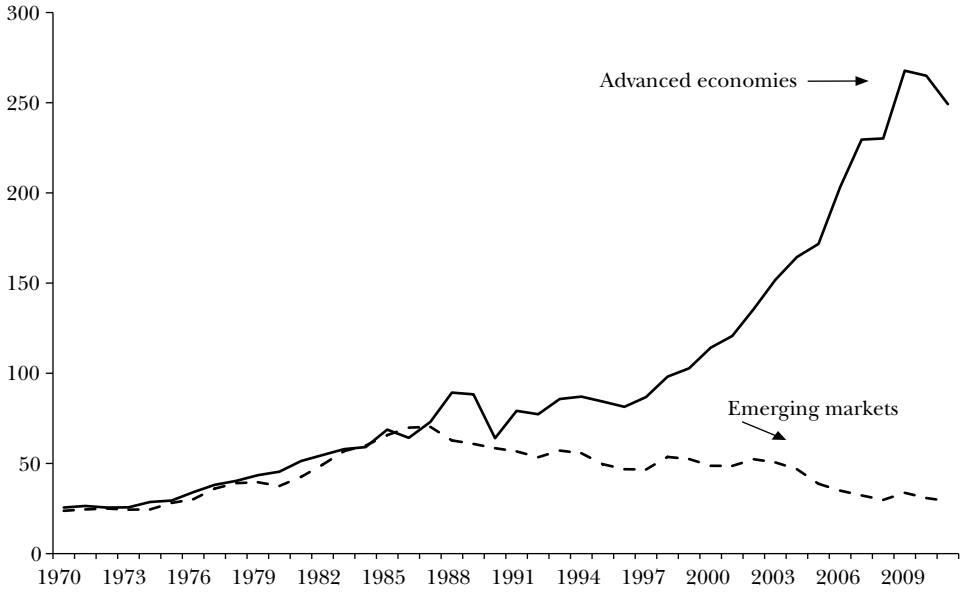
crisis, as for example in Ireland where the government took on massive quantities of bank debt shortly after the collapse of Lehman Brothers in September 2008.

Figure 1 presents average gross central government debt as a percent of GDP for 70 countries aggregated into subgroups consisting of 22 advanced and 48 emerging market economies from 1900 to 2011. The lines show the simple unweighted arithmetic averages presented for the two groups. The average for emerging market economies topped out at a debt/GDP ratio of about 100 percent in the late 1980s and early 1990s. The 22 advanced economies averaged a debt/GDP ratio around 90 percent in the years just after World War II, and in 2010 are just above the 90 percent benchmark. Of course, this benchmark should not be taken as a law of nature, like the boiling point of water at sea level, but it suggests that numerous countries are in the neighborhood of experiencing a public debt overhang.[2]

[2] Of course, focusing on gross debt issued by the central government has its shortcomings. For example, it would be desirable to have long-dated measures of general government debt that include states and municipalities. However, for long-dated historical data, the Reinhart–Rogoff (2009) database only contains central government debt. There is also the issue of net debt versus gross debt, with the main difference being government debt held by government-run, old-age support trust funds. This distinction has become much more important recently as the trust funds have massively expanded. Again, net debt data is not available on a long-dated cross-country basis. However, per our arguments in the conclusions,

Figure 2

Gross Total (Public plus Private) External Debt as a Percent of GDP: 22 Advanced and 25 Emerging Market Economies, 1970–2011



Sources: Lane and Milesi-Ferretti (2010), Reinhart and Rogoff (2009), and sources cited therein; *Quarterly External Debt Statistics*, World Bank, various years; *Global Development Finance*, World Bank, various years.

Figure 2 traces the trajectory of the sum of gross public and private external debt/GDP since 1970 for the same sample of 22 advanced and 48 emerging market economies. The overlap and interaction between different types of debt is particularly acute when it comes to external debt. As Reinhart and Rogoff (2009, 2011) note, the historical record indicates that private external debts are often absorbed by the sovereign during a debt crisis.

Led by European countries, the surge in external debts of the advanced economies since the early 2000s is unprecedented; for example, it dwarfs the late 1970s to early 1980s lending boom to emerging markets.[3] For Europe as a whole, public and private external debts are already more than double the 90 percent threshold and constitute a considerable source of uncertainty.

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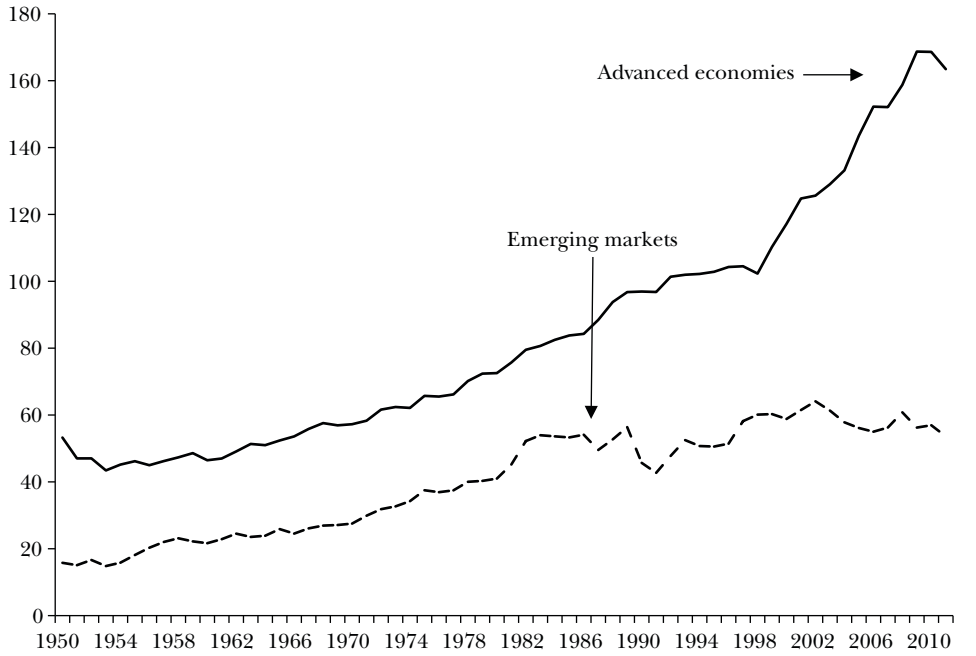
the fact that net public debt today tends to be significantly lower than gross public debt would do little to reverse our conclusions since by and large the trust funds are woefully underfunded, and implicit tax liabilities in most pension systems are hugely positive. In other words, these trust funds are hardly sources of future revenues to offset gross government deficits.

[3] Of course, this recent rise in external debt arises partly because we (and others including the IMF) label debt across euro-zone countries as external. This is clearly a plausible approximation given the weakness of euro-wide institutions, but as euro institutions are still stronger than many international counterparts, it may also be regarded as an exaggeration.

Figure 3
Private Domestic Credit as a Percent of GDP
(22 advanced and 28 emerging market economies, 1950–2011)



Sources: International Financial Statistics, and *World Economic Outlook*, International Monetary Fund, various issues; and Reinhart (2011) and sources cited therein.

Figure 3 plots private domestic credit—the data is essentially bank loans. Although this measure of private credit is incomplete, particularly for the United States with its highly sophisticated capital market, this measure is most easily compared across time and countries. For the 48 emerging markets, the average unweighted value of this measure of private domestic credit has been roughly constant at around 40 percent of GDP since the 1980s. For the 22 advanced economies, there is a steady rise in credit going back to the 1950s, which through much of this time probably reflects the development and deepening of the financial sector. But there is also a rapid rise in the rate of credit growth starting around 2000. Schularick and Taylor (2012) have calculated the rise in private debt by looking at bank assets, and find a similar pattern of a steady increase from the 1950s up through the 1990s followed by a more rapid expansion after about 2000. This general similarity of the pattern in Figure 2 showing the rise in external debt and the pattern in Figure 3 showing the rise in private debt should not come as a surprise. The literature on domestic credit booms (for example, Mendoza and Terrones 2011) links these booms to capital inflow surges—to borrowing from the rest of the world.

In short, our focus on public debt in this paper should not obscure the reality that many advanced economies are facing quadruple debt overhang problems: public, private, external, and pension. Nor have we paid attention here to the likely possibility of significant "hidden debts," especially in the public sector, which Reinhart and Rogoff (2009) find to be a significant factor in many debt crises, and as documented in detail in the Reinhart (2011) chartbook. Although we focus here on exceptionally high public debt episodes, the topic of multidimensional debt overhang is a critical topic for future research.

Features of Episodes of High Public Debt Since 1800

As noted earlier, we focus on public debt overhang episodes where the gross public debt/GDP ratio exceeds 90 percent for five years or more. We identify 26 public debt overhang episodes in 22 advanced economies from the early 1800s through 2011. This tally does not include the unfolding cases in Belgium, Iceland, Ireland, Portugal, and the United States, where the beginnings of the debt overhangs date to the financial crisis and recession in 2008 or later, and thus do not meet our five-year minimum criterion. We suspect all these will eventually reach the five-year mark as, indeed, episodes in advanced countries lasting only one to four years appear very infrequently in our data set. Among more recent public debt overhang episodes, our sample does include the cases of Greece, Italy, and Japan, where the beginnings of the debt overhangs (as defined above) date back to 1993, 1988, and 1995, respectively.

The 26 Episodes

Tables 1 and 2 provide information on the 26 episodes that fulfilled the criteria on magnitude and duration of our definition of public debt overhang. Table 2 also provides information on four shorter spells of high debt (with the duration marked with an asterisk) lasting less than five years, that were largely associated with war or cyclical downturn in the Depression of the 1930s.

The first column of Table 1 is categorized by country. As noted, our tabulation covers 22 advanced economies. Of these, nine countries have no episodes that meet our criteria of a public debt overhang: Austria, Denmark, Finland, Germany, Iceland (not until 2009), Norway, Portugal (not until 2010), Sweden, and Switzerland. The fact that many countries do not have any history of public debt/GDP above 90 percent helps explain the finding in Reinhart and Rogoff (2010a) that fewer than 10 percent of the post–World War II annual observations of public debt/GDP for all advanced economies are above the 90 percent cutoff. The remaining 13 countries record one or more debt overhang episodes, as shown in Tables 1 and 2. Table 1 presents the averages for growth and real interest rates across the debt overhang episodes listed individually in Table 2.

The sample coverage (in the second column in Table 1) is determined by data availability and varies by country. The next six columns provide averages for real GDP

Table 1
Features of Public Debt Overhang Episodes: Advanced Economies, 1800–2011

		Average real GDP growth		*Average real interest rates*				*Share of years above 90%*
				Short-term		*Long-term*		
Country	*Sample*	*Below 90%*	*Above 90%*	*Below 90%*	*Above 90%*	*Below 90%*	*Above 90%*	
Australia	1852–2011	4.0	3.5	1.7	−0.4	3.2	1.6	6.1
Belgium	1836–2011	2.5	2.7	2.5	2.4	2.9	3.6	20.5
Canada	1871–2011	3.6	3.2	0.6	2.4	2.3	4.5	10.6
France	1880–2011	3.2	1.9	0.7	2.1	2.1	2.5	28.0
Greece	1848–2011	4.7	3.0	−1.8	4.7	−6.0	12.5	56.1
Ireland	1924–2011	3.4	2.5	−0.6	6.1	2.3	6.5	15.5
Italy	1861–2011	3.9	1.1	0.4	4.1	2.2	4.3	48.0
Japan	1872–2011	4.2	0.8	2.1	0.3	2.7	1.4	12.1
Netherlands	1816–2011	3.3	2.1	2.4	3.1	3.4	4.3	45.6
New Zealand	1861–2011	4.8	3.1	1.9	2.7	2.1	3.0	48.0
Spain	1850–2011	2.9	2.1	2.18	2.52	2.39	9.05	18.6
United Kingdom	1830–2011	2.1	1.8	2.42	2.57	2.74	3.68	45.3
United States	1791–2011	3.6	−1.0	1.75	−4.45	3.72	−2.73	3.2
Memorandum items:								
Countries where debt/GDP exceeded 90% for 1 to 4 years (not meeting the debt overhang criteria)								
Austria	1880–2011							
Finland	1914–2011							
Iceland	1908–2011							
Portugal	1850–2011							
Countries where debt/GDP did not exceed 90% in any year over the sample								
Denmark	1880–2011							
Germany	1880–2011							
Norway	1880–2011							
Sweden	1719–2011							
Switzerland	1880–2011							

Note: For Belgium, real rate averages exclude 1926, when inflation hit an all-time peak of 40 percent and real ex-post interest rates were about –34 percent.

growth, real (inflation adjusted) short-term interest rates, and real long-term interest rates. For each of these three variables, we provide the averages for debt/GDP below and above 90 percent. Details on the interest rate and other data used are provided in a Data Appendix available online with this paper at ⟨http://e-jep.org⟩. The final column of Table 1 provides a calculation of the share of years in the total sample (shown for each country in column 2) where debt/GDP was above 90 percent. For example, since 1848 (when the public debt data is available), Greece leads the way with 56 percent of the debt/GDP ratio observations above 90 percent.

In Table 2, we list each of the 26 episodes meeting our criteria of a public debt overhang (plus the four shorter episodes, marked with an asterisk). The last column provides some commentary on each debt overhang episode. The episodes are grouped along the lines of whether the debt arises primarily from specific wars,

financial crises and economic depression, domestic turmoil, or other factors. Owing to their multidecade span, several episodes incorporate several wars and a multitude of business cycles. In the comment entries, we indicate features such as peak levels of debt and interest rates and whether there were other related events or arrangements in financial markets, such as a debt conversion or financial repression.[4] It is noteworthy that most pre–World War II episodes involved credit events ranging from default on all debt and selective default on some debt (such as World War I debts to the United States) to a variety of conversions (voluntary and otherwise).

As the commentary in the final column of the tables highlights, many debt overhangs result from costly wars. There are distinct clusterings around World War II and, to a lesser extent, World War I, which then merges with the Depression era debt buildup. Back in Figure 1, this sequence of World War I, the Great Depression, and World War II shows up as the three nearly consecutive peaks in the advanced economies' aggregate debt ratios. Greece and Italy are tied for first place in the number of debt overhang episodes: each has four episodes, and the percent of years in the total sample where they had an overhang is 56 and 48 percent, respectively. It is perhaps more surprising that the two previous world powers, the Netherlands and the United Kingdom, have so few debt overhang episodes—just three and two, respectively. However, the few episodes that did happen in these nations lasted for a long time. The Napoleonic wars of the early nineteenth century, in particular, left a deep mark on the finances of both countries. It took a longer time to work down debt ratios in the nineteenth century (Reinhart and Sbrancia 2011). In those days before fiat currency, inflation was not as prevalent as it would later become. Thus, the "liquidation" of government debt via a steady stream of negative real interest rates was not as easily accomplished in the days of the gold standard and relatively free international capital mobility as in the decades after World War II.

In addition, governments in the second half of the twentieth century often used policies of "financial repression" to reduce the cost of the public debt, by limiting capital flows and regulating financial institutions in such a way that alternative investments were blocked and financing for government debt would flow more cheaply. The modern tools of financial repression were not as available to advanced economies in the nineteenth century, but other forms of economic repression were available. In particular, there were substantial transfers from the colonies to finance debts and facilitate debt reduction. During much of the 1800s, the Netherlands, for example, earmarked Indonesian revenues for deficit reduction (Bos 2007).

[4] "Financial repression" includes directed lending to the government by captive domestic audiences (such as pension funds or domestic banks), explicit or implicit caps on interest rates, regulation of cross-border capital movements, and a tighter connection between government and banks, either explicitly through public ownership of some of the banks or through heavy "moral suasion." It is often associated with relatively high reserve requirements (or liquidity requirements), securities transaction taxes, prohibition of gold purchases (as in the United States from 1933 to 1974), or the placement of significant amounts of government debt that is nonmarketable. In principle, "macroprudential regulation" need not be the same as financial repression, but in practice, one can often be a prelude to the other.

Table 2
"Types" of Public Debt Overhang Episodes, Advanced Economies, 1800–2011

Country	*Debt overhang*	*Years duration*	*Comments on factors contributing to debt build*
Shorter post-WWI and WWII episodes			
Australia	1945–1950	6	Significantly negative real interest rates (–7%); financial repression; growth is below average.
Belgium	1920–1926	7	Postwar boom and reconstruction; inflation spike and sharply negative real rates.
Belgium	1946–1947	*	Too short to define as a debt overhang.
Canada	1944–1950	6	Debt peaked at 136% in 1946, Real short rates and long rates averaged 0.39 and 2.69%.
Finland	1943–1945	*	Too short to define as a debt overhang.
Italy	1940–1944	5	Default during 1940–1946; inflation peaks at 344% liquidating debts by 1947 debt/GDP is 25%.
United States	1944–1949	6	Federal gross debt peaks at 121% in 1946. Deployment and output decline of 11% in 1946. Era of financial repression worldwide under Bretton Woods agreement; negative real interest rates.
Longer WWI/banking crises 1930s depression/WWII episodes			
France	1920–1945	26	1922 debt is 262%; 1932 WWI debt to the U.S. is in default. 1932 WWI debt to U.S. is in default.
Italy	1917–1936	20	Several debt conversions in 1920s.
Netherlands	1932–1954	25	Strong post WWII recovery; negative real interest rates.
United Kingdom	1917–1964	48	Default on WWI debts to U.S. in 1932. Post WWII debt 248%. Financial repression era; short and long rates –1.1% and 0.5%.
Banking crisis and economic depression			
Australia	1931–1934	*	Too short to define as a debt overhang.
Greece	1928–1939	12	Banking crisis in 1931; default 1932–1964.
Italy	1881–1904	24	Severe banking crisis in early 1890s.
Japan	1995–2012	18, ongoing	1989 equity market crash, severe banking crisis in 1991; large private sector debt "overhang" by any measure since 1980s.

(Continued)

There were also "usury laws" that were the ancestors to the interest-rate ceilings that accompanied financial repression after World War II (Homer and Sylla 1996).

The relatively modern peacetime episodes of public debt overhang in the advanced economies are comprised of Belgium, Canada, Greece, Ireland, Italy, and Japan. Of these six, the shortest were Canada and Ireland, lasting 8 and 11 years, respectively. Japan's mounting public debts had their origins in the systemic banking crisis of 1991 and asset (equity and real estate) collapse that began somewhat earlier. It can be conjectured that Greece, Ireland, and Italy's debt build-ups may have been in part connected to their efforts in joining the euro zone; in effect, these countries had been using high rates of inflation to manage their debt/GDP ratios, but when

Table 2—continued

Longer episodes, other wars, and internal conflicts			
France	1880–1905	26	Franco-Prussian War, 1870–1871 legacy of reparations payments to Germany.
Netherlands	1816–1872	57	Napoleonic War debts; 1830s war with Belgium debt rises to 280% followed by several conversions.
Spain	1868–1882	15	1868–1876, Third Carlist Wars. Real bond yields around 25%. Default in 1877–1882.
Spain	1896–1909	14	1879 external public debt peak 52%. Wars and loss of last colonies.
United Kingdom	1830–1863	34	Debt peaks at 260% in 1819–1821 after Napoleonic Wars. (no real GDP data prior to 1830) There are several debt conversions.
Modern peacetime episodes often involving inflation stabilization			
Belgium	1982–2005	24	Growth is below average; inflation declines from over 8%.
Canada	1992–1999	7	Real bond rates were as high as 9%; shortest peacetime episode.
Ireland	1983–1993	11	Inflation near 20%. Real rates on the long bond peak at 10% in 1986; real short-term rates averaged 15% during 1992 ERM crisis.
Greece	1993–2012	20, ongoing	Inflation near 15% in 1993; real bond yields about 4% in episode, lower than pre-war; boom followed by banking crisis and restructuring.
Italy	1988–2012, ongoing	25, ongoing	Lower real interest rates than pre-war; lower reliance on external debt.
Other episodes			
Austria	1882–1883	*	Too short to define as a debt overhang.
Greece	1848–1883	36	Nation-building. Pre-WWII real long-rates were over 15%.
Greece	1887–1913	27	Defaults in 1843–1878 and 1894–1897.
Netherlands	1886–1898	13	Shrunken revenues from Indonesia added to debt buildup.
New Zealand	1881–1951	71	Severe banking crisis in 1893. Debt peaks at 226% in 1932 amid collapsing commodity prices; debt conversion in 1933.

*Too short to define as a debt overhang.

joining the euro zone required them to hold down their inflation rate, their debts continued to rise. In effect, debt financing supplanted inflation finance.

Public Debt Overhang and Slow Growth

The standard textbook discussion of connections between public debt and economic growth emphasizes two potential channels. The first channel operates through a quantity effect on private sector investment and savings. When public debt is very high, it will tend to soak up the available investment funds and thus to crowd out private investment. If the government at the same time is imposing policies that attempt to reduce its debt burden with higher taxes, a burst of unexpected

inflation, or various types of financial repression, then investment may well be discouraged further. The second channel involves a rising risk premium on the interest rates for government debt. Sufficiently high levels of public debt call into question whether the debt will be repaid in full, and can thus lead to a higher risk premia and its associated higher long-term real interest rates, which in turn has negative implications for investment as well as for consumption of durables and other interest-sensitive sectors, such as housing. Our long-run data on public debt and output does not include sectoral data on investment and savings, so we cannot examine the possible mechanisms underlying public debt and growth. But in this section, we look at some of the evidence connecting a public debt overhang with lower growth rates. In the next section, we consider the link from public debt overhang to real interest rates.

As a starting point, we observe that in the countries that have one or more episodes of public debt overhang listed in Table 1, real GDP growth averages 3.5 percent per annum over the full period for which debt/GDP is less than 90 percent and data is available. The comparable average for all debt overhang episodes is 2.3 percent (or 1.2 percent lower than the lower debt periods). Similarly, Reinhart and Rogoff (2009) show that periods where public debt is over 90 percent of GDP are associated with roughly 1 percent lower growth, while at lower debt thresholds, the correlation of the public debt/GDP ratio with growth is small. Three episodes of public debt overhang, however, are associated with higher GDP growth. One of these, an outright boom, is associated with post–World War I rebuilding in Belgium.

But obvious concerns arise here about cause and effect. Is the public debt overhang causing the slower growth? Or is an exogenous shock that causes slower growth either helping to generate the public debt overhang or else prolonging the escape from that debt overhang? This endogeneity conundrum has not been fully resolved. However, a number of recent studies have tackled the problem. The common finding from a number of approaches is that the relationship between public debt and growth is nonlinear, but at high levels, often at a debt/GDP ratio around 90 percent of GDP, public debt overhang does seem to have a negative effect on growth.

As one approach, Kumar and Woo (2010) look at a panel of 38 advanced and emerging market economies with population over five million from 1970–2007. Using a variety of estimation strategies and subsamples within the context of an endogenous growth model, they find an inverse relationship between initial debt and subsequent growth, after controlling for a number of other determinants of growth. On average, they find that an increase of 10 percentage points in the initial debt/GDP ratio is associated with a slowdown of around 0.2 percentage points per year, with some evidence that this effect is only significant at a debt/GDP ratio above about 90 percent. Along similar lines, Balassone, Francese, and Page (2011) seek to deal with endogeneity in their study of Italy from 1861–2010 by fitting the data to an endogenous growth model and then using a variety of estimation strategies.

Another method of attempting to control for possible feedback from economic growth to public debt is to use five-year averages of growth that are a

function of regressors that are predetermined (and thus not subject to feedback effects). Cecchetti, Mohanty, and Zampolli (2011) take this approach in examining public debt and growth in 18 OECD economies (none in emerging markets) from 1980–2010. They find that government debt begins to reduce economic growth once it crosses a threshold of about 85 percent. Arcand, Berkes, and Panizza (2012) also work with five-year growth averages and find threshold results similar to most other studies for a group of 44 advanced and emerging market economies over the 1976–2005 period.

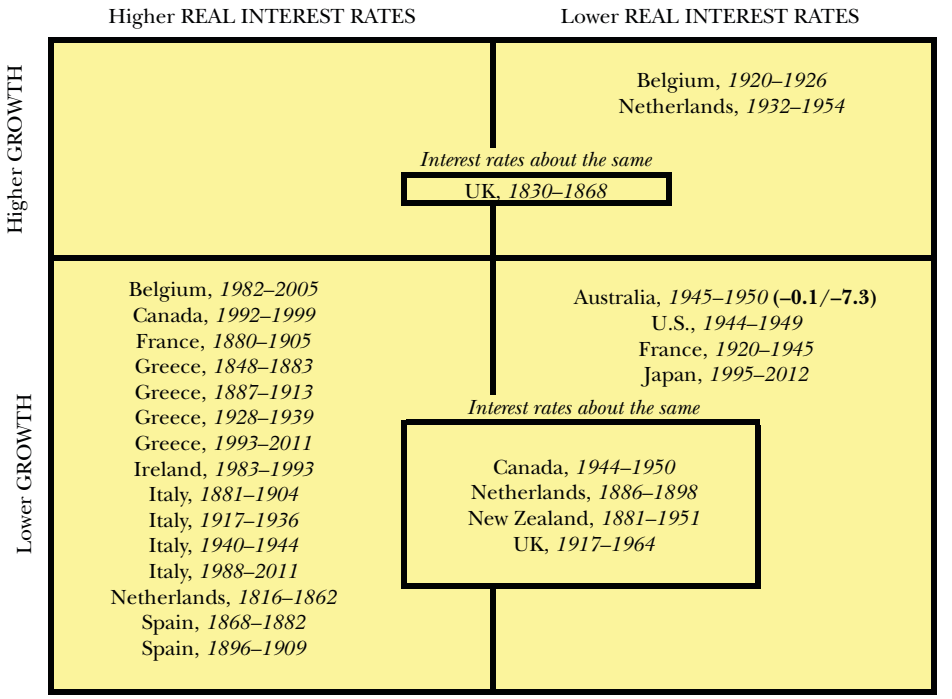
Yet another approach to address endogeneity problems is to use instrumental variables. For example, in the Checherita and Rother (2010) study of 12 euro area economies from 1970–2008, the authors use the lagged value of debt and average debt in the euro area as instruments. Patillo, Poirson, and Ricci (2011) use robust general method of moments (GMM) estimation as a way of controlling for endogeneity in their study of how external debt (public and private) affects growth in 93 developing countries from 1969–1998. Both approaches find that public debt reduces growth above a certain threshold.

Finally, using a similar estimation strategy as Cechetti, Mohanty, and Zampolli (forthcoming) and Kumar and Woo (2010), Panizza and Prebistero (2012) use the share (in total debt) of foreign currency debt as their key instrument to deal with the potential endogeneity of debt. They conclude that there is little evidence that high public debt levels hurt future growth in advanced economies, but suggest that things are different in developing countries, where a significant fraction of debt is external and the debt overhang argument has more bite. Of course, as the authors discuss, their critical instrument has an important drawback—it has nearly zero mean and variance in France, Germany, Japan, the Netherlands, and the United States, as these five countries do not have public debt denominated in foreign currency.

In investigating the potential transmission mechanisms, Elmeskov and Sutherland (2012) argue that high public debt overhang affects growth through a number of channels including the cost of capital. An Appendix available with this paper at ⟨http://e-jep.org⟩ gives summary information for recent studies, including those mentioned here, that examine the connections between public debt, private debt, external debt, and economic growth.

We would not claim that the cause-and-effect problems involved in determining how public debt overhang affects economic growth have been definitively addressed. But the balance of the existing evidence certainly suggests that public debt above a certain threshold leads to a rate of economic growth that is perhaps 1 percentage point slower per year. In addition, the 26 episodes of public debt overhang in our sample had an average duration of 23 years, so the cumulative effect of annual growth being 1 percentage point slower would be a GDP that is roughly one-fourth lower at the end of the period. This debt-without-drama scenario is reminiscent for us of T.S. Eliot's (1925) lines in "The Hollow Men": "This is the way the world ends/Not with a bang but a whimper." Last but not least, those who are inclined to the belief that slow growth is more likely to be causing high debt, rather

Figure 4
Growth and Real Interest Rate Outcomes for 26 High-Debt Episodes in Advanced Economies, 1800–2011



Source: Authors' calculations based on data sources listed in the Data Appendix.

than vice versa, need to better reconcile their beliefs with the apparent nonlinearity of the relationship, in which correlation is relatively low at low levels of debt but rises markedly when debt/GDP ratios exceed the 90 percent threshold. Overall, the general thrust of the evidence is that the cumulative economic losses from a sustained public debt overhang can be extremely large compared with the level of output that would otherwise have occurred, even when these economic losses do not manifest themselves as a financial crisis or a recession.

Will Interest Rates Sound the Alarm?

Higher real interest rates are more common than not during periods of high debt as we see these for 15 of the 26 episodes shown in Figure 4. Figure 4 places the individual episodes into a two-by-two matrix. The rows divide the episodes into 1) those where the average growth during the period of debt overhang is associated with higher average growth than the country's average growth across all the years in which debt/GDP was below 90 percent (upper row) and 2) those episodes where the growth during the debt overhang is lower (bottom row). The columns perform a comparable division for episodes where real interest rates (long bond) were

higher (left column) and those where rates were lower. The middle insets represent the cases where there was little differential in interest rates between the high and lower debt periods. As Figure 4 illustrates, a nontrivial share of the 26 episodes are characterized by both lower growth *and* lower or comparable real interest rates (relative to the period without a debt overhang). This potential outcome is left largely unexplored in textbooks.

Furthermore, there is little to suggest a systematic mapping between the largest increases in average interest rates and the largest (negative) differences in growth during the individual debt overhang episodes. Belgium's post–World War I debt overhang from 1920–1926 is associated with a rebuilding boom in which average annual GDP growth during this period was 6.2 percent—that is, 3.7 percent above the long term-growth average of 2.5 percent (for all years in which debt/GDP is below 90 percent). A rare (for Belgium) postwar inflation spike also produced what turned out to be very negative real interest rates (minus 8 percent). At the other end, average post–World War II GDP growth during the six-year debt overhang (1944–1949) in the United States is sharply lower (there was no need to rebuild entire cities, as in Europe and Japan). More germane to the current situation are the longer peacetime debt overhangs—for example, Belgium, Canada, Greece, Ireland, and Italy in the 1980s and 1990s, and Greece, Italy, the Netherlands, and New Zealand in an earlier era. With the exception of the United Kingdom at the height of its colonial powers in the nineteenth century, these long peacetime debt overhangs are consistently associated with lower growth (in varying degrees), irrespective of whether real interest rates rose, declined, or remained about the same.

The relationship between debt and alternative measures of sovereign external default risk is similarly highly nonlinear as discussed in Reinhart, Savastano, and Rogoff, (2003) as well as Reinhart and Rogoff (2009). Up to a critical level, in the neighborhood of 60 percent of GDP but lower for some countries, market measures of default risk are relatively invariant to total external debt, but they spike at some point when debt rises above that level.

Conclusion

We identified 26 episodes since 1800 of public debt overhang in advanced economies: that is, cases where the ratio of gross public debt to GDP exceeded 90 percent in a given country for more than five years.[5] Taken as a whole, these episodes suggest several lessons about public debt overhang. First, once a public debt overhang has lasted five years, it is likely to last 10 years or much more (unless the debt was caused by a war that ends). The average duration of our debt overhang

[5] Reinhart and Rogoff (2010a) point out that a threshold substantially above the 90 percent debt/GDP ratio would leave relatively few observations. For example, on a yearly basis since World War II, just over 1 percent of all gross central government debt-to-GDP ratios among advanced countries have exceeded 120 percent.

episodes was 23 years. Second, it is quite possible to have a "no drama" public debt overhang, which doesn't involve a rise in real interest rates or a financial crisis. Indeed, in 11 of our 26 public debt overhang episodes, real interest rates were on average comparable, or lower, than at other times. Third, the weight of the evidence suggests that a public debt overhang does slow down the annual rate of economic growth, and given the length of these episodes of public debt overhang, losing even 1 percentage point per year from the growth rate will produce a substantial decline in the level of output, and a massive cumulative loss.

The advanced world has entered an era characterized by massive overhang of public and private debt. The average level of gross public debt to GDP in advanced countries as a whole already exceeds our 90 percent threshold. To what extent should we be concerned that the lessons we have just outlined will apply in the next decade or two? Of course, there are always reasons why lessons drawn from a collection of historical episodes may be less or more pertinent to the problems of today.

For example, one possible reason for minimizing concerns about public debt overhang is to argue that financial globalization in the early twenty-first century has made it easier to carry high public debt burdens. However, we see no compelling evidence that this is the case for advanced countries as a whole. Indeed, one might argue that financial globalization has created the possibility of greater volatility and sharper crises in sovereign debt markets. Moreover, one should not underestimate the sophistication and interconnection of national markets in the nineteenth century, which is half the timespan covered in this study. Another line of reasoning for dismissing concerns about public debt overhangs is the view that causality mostly runs from growth to debt. However, we discussed a body of evidence which argues that causality does indeed run from the public debt overhang to slower growth. There are counterexamples where a public debt overhang was accompanied by rapid growth, like the immediate period after World War II for the United States and United Kingdom, but these exceptions to the typical pattern do not seem to be the most relevant parallels for the modern world economy. At the very least, the multidecade-long duration of past public debt overhang episodes suggests that the association between public debt overhang and slower growth is not due to recessions at business cycle frequencies.

Of course, new developments in technology and globalization might conceivably provide such a remarkable reservoir of growth that today's public debt burdens will prove to be quite manageable. Barring such a growth resurgence, the public debt overhang problem that already affects some advanced economies, and has the potential to affect many others including the United States sometime soon, could have consequences at least as large as those seen in the 26 historical episodes that have been our focus here. There are three reasons to worry this could happen. First, public debt is projected over the next decade or two to rise from its already high levels in many advanced economies, as the contingent liabilities now built into old-age programs come to pass. At present, the momentum is for public debt to become substantially worse over time, even when or if more sustained and rapid economic growth resumes. Second, many advanced economies are in fact facing a

quadruple debt overhang of public, private, external, and pension debt. Third, we have not paid attention here to the likely possibility of significant "hidden debts," especially in the public sector, which Reinhart and Rogoff (2009; see also Reinhart 2011) find to be a significant factor in many debt crises.[6]

This paper should not be interpreted as a manifesto for rapid public debt deleveraging exclusively via fiscal austerity in an environment of high unemployment. Our review of historical experience also highlights that, apart from outcomes of full or selective default on public debt, there are other strategies to address public debt overhang including debt restructuring and a plethora of debt conversions (voluntary and otherwise). The pathway to containing and reducing public debt will require a change that is sustained over the middle and the long term. However, the evidence, as we read it, casts doubt on the view that soaring government debt does not matter when markets (and official players, notably central banks) seem willing to absorb it at low interest rates—as is the case for now.

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[6] Hidden debt can involve contingent liabilities of the public sector, payment arrears, or other off-balance-sheet items.

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