What is the relationship between large deficits and inflation in industrialized countries?

Marco Bassetto and R. Andrew Butters

Introduction and summary

In the aftermath of the recent financial crisis, the U.S. government ran a deficit of 9.9 percent of gross domestic product (GDP) in 2009—an unprecedented level during peacetime. Figure 1 shows the United States' deficit experience since World War II. Because U.S. history does not provide us with a guide for how fiscal balance will be restored, we look at the experiences of other countries that have faced similar budget shortfalls. In our investigation, we restrict our attention to industrialized countries since 1970. We do this because of the availability and quality of data published on these countries. Also, the institutions and economic fabric of these countries are closest to those of the United States, so their experiences are more likely to be informative for our current situation.

In this article, we address the following questions: Is there evidence of a relationship between high deficits and inflation? And how was fiscal balance restored in industrialized countries that experienced large deficits? Did governments do this primarily by restoring fiscal discipline, by defaulting on debt, or by devaluing debt by means of high inflation?

In the next two sections, we explain the intuition and then review empirical evidence concerning the first question. Deficits and inflation are mechanically linked because inflation causes higher nominal interest payments and thus swells public spending. However, as we explain in box 1 (p. 85), these large interest payments simply cover the depreciation in the real value of debt and do not increase the real burden of debt. After appropriately accounting for these interest payments, we find that large deficits are not associated with higher inflation contemporaneously, nor are they associated with the emergence of higher inflation in subsequent years. This finding should not necessarily be interpreted as implying that high deficits never cause inflation; rather, it is likely that the countries that can afford large deficits have built solid reputations and institutions that support a sound monetary policy and the reversion to a stable fiscal regime.

Having shown that inflation does not appear to be the universal outcome of large fiscal deficits in our main sample, we examine the specific experiences of three countries that ran among the largest public deficits on record while retaining low inflation: Finland and Sweden in the early 1990s and Japan in the 1990s and 2000s. In the case of Finland and Sweden, the fiscal imbalance was short-lived; after a large but brief rise, the level of public debt returned to a sustainable path, thanks to fiscal surpluses and healthy macroeconomic growth. In Japan, public deficits were much more persistent, partly as a result of economic stagnation. Consequently, public debt there has continued to increase over the past 20 years, and a full resolution of fiscal imbalances has yet to occur.

One commonality of the Finnish, Swedish, and Japanese experiences is that each nation's large deficits were the consequence of a banking crisis and the ensuing recession—this is analogous to the current U.S. experience. Our analysis complements Reinhart and Rogoff's (2008a, 2008b, 2009) broader and more systematic work, which specifically looks at the onsets and aftermaths of financial crises across the world. Reinhart and Rogoff pay particular attention to macroeconomic performance and fiscal policy; our findings confirm Reinhart and Rogoff's (2009) conclusion that banking

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FIGURE 1

U.S. federal budget

Source: Haver Analytics.

crises are associated with large jumps in public indebtedness. In this article, our focus is on the consequences of these episodes for inflation and monetary policy.

Theoretical background on deficits and inflation

To establish our framework for examining the link between large deficits and higher inflation, we start by looking at a simple version of the government budget constraint relating nominal government debt to government surplus:

$$1) \quad B_t = (1+i_t)\, B_{t-1} + P_t(G_t - T_t) - S_t,$$

where B_t is the nominal value of government debt in year t, i_t is the nominal rate of return on government debt, P_t is the price index, G_t is real government expenditure (including transfers, but excluding interest payments on debt), T_t is real tax revenues, and S_t is seigniorage (that is, central bank profits remitted to the treasury).[1]

Since we will concentrate on the experience of low-inflation countries, S_t will not play a significant role in our analysis. Nonetheless, we include it explicitly because it has been emphasized by much of the prior research on the connections between inflation and budget deficits. King and Plosser (1985) discuss several different measures of seigniorage and show their similarities and differences in the case of the United States. The measure we adopt here starts from a simple version of the central bank's balance sheet: On the liability side is the monetary base, made up of cash and bank reserves;[2] and on the asset side are bonds, paying the nominal interest rate i_t. If no interest is paid on bank reserves, the central bank's profits are then given by $S_t = i_t M_t$, where M_t is the monetary base.

Equation 1 describes the evolution of public debt from one year to the next in nominal terms. Growth in debt need not lead to fiscal imbalances if it is purely driven by inflation or if it is matched by growth in the real economy that supports debt repayments. We thus rescale the equation by (nominal) GDP.

$$2) \quad \frac{B_t}{P_t Y_t} = \frac{1+i_t}{(1+\pi_t)(1+g_t)} \frac{B_{t-1}}{P_{t-1}Y_{t-1}} + \frac{G_t - T_t}{Y_t} - \frac{i_t M_t}{P_t Y_t},$$

where Y_t is real GDP, $\pi_t = P_t / P_{t-1} - 1$ is inflation, and $g_t = Y_t / Y_{t-1} - 1$ is the real growth rate of the economy.

We make explicit the link between nominal interest rates and inflation by writing

$$3) \quad 1 + i_t = (1 + r_t^e)(1 + \pi_t^e) \Rightarrow i_t \approx r_t^e + \pi_t^e.$$

Equation 3 states that the nominal interest rate is approximately the sum of the real rate of return that savers expect to obtain from bonds (r_t^e) and their expectations about inflation.[3] We substitute equation 3 into equation 2 and obtain

$$4) \quad \frac{B_t}{P_t Y_t} = \frac{(1+r_t^e)(1+\pi_t^e)}{(1+\pi_t)(1+g_t)} \frac{B_{t-1}}{P_{t-1}Y_{t-1}} + \frac{G_t - T_t}{Y_t} - \frac{(r_t^e + \pi_t^e) M_t}{P_t Y_t}.$$

According to equation 4, the following five factors would shrink the debt/GDP ratio (or increase it if reversed).

- High primary surplus relative to GDP:[4] Like any other debtor in the economy, the government can reduce its debt by spending less than its revenues.
- Increased seigniorage: When expected and realized inflation coincide ($\pi_t^e = \pi_t$), high inflation increases seigniorage and reduces debt. This source of funds

BOX 1

Adjusting deficits to distinguish between nominal and real interest payments

To understand the importance of adjusting the deficit measure, we start with equation 1 (p. 84). In that equation, net lending is $-(B_t - B_{t-1})$. As the equation shows, nominal interest payments by the government ($i_t B_{t-1}$) contribute to the deficit, since the government's balance sheet counts them as expenses. However, the balance sheet does not take into account that in the presence of inflation, the real value of nominal debt is reduced. In nominal terms, investors lent B_{t-1} to the government in period $t-1$ and receive $(1+i_t)B_{t-1}$ in period t. However, in real terms, the resources lent by the investors are B_{t-1}/P_{t-1}, and the resources received are

$$\text{B1)} \quad \frac{B_{t-1}(1+i_t)}{P_t} = \frac{B_{t-1}(1+i_t)}{P_{t-1}(1+\pi_t)} \approx \frac{B_{t-1}}{P_{t-1}}(1+i_t-\pi_t),$$

where the last approximation is accurate when inflation is small. Equation B1 suggests that the true interest cost to the government is only approximately $i_t - \pi_t$. Accordingly, from now on we correct the deficit according to the following definition:

$$\text{B2)} \quad \textit{Corrected deficit}_t = B_t - (1+\pi_t)\,B_{t-1}.$$

Equation B2 would be the precise correction if all government assets and liabilities were nominal and all debt lasted one period. In practice, the precise correction should take into account the following complications.

- Governments issue long-term, as well as short-term debt. The real value of long-term debt fluctuates not just because of inflation, but also because of changes in future interest rates. The future rate may fluctuate both because expectations about future inflation may change and because real interest rates may vary.
- Some governments issue debt indexed to inflation, or some issue debt denominated in a foreign currency. In this case, the real value of debt will be preserved even if interest payments do not track domestic inflation, and a correction based on domestic inflation would be inappropriate.
- An important distinction arises between *gross* and *net* government liabilities. One particularly stark example is Norway, which issues some government debt and thus has some nominal liabilities that are subject to erosion; at the same time, its Government Pension Fund uses oil revenues to purchase a very large amount of assets. When government assets are stakes in real companies (or are invested abroad), correcting for domestic inflation should be done only on the liability side, since the real value of a company will not be affected by inflation. However, in some cases, large nominal assets may also be relevant. In Japan, a large fraction of government liabilities are held by other government entities, such as public financial institutions and social security funds.

In this article, we ignore the first two factors. For our main sample, based on Organization for Economic Cooperation and Development (OECD) countries, this does not constitute a large problem, since most borrowing undertaken by these countries is nominal. The larger sample from International Monetary Fund statistics does include countries whose borrowing is primarily indexed to prices or foreign exchange rates. As was the case for Catão and Terrones (2005), a deficit correction is impossible in the larger sample because we lack data on the stock of government liabilities (B_{t-1} in equations B1 and B2). Hall and Sargent (1997, 2010) use detailed information about individual government securities to compute the value of government debt at each point in time in the United States since World War II. Their exercise provides a much more accurate account of the factors that drove the evolution of U.S. government debt. Unfortunately, a similar exercise is not available for other countries. Over short horizons, the Hall–Sargent measure of deficits is much more volatile than the one adopted here, and is mainly driven by changes in interest rates. At longer horizons, however, the two measures are more similar.

We deal with the third factor by conservatively assuming that government assets are nominal, and we thus compute the inflation correction based on net government financial liabilities. Figures based on correcting deficits based on gross liabilities would strengthen our conclusion—that deficits are not associated with higher inflation in our OECD sample; in fact, the opposite relationship would emerge—that is, countries with higher deficits (after the correction) would tend to have *lower* inflation.

has been important for many developing countries that have experienced high inflation. As an example, Sargent, Williams, and Zha (2009) report that seigniorage frequently raised revenues of more than 5 percent of GDP for Argentina and Brazil during their high-inflation years, with occasional higher spikes. In the case of low-inflation economies, however, this number is always very small. In the case of the United States, seigniorage revenues averaged 0.36 percent of GDP between 1959 and 2009, and were never more than 0.8 percent, even in the 1970s, when inflation was relatively high.[5] Any link between deficits and inflation that concerns us will thus come from a different channel.

- High unexpected inflation: When unexpected inflation comes, it reduces the real value of previously issued debt. Unexpected inflation acts thus as a hidden default on debtors' obligations. A government dealing with larger deficits faces a greater incentive to lean on the central bank and encourage higher inflation to alleviate its fiscal imbalance. This is a well-known source of the time inconsistency of monetary policy:[6] Once the private sector's expectations are locked into the nominal interest rate, any movement in inflation becomes "unexpected," and the temptation to "inflate debt away" emerges. In our simple version of the budget constraint, inflation expectations are locked in for a single year, since all debt matures at the end of the year. However, in reality government debt has a longer average maturity; for example, the current average maturity of U.S. debt is 54 months.[7] This gives extra time for inflation to act, and correspondingly increases the temptation for a government to inflate its debt away.[8]
- A smaller real interest rate: The debt/GDP ratio decreases (or increases more slowly) if lenders require a smaller real interest rate. To the extent that government debt crowds out private investment, we would expect higher debt/GDP ratios to put upward pressure on the real interest rate. However, large deficits may be associated with other circumstances that lower the real interest rate paid by the government. For instance, the recent financial market turmoil has led to a "flight to quality" that has greatly reduced yields on government bonds while sharply increasing rates for less creditworthy borrowers. The government may also be tempted to use capital taxes, capital controls, or other direct measures to divert credit away from private markets and toward its own needs. A prominent recent example was the Argentinian government's takeover of private pension plans.[9] For the United States after World War II, Berndt, Lustig, and Yeltekin (2010) find that real interest rates decrease after a negative fiscal shock, hedging 7.8 percent of the risk stemming from these shocks.
- High real economic growth: Growth spreads the burden of debt onto a bigger productive base. In most economic models of a closed economy, high growth is associated with high real interest rates, and no direct fiscal benefit would ensue from such growth. However, empirically, the link between growth and interest rates is not as strict, and this is particularly true in an open economy, where interest rates are also affected by the saving decisions of foreigners.[10]

Equation 4 does not explicitly allow for a reduction in debt through default; this is not an important omission, since we are mainly interested in the experience of countries that experienced high deficits and low inflation (none of them having defaulted on their debt). Nonetheless, an implicit default is allowed by equation 4, in the form of a capital levy on holders of government debt that would be counted among the tax revenues.

The empirical link between deficits and inflation

In the previous section, we noted that engineering higher inflation is a temptation for governments facing fiscal imbalances, since it devalues previously issued debt. In this section, we explore the relationship between deficits and inflation in the data.

A very large literature on this topic already exists. Sargent (1982, 1983) finds evidence of a strong link between deficits and inflation in several European countries in the aftermath of World War I. Furthermore, inflation was brought under control in these countries only when fiscal reforms placed government finances on sound footing. While there is widespread consensus that hyperinflations are caused by fiscal imbalances,[11] at more-moderate inflations the evidence of a link is murkier. The case of France in the 1920s analyzed by Sargent (1983) is not as typical of the post-World War II experience.

Rather than looking at inflation, several researchers have studied the link between money creation and deficits. For the United States after World War II, Hamburger and Zwick (1981) find that monetary growth is influenced by deficits, but only in specific episodes. Likewise, King and Plosser (1985) show that whether deficits can predict monetary growth depends on what other variables are used in the forecasting exercise; they

conclude that there is no evidence of a link between monetary growth and deficits in the United States. King and Plosser also extend the analysis to 11 other countries and again find no evidence of a link between deficits and seigniorage.

Catão and Terrones (2005) expand the analysis of inflation and deficits to a very large number of countries by relying on the International Monetary Fund's (IMF) International Financial Statistics. They also allow for a richer dynamic specification of the inflation process and test whether there is a long-run relationship between deficits and inflation. They do find such a link: Specifically, when deficits are rescaled by GDP, a 1 percent increase in the deficit/GDP measure is associated with about 5 percent extra inflation.[12] However, even in their paper, no such evidence is found among advanced economies with low inflation. Furthermore, data limitations do not allow them to correct deficits to properly account for real interest payments on debt.

In this article, we take the view that an economy with inflation is like a person with a fever: The fever tells you something is wrong, but it can have many causes.[13] The question we address is whether high deficits are one of the conditions that is invariably associated with inflation. To answer this question, we work mostly in reverse, looking at low-inflation countries and checking whether their fiscal house is always in order.

In figure 2, panel A, we look at the relationship between government surplus as a fraction of GDP (more formally, net lending as a fraction of GDP) and inflation, as measured by the consumer price index (CPI), in our main sample. This sample consists of data for countries in the Organization for Economic Cooperation and Development (OECD), excluding Mexico, Turkey, and some other ex-communist countries, over the period 1970–2008 (for details, see the appendix). The marks in panel A of figure 2 represent the inflation–surplus pairs for all the countries in each year of available data. To gain a better understanding of the pattern, we sort all observations by their inflation level and divide them into ten bins. Within each bin, we then compute the median, represented by the black line, and the 5th and 10th percentiles, represented by the two red lines.[14] While the median shows little, if any relationship between surpluses and inflation, the two red lines suggest a negative relationship: It appears that, at high deficit levels (very negative surpluses), further increases in deficits are associated with higher inflation.

Figure 2, panel B shows a similar pattern for a broader set of countries—52 countries from the IMF's International Financial Statistics[15] (see the appendix for details). Panels A and B of figure 2 paint a misleading picture of the true economic relationship between deficits and inflation. The nominal deficit measure adopted in these panels shows the change in *nominal* debt. In the presence of inflation, nominal interest payments may be high and swell the nominal deficit measure, even though the real cost of servicing the debt is not particularly high, as shown by equation 3. This generates a mechanical link between inflation and deficits that is not related to the underlying economic situation. A more accurate description of the fiscal burden left to repay is the change in *real* debt. Therefore, we exclude the part of the nominal interest payments that compensates investors for the erosion of the real value of debt that comes from inflation.

From now on, we focus on our main sample, which uses data on OECD countries. Figure 2, panel C shows how the relationship changes after the surplus measure is corrected. Here, we observe no relationship between surpluses and inflation. Table 1 presents the same evidence through the lens of a parametric statistical model. Specifically, we regress the surplus in country i and in year t (measured in percentage points of GDP) on CPI inflation (measured in percentage points):

$$5) \quad surplus_{it} = \alpha + \beta inflation_{it} + \varepsilon_{it},$$

where ε_{it} is an error term that captures all the reasons why inflation and surpluses are not perfectly linked. As in figure 2, we are interested in capturing how the relationship fits at different deficit levels, paying particular attention to countries experiencing high deficits. We achieve this by estimating equation 5 with three separate quantile regressions: The 5 percent and 10 percent quantiles show the relationship at very low surplus levels (high deficits), and the median (the 50 percent quantile) shows the relationship closer to more typical levels.[16] Each regression suggests a very weak, statistically insignificant, and *positive* relationship between inflation and surpluses, as shown by the positive coefficients on inflation; these results confirm the picture emerging from the figure 2, panel C.

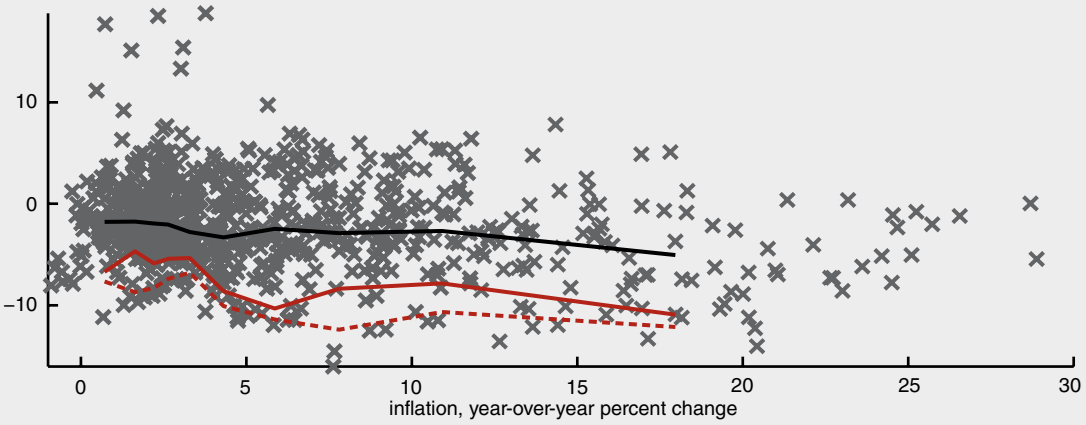
So far, we have concentrated on the contemporaneous correlation between inflation and deficits. There are several reasons, however, why this relationship may show up with a delay. First, Sargent and Wallace (1981) show that the timing of an inflationary response to deficits may depend on the details of monetary policy. Second, if engineering higher inflation is a response to the temptation to devalue nominal debt, this temptation will gradually grow as deficits swell the size of debt. In figure 3 (p. 90), we look for evidence that large deficits are precursors to higher inflation in subsequent

FIGURE 2

Government surplus and inflation

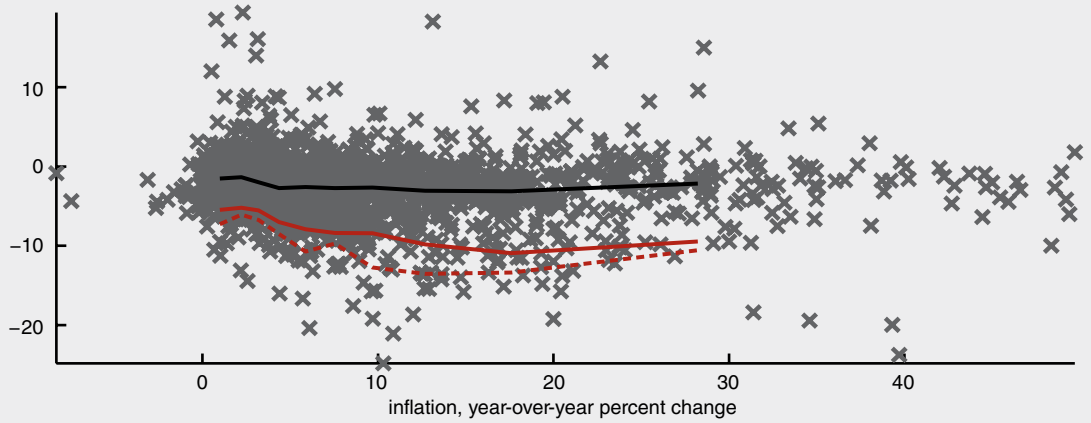
A. Organization for Economic Cooperation and Development sample

surplus, percent of gross domestic product



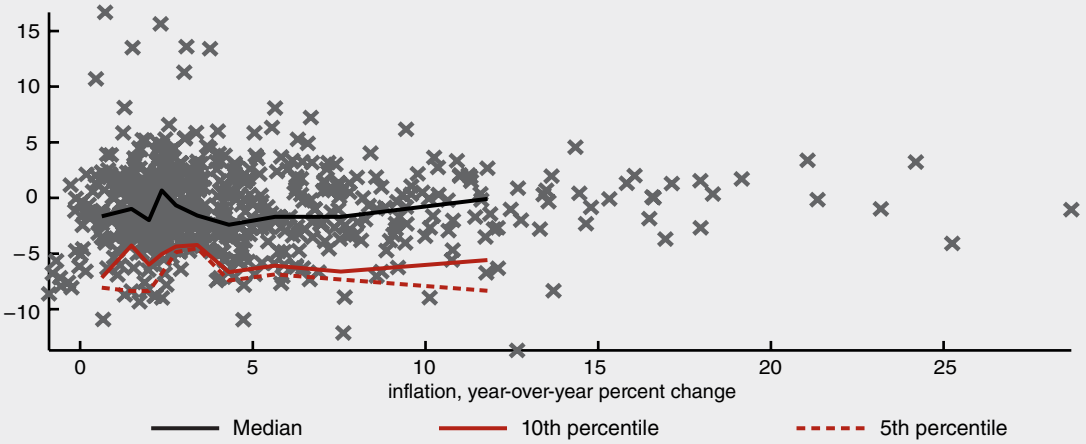
B. International Monetary Fund sample

surplus, percent of gross domestic product



C. Organization for Economic Cooperation and Development sample with debt-adjusted surplus

surplus, percent of gross domestic product



Notes: Inflation is measured by the consumer price index. Panel C uses the debt adjustment described in box 1.

Sources: Authors' calculations based on data from the Organization for Economic Cooperation and Development, SourceOECD; and International Monetary Fund, Statistics Department (1995, 2000, 2005, 2009).

TABLE 1

Quantile regressions of government surplus on inflation

	Fifth	Tenth	Median
Inflation	0.059	0.061	0.063
	(0.091)	(0.072)	(0.039)
Constant	–7.140	–5.617	–1.496
	(0.554)	(0.461)	(0.238)

Notes: Inflation is measured by the consumer price index (CPI). Each column corresponds to a different quantile regression. The standard errors, which appear in parentheses, are not corrected for clustering, so the precision of the estimates are overstated. The cluster correction would lead them to be even less statistically significant. For more details, see the text.

Source: Authors' calculations based on data from the Organization for Economic Cooperation and Development, SourceOECD.

years. Specifically, panel A of figure 3 shows the connection between (corrected) surpluses and the average of inflation two to four years ahead, and panel B of figure 3 repeats the exercise for the average of inflation five to seven years ahead. Again, these panels in figure 3 show no clear connection; if anything, very high deficits seem more prevalent in countries that experience low inflation in the subsequent years. As a final check, in figure 4 we look at the relationship between the stock of government net assets (as a fraction of GDP) and inflation. Once again, this figure shows no evidence of a negative relationship: Heavily indebted countries seem to have lower inflation.[17]

Government deficits are the outcome of a supply of bonds by the government that is met by a demand from willing lenders.[18] Accordingly, our results are consistent with two possible explanations that emphasize the supply and the demand, respectively:

- Governments do not give in to the temptation to inflate away debt, even in times of fiscal straits that lead them to large deficits.
- Lenders are aware that different governments have different reactions to the temptation to inflate debt away or to outright default on their obligations through other means; each government's reaction largely depends on the institutional framework of the country or the political inclination of the dominant parties in that country. As a consequence, lenders are only willing to lend to (and thus permit large deficits in) countries during periods in which the government can be trusted to raise appropriate revenues to repay debt. In this case, the lack of a relationship between higher inflation and large deficits reflects the fact that only the "most virtuous" countries (those that repay their debts on time) ever experience large deficits.

We will not attempt to distinguish which is the correct interpretation. However, previous literature has provided indirect evidence in favor of the second hypothesis. Many researchers have emphasized the link between low inflation and central bank independence from the executive branch of government;[19] it is likely that this institutional arrangement played an important role for many countries that had low inflation, though they were running (or had previously run) high deficits.[20] Furthermore, Reinhart, Rogoff, and Savastano (2003) identify thresholds of "external debt intolerance" that differ across countries. A country more intolerant of debt faces macroeconomic instability and market expectations of a default at levels that do not cause concern for a less intolerant country.

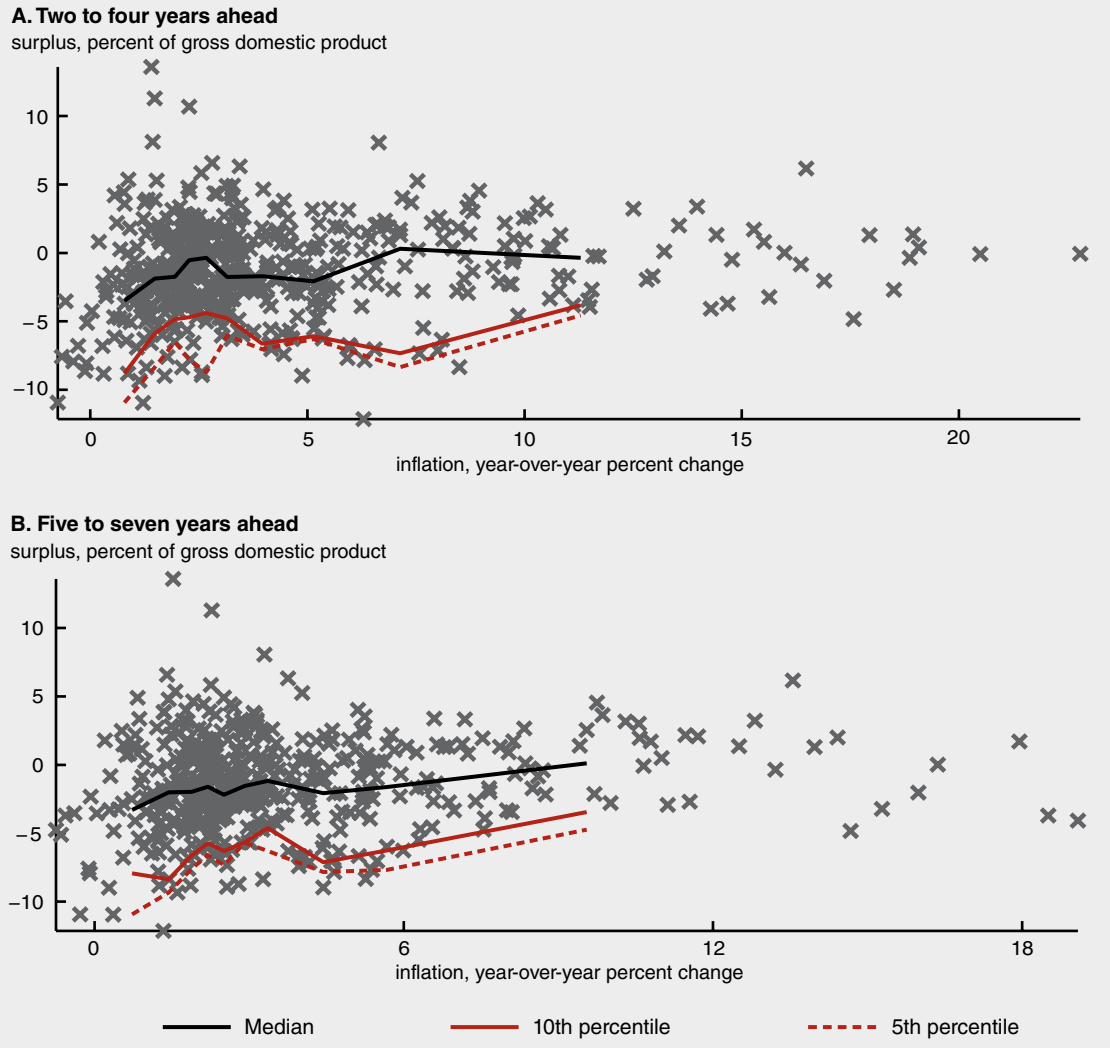
In figure 2, panel C (p. 88), we established that there are several instances of countries that ran very large deficits and pursued low inflation at the same time. Figure 5 magnifies the bottom left corner of figure 2, panel C, and identifies these instances. Of the points identified here, three are due to large one-off accounting adjustments that do not reflect the true deficit: This is the case of Germany and the Netherlands in 1995 and Japan in 1998 (although Japan's deficit in 1998 remains substantial even after adjusting for one-off measures).[21] Two countries appear repeatedly in the picture: Sweden in the early 1990s and Japan in the late 1990s and at the beginning of this century. Furthermore, while Finland appears only once, its macroeconomic and fiscal performance in the early 1990s was similar to that of Sweden. In the next two sections, we discuss these particular deficit experiences in Finland, Sweden, and Japan in further detail.

Finland and Sweden

In both Finland and Sweden, the 1980s were a decade of financial deregulation.[22] The improved ability to access foreign capital markets led to a boom in asset prices. Figure 6, panel A (p. 92) shows the performance of major stock market indexes in the two countries; for Sweden, the stock market appreciation of the late 1980s is even faster than the high-flying dot-com era of the late 1990s. Both countries adopted a fixed-exchange-rate regime in this period: Both the Finnish markka and the Swedish krona were pegged to a basket of foreign currencies.[23] The interest rate differential with respect to Germany and other countries with a stronger tradition of price stability induced domestic borrowers to take loans denominated in foreign currencies; while this saved interest costs during the pegged-exchange-rate regime, it magnified the balance sheet difficulties when central banks were forced to devalue their currencies and let them float in the wake of the crisis.

FIGURE 3

Government surplus and future inflation

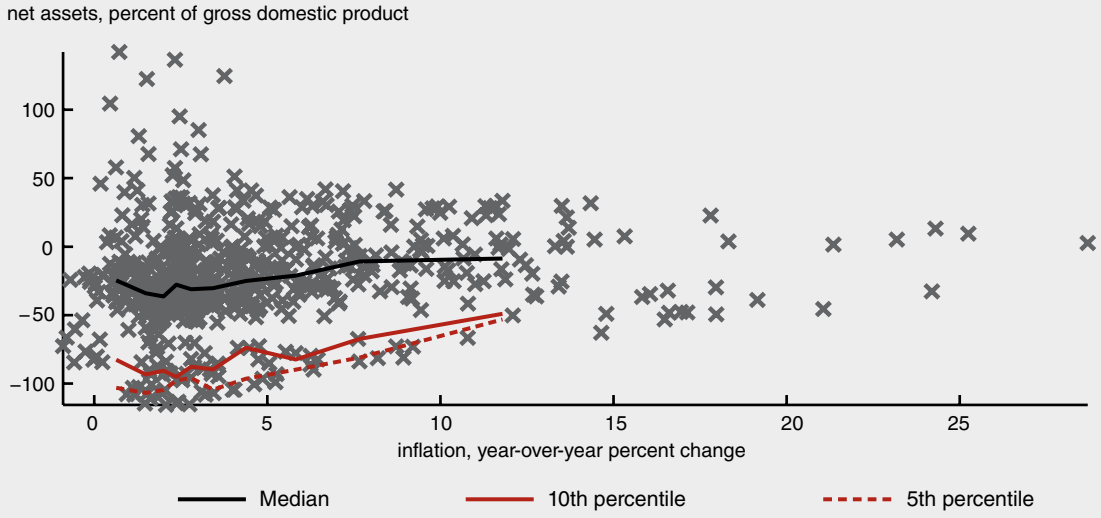


Notes: Inflation is measured by the consumer price index. This figure uses the debt adjustment described in box 1.
Source: Authors' calculations based on data from the Organization for Economic Cooperation and Development, SourceOECD.

By 1990, the combination of a rise in interest rates throughout Europe (following the German reunification) and the increasing risk of a devaluation of the Finnish markka and the Swedish krona led to a surge in interest rates, first stopping and later dramatically reversing the asset price appreciation. This led to large losses in the banking sector, and eventually forced the governments of both Finland and Sweden to step in, guarantee the banks' creditors, and take over some of the most troubled institutions. The financial crisis was accompanied by a severe recession, as highlighted in figure 6, panel B, which measures real GDP. Figure 6, panel C plots government surpluses as a fraction of GDP (that is, net lending as a fraction of GDP) in Finland and Sweden.[24] As seen in this panel, the large deficits documented in figure 5 were a (slightly delayed) consequence of the recession. They were mostly caused by the need to recapitalize the banks and by the so-called automatic fiscal stabilizers, that is, the natural tendency of tax revenues to drop and unemployment and other welfare payments to increase during recessions. There was no intentional "fiscal stimulus;" rather, discretionary fiscal policy actually started tightening by 1993, with tax rate increases and the containment of public expenditure,

FIGURE 4

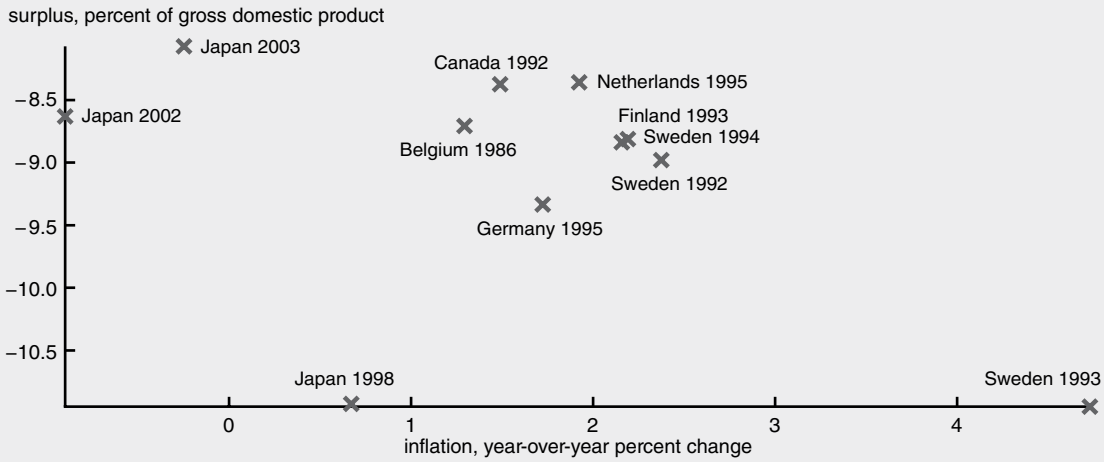
General government net assets and inflation



Note: Inflation is measured by the consumer price index.
Source: Authors' calculations based on data from the Organization for Economic Cooperation and Development, SourceOECD.

FIGURE 5

Government surplus and inflation: High-deficit, low-inflation countries



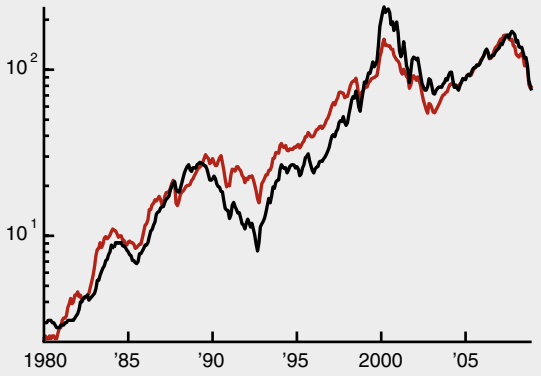
Notes: Inflation is measured by the consumer price index. This figure uses the debt adjustment described in box 1.
Source: Authors' calculations based on data from the Organization for Economic Cooperation and Development, SourceOECD.

as discussed by Honkapohja et al. (2009) and Jonung, Schuknecht, and Tujula (2005). Figure 6, panel D displays government gross financial liabilities.[25] The financial crisis and the recession saddled Finland and Sweden with substantial liabilities. Nonetheless, the ratio of debt to GDP in both countries started to decline shortly after the end of the recession. This decline was entirely driven by solid growth rates in GDP and fiscal surpluses—and not by inflation, to which we turn next, in figure 6, panel E. As seen in that panel, Finland and Sweden did experience moderate degrees of inflation, but this *preceded* the crisis, rather than followed it.

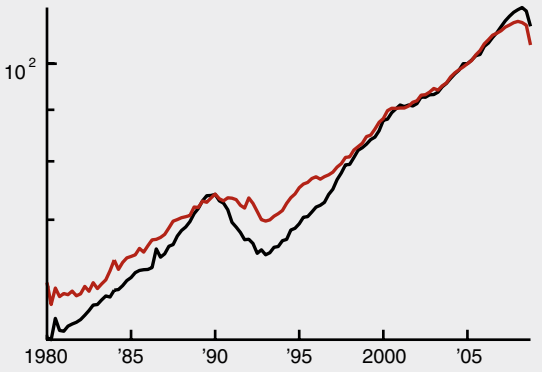
FIGURE 6

Finland and Sweden: Macroeconomic indicators

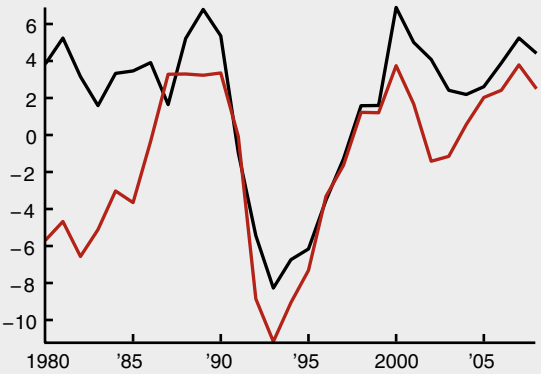
A. Stock market indexes
index, log scale, 2005 = 100



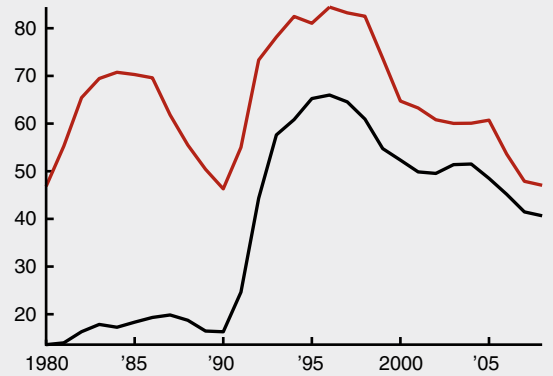
B. Real gross domestic product
index, log scale, 2005 = 100



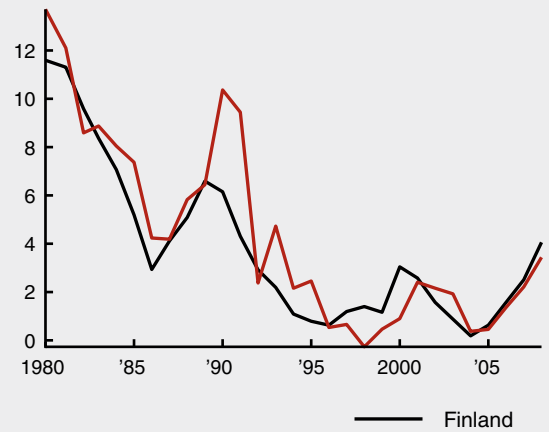
C. General government surplus
percent of gross domestic product



D. General government gross financial liabilities
percent of gross domestic product



E. Inflation
year-over-year percent change



Finland Sweden

Notes: Panel A plots the performance of the Helsinki Stock Exchange (HEX) All Share Index for Finland and the Affärsvärldens Generalindex (AFGX) for Sweden. Panel E plots inflation as measured by the consumer price index.
Sources: Authors' calculations based on data from the Organization for Economic Cooperation and Development, SourceOECD; and Haver Analytics.

Inflation was one of the causes of the crisis: In combination with a fixed exchange rate, it led to a loss in competitiveness, which was only restored after the currency pegs were abandoned in 1992. However, neither country attempted to rely on a monetary policy accommodating high inflation during or after the deficit years to erode the large stock of accumulated financial liabilities.[26]

Japan

As with Finland and Sweden, Japan also experienced a dramatic rise in asset prices during the 1980s. In late 1991, the value of the land underneath the Emperor's Palace in Tokyo was estimated to be worth about the same as the value of the land in the entire state of California.[27] Panel A of figure 7 shows the performance of Japan's stock market, which peaked a little earlier than those of Finland and Sweden, in 1989. The causes of the Japanese boom and bust are more complex than those of Finland and Sweden; a more complete discussion can be found in Kuttner and Posen (2001), Posen (1998), Hayashi and Prescott (2002), and Hoshi and Kashyap (2004). An important difference is that Japanese assets never recovered from the crisis, and still remain well below their peaks registered 20 years ago.

Panel B of figure 7 displays Japan's real GDP, whose path is similar to that of Japan's stock market. While Finland and Sweden experienced a quick recovery after the recession, Japan entered into a prolonged period of stagnation. The extent to which Japan resorted to expansionary fiscal policy to overcome its weak macroeconomic performance is debated. Kuttner and Posen (2001) and Posen (1998) argue that Japan's fiscal deficits were largely a natural consequence of weak growth, with only small discretionary fiscal expansion; fiscal policy even turned contractionary in 1997, as discussed in some detail by Braun and Díaz-Giménez (2009). Whether it was a consequence of automatic stabilizers or a conscious choice to use fiscal policy to stimulate growth, panel C of figure 7 shows that Japan has run large public deficits since the early 1990s, particularly in the early 2000s.[28] As a consequence of these deficits, Japan has accumulated a large debt position. In figure 7, panel D, we plot the gross financial liabilities of the Japanese government. Panel D of figure 7 exaggerates the Japanese indebtedness, since a significant fraction of these liabilities are held by government agencies, as emphasized by Broda and Weinstein (2004). Government net financial liabilities, as shown in figure 7, panel E, provide a clearer picture of the Japanese fiscal situation. Even by this measure, Japan has been accumulating a large stock of debt. Since our debt metric is the ratio of debt to GDP, the lack of growth in GDP is an important cause of this accumulation: Had Japan grown as much as Sweden between 1992 and 2008, its ratio of debt to GDP would have been about 20 percent smaller than it is, even with no change in deficits.[29] Unlike for Finland and Sweden, a full fiscal adjustment to restore stability in the debt/GDP ratio has not yet materialized in Japan, so it is still possible in principle that the large debt accumulation will be eventually eroded away through higher inflation. Nonetheless, the experience of the past 20 years shows no evidence that Japan has given in to this temptation; in fact, as is well known, Japan often experienced *deflation* in this period, as shown in figure 7, panel F. Market interest rates on Japanese government bonds remain low, suggesting that lenders do not yet perceive a significant risk of default or inflation in the future.[30] This is yet another difference from the Finnish and Swedish experience in the 1990s: In Finland and Sweden, interest rates spiked during their financial crisis, providing strong incentives for fiscal adjustment that Japan never faced.[31]

Conclusion

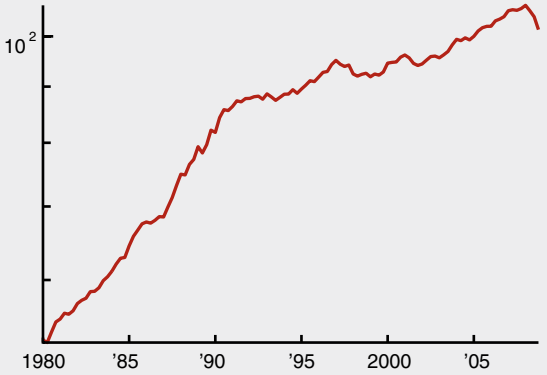
The evidence presented in this article shows that large fiscal deficits in industrialized countries did not coincide with higher inflation, nor did large deficits precede higher inflation. Facing sizable fiscal imbalances, central banks in these countries were nonetheless able to maintain an orderly monetary policy.[32] A tempting interpretation is that these central banks stood fast because their independence allowed them to do so and they wanted to preserve their solid reputations; at the same time, central bank independence shielded governments from the temptation to force the monetization of debt, and led fiscal authorities to revert quickly to a sustainable debt path. However, a full account of the institutions that supported price stability in the face of large fiscal shocks is beyond the scope of this article.

FIGURE 7

Japan: Macroeconomic indicators

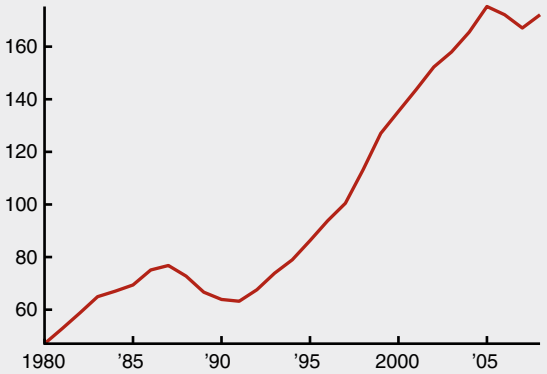
A. Stock market index
index, log scale, 2005 = 100

B. Real gross domestic product
index, log scale, 2005 = 100

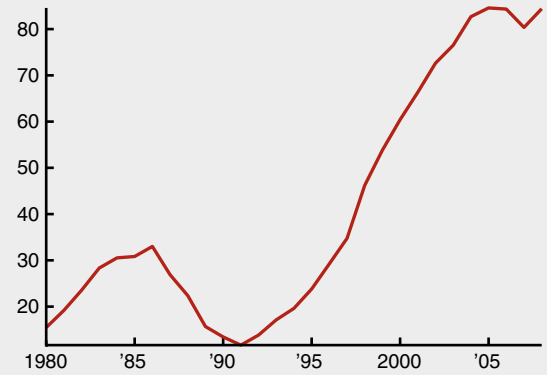


C. General government surplus
percent of gross domestic product

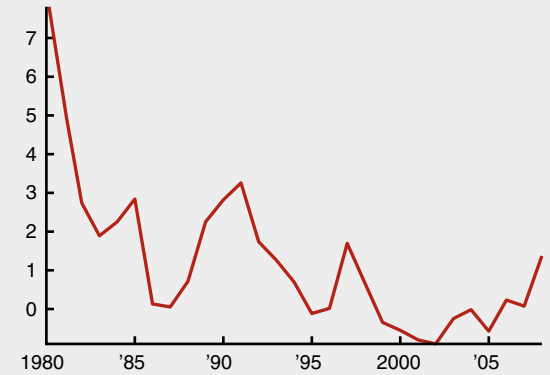
D. General government gross financial liabilities
percent of gross domestic product



E. General government net financial liabilities
percent of gross domestic product



F. Inflation
year-over-year percent change



Notes: Panel A plots the performance of the Tokyo Stock Exchange Stock Price Index (TSE TOPIX). Panel F plots inflation as measured by the consumer price index.
Sources: Authors' calculations based on data from the Organization for Economic Cooperation and Development, SourceOECD; and Haver Analytics.

NOTES

[1]One simplification is that equation 1 treats government debt as if it had a one-year maturity. In practice, a large fraction of government debt has longer maturity. The deficit implications of correctly valuing long-term debt are studied by Hall and Sargent (1997, 2010). This equation also treats the government as a single entity. In practice, even at the U.S. federal level, the Social Security and Medicare trust funds keep separate accounts from the rest of the federal government. Moreover, states and numerous local governments have their own budgets. Throughout this article, we consolidate all of these budgets into one (whenever possible). A further simplification is that we lump purchases of capital together with other forms of spending in G_t and that we lump sales of capital together with other revenues in T_t. In the case of the United States, spectrum auctions (auctions to sell the rights to transmit signals over specific electromagnetic wavelengths) are the only major source of revenues from privatization of public capital.

[2]The liability side also contains the bank's capital; however, this is a relatively small entry, so we abstract from it here.

[3]The approximation is accurate as long as inflation and interest rates are small.

[4]The primary surplus is the difference between government revenues and expenditures, excluding interest payments, and is captured by the second term on the right-hand side of equation 4.

[5]For this computation, we used interest rates on one-year Treasury constant maturities and the monetary base from Federal Reserve Statistical Releases H.15 (www.federalreserve.gov/releases/h15/data.htm) and H.3 (www.federalreserve.gov/releases/h3/hist/), respectively.

[6]For early treatments, see, for example, Calvo and Guidotti (1990).

[7]See U.S. Department of the Treasury, Financial Management Service (2010), table FD-5.

[8]Missale and Blanchard (1994) analyze the relationship between the size of debt and its maturity structure in the case of Belgium, Ireland, and Italy, and show that the maturity structure varies inversely with the size of the debt/GDP ratio. They interpret this as evidence that a shorter maturity is needed to contain the temptation to inflate debt away when debt is larger.

[9]See Economist Newspaper Limited (2008).

[10]For example, the low interest rates of the last decade have sometimes been attributed to a "global saving glut;" see Bernanke (2005).

[11]It should be noted that hyperinflations exacerbate underlying fiscal imbalances; when inflation is so high that it impacts the real value of money on a day-to-day basis, even minor delays in the collection of taxes have a large effect on the real value of tax revenues.

[12]More precisely, Catão and Terrones (2005) use a logarithmic specification for one plus the inflation rate, and they find that a 1 percent increase in the deficit/GDP ratio is associated with 0.044 log points for their logarithmic measure. At low levels of inflation, this translates to 5 percent extra inflation, but this effect becomes bigger at higher inflation rates.

[13]To mention but one example, Barro and Gordon (1983) stress the time inconsistency problem that arises when the central bank wishes to push employment beyond its equilibrium level. Ireland (2000) views this as a cause for the inflation experienced by the United States in the 1970s.

[14]The 5th (10th) percentile is defined so that 5 percent (10 percent) of the points in the bin lie at or below it.

[15]International Monetary Fund, Statistics Department (1990, 1995, 2000, 2009).

[16]It may seem more natural to treat inflation as the dependent variable and the surplus as the independent variable. However, ours is a purely statistical exercise, trying to establish correlation patterns among two variables with no pretense of establishing causation. In this form, the regression allows us to concentrate on the low-surplus quantiles that we are most interested in. We have run similar regressions inverting the dependent and independent variables, and our results are similar.

[17]The figure for gross financial liabilities would be even more striking, mainly because of the recent Japanese experience, where very large gross financial liabilities coexisted with stable or declining prices.

[18]Sometimes governments resort to forced lending; in this case, a proper economic accounting would require us to disentangle how much lenders would willingly offer the government from the hidden tax that is imposed by the mandatory government scheme. Fortunately, this is not an issue for the OECD countries in the period we consider.

[19]See, for example, Grilli, Masciandaro, and Tabellini (1991); Cukierman (1992); and Alesina and Summers (1993).

[20]In the case of Japan, the central bank only gained operational independence in 1997, well after the crisis had started, but still well before government debt grew to alarming levels. See, for example, Bernanke (2010).

[21]See Joumard et al. (2008).

[22]For more detailed accounts of the financial crisis in Finland and Sweden, see, for example, Honkapohja et al. (2009); Jonung, Schuknecht, and Tujula (2005); and Englund (1999).

[23]See Holden and Vikøren (1996). In later years, the basket corresponded to the accounting unit of the European Community—the ECU.

[24]Unlike in figure 5, the actual occurrence of deficits without the correction for inflation is plotted in figure 6, panel C. The pattern is very similar even with the correction.

[25]Plotting net liabilities would show a similar pattern. However, both the Finnish and Swedish governments own substantial interests in private companies, whose market values fluctuated in the late 1990s and early 2000s. These movements confound the underlying evolution of the debt/GDP ratio driven by growth and stable fiscal finances.

[26]It is interesting to note that the macroeconomic and fiscal policy evolution continued to be very similar in both Finland and Sweden, even though their respective institutional environments became very different from the mid-1990s onward. Finland opted to join the Economic and Monetary Union of the European Union (EU), relinquishing its ability to run an independent monetary policy and accepting the fiscal constraints implied by the EU's Stability and Growth Pact. Sweden remained outside of the eurozone, but pursued similar fiscal and monetary policies to those of Finland, even though it was not bound by external constraints.

[27]See Stone and Ziemba (1993).

[28]As we already mentioned, the large outlier in 1998 is due to one-off debt assumptions. The actual occurrence of deficits without the correction for inflation is plotted in figure 7, panel C. The pattern is very similar even with the correction.

[29]Additional growth would also have helped tax revenues, and would thus most likely have reduced the deficits. At the same time, the Japanese government paid very low real interest rates on its debt; had the economy grown faster, higher rates might have prevailed, increasing the burden of debt.

[30]Of course, the recent experience in Greece shows that market expectations can change abruptly.

[31]We are indebted to R. Anton Braun for suggesting this observation.

[32]In fact, many economists have complained that the Bank of Japan was *too restrictive* given the economic conditions; see, for example, Bernanke and Gertler (1999).

Two separate samples were created for our analysis. We present further details on our primary sample comprising data from most countries in the Organization for Economic Cooperation and Development and our larger sample composed of data on 52 countries in the International Monetary Fund's International Financial Statistics.

OECD sample

The primary sample for our article was compiled using the OECD Economic Outlook Database on SourceOECD (www.sourceoecd.org). While this sample does not include all OECD countries, for exposition purposes it will be labeled as such. We gathered annual statistics of general government net lending, net and gross general government financial liabilities, and the inflation as measured by the CPI for 23 countries over the period 1970–2008. The Czech Republic, Hungary, Luxembourg, Mexico, the Slovak Republic, and Turkey were not included because of data availability issues with the particular series of interest. For an exhaustive list of the data availability of the net lending statistic, as well as the countries used, see table A1. In the OECD Economic Outlook Database, the general government sector consolidates accounts of the central, state, and local governments, plus social security. Additionally, net lending, net financial liabilities, and gross financial liabilities are all scaled as a percentage of GDP.

In the OECD Economic Outlook Database, government net lending is defined as general government current tax and nontax receipts less general government total outlays.[1] Tax receipts of the government sector include the sum of direct taxes on household and business sectors, indirect taxes, and social security contributions. Nontax receipts pertain to operating surpluses, property income, user charges and fees, and other current account and capital transfers received by the general government. Total outlays consist of current outlays plus capital outlays. Current outlays are the sum of current consumption, transfer payments, subsidies, and property income paid (including interest payments).[2]

Gross financial liabilities refer to all the debt and other liabilities (short- and long-term) of all the institutions in the general government sector. Subsequently, net financial liabilities measure these gross financial liabilities of the government sector less the financial assets. Such assets may be cash, bank deposits, loans to the private sector, participation in private sector companies, holdings in public corporations, or foreign exchange reserves, depending on the institutional structure of the country concerned and data availability.[3] The status and treatment of government liabilities with respect to their employee pension plans in the national accounts vary across countries, making international comparability of government debts difficult. The current interpretation of the 1993 System of National Accounts distinguishing between "autonomous" funded pension plans and "nonautonomous" pension plans is maintained for this sample.[4]

IMF sample

The second sample was created by collecting the government deficit, the inflation as measured by the CPI, and the GDP of each country from the country pages of the International Monetary Fund's International Financial Statistics Yearbooks.[5] This sample will be referred to as the IMF sample. Annual figures were recorded over the period 1970–2008 for 52 countries. For some countries the only reported government budget was that of the central government; however, the general government budget was used for every country in which it was available over the entire history. For an exhaustive list of the data availability of the deficit statistic, as well as the countries used, see table A1. The deficit calculated by the IMF in its International Financial Statistics is the difference between revenue, including grants received, and the sum of expenditures and lending minus repayments.[6] Subsequently, this deficit calculation is also equal, with the opposite sign, to the sum of the net borrowing by the government plus the net decrease in government cash, deposits, and securities held for liquidity purposes, and parallels the OECD net lending statistic accordingly.

Table A1 summarizes the two samples by listing the particular countries used in each; the data availability of the particular deficit/surplus statistic; and the particular aggregation of the government budget reported in the IMF sample.

[1]Sources and Methods of the OECD Economic Outlook, annex table 27, available at www.oecd.org/document/14/0,3343,en_2649_34573_1847822_1_1_1_1,00.html (with general information available at www.oecd.org/eco/sources-and-methods).

[2]Ibid., annex tables 25 and 36.

[3]Ibid., annex table 33.

[4]Ibid.

[5]To construct the full time series for each country, we used International Monetary Fund, Statistics Department (1990, 1995, 2000, 2009).

[6]See International Monetary Fund, Statistics Department (2009), p. xxvi.

TABLE A1

Countries included in the analysis

Country	OECD	IMF	Government unit
Argentina		1970–2004	Central
Australia	1970–2008	1970–2002, 2004–08	Central
Austria	1970–2008	1970–97, 2006–08	General
Belgium	1970–2008	1970–2008	Central
Brazil		1970–94, 1997–98, 2006–08	Central
Burkina Faso		1973–2005	Central
Cameroon		1975–83, 1989–95, 1998–99	Central
Canada	1970–2008	1970–2007	Central
Chile		1970–2008	Central
Colombia		1970–2006	Central
Costa Rica		1970–2006	Central
Cyprus		1970–2003	Central
Denmark	1971–2008	1970–2000, 2006–08	General
Egypt		1975–79, 1981–2004, 2006–07	General
Finland	1970–2008	1970–2008	Central
France	1978–2008	1970–97, 1999–2007	General
Germany	1970–2008	1970–2008	General
Ghana		1970–97	Central
Greece	1970–2008	1970–2007	General
Iceland	1980–2008	1972–2008	General
India		1970–2008	Central
Indonesia		1970–2008	Central
Iran		1972–2007	Central
Ireland	1970–2008	1970–2002, 2006–08	General
Israel		1970–2001, 2006–08	Central
Italy	1970–2008	1970–2008	Central
Japan	1970–2008	1970–93, 2001–06	General
Kenya		1970–2006	Central
Malaysia		1970–99	Central
Mexico		1972–2008	Central
Morocco		1970–2005, 2007–08	Central
Netherlands	1970–2008	1970–2007	Central
New Zealand	1986–2008	1970–88, 1990–2005	Central
Nigeria		1970–74, 1976–94, 1997–2007	Central
Norway	1970–2008	1970–2007	General
Pakistan		1970–2007	Central
Paraguay		1970–2007	Central
Peru		1970–2007	Central
Philippines		1970–2005, 2008	Central
Portugal	1977–2008	1970–98, 2006–08	General
South Africa		1970–2008	Central
South Korea	1975–2008	1970–99, 2001–07	Central
Spain	1970–2008	1970–2007	Central
Sweden	1970–2008	1970–2000, 2002–07	Central
Switzerland	1990–2008	1970–2007	Central
Tanzania		1970–2005	Central
Thailand		1970–2003	Central
Tunisia		1972–2007	Central
Turkey		1970–81, 1983–84, 1987–96	Central
United Kingdom	1970–2008	1970–2008	General
United States	1970–2008	1970–2008	Central
Uruguay		1970–2007	Central

Notes: The years in the second and third columns indicate the periods for which data are available. The second column indicates the data availability of countries in the Organization for Economic Cooperation and Development (OECD) sample, and the third column indicates the data availability of countries in the International Monetary Fund (IMF) sample. Government unit, in the fourth column, refers only to the particular aggregation of government budget reported in the IMF sample (all data in the OECD sample are reported for the general government).
Sources: International Monetary Fund, Statistics Department (1990, 1995, 2000, 2009); and Organization for Economic Cooperation and Development, SourceOECD and the Sources and Methods of the OECD Economic Outlook, available at www.oecd.org/eco/sources-and-methods.

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