Reducing public debt: the experience of advanced economies over the last 70 years [1]

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ABSTRACT

This paper investigates the episodes of public debt reduction in advanced economies since the Second World War. We find 30 episodes of large reductions in the public debt-to-GDP ratio. Four main approaches succeeded in lowering the debt ratio. First, after the end of WWII, high and unexpected inflation eroded a large share of public debt. Second, during the Bretton Woods era, a mix of financial repression, high economic growth and moderate inflation helped reducing public debt. Third, since the 1980s, several advanced economies followed orthodox fiscal adjustments, namely improving their primary balance by reducing expenditure and/or raising taxes. The fourth approach (debt restructuring) was implemented only in one case: Greece in 2011-12. One key finding of our paper is that debt reduction has never been achieved by relaxing fiscal policy (cutting taxes or increasing expenditure), hoping that this would set in motion a growth process sufficiently strong to lower the debt ratio (the so-called "denominator approach" which has recently become fashionable in some countries, including Italy). The empirical evidence of the last 70 years suggests that running a sufficiently strong primary surplus is the only viable option to reduce the public debt ratio nowadays, particularly in countries that are part of the euro area.

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1. Introduction

This paper discusses the experience of those advanced economies that succeeded in reducing their public debt-to-GDP ratio by sizable amounts after the end of the Second World War. Let us underscore from the outset that we do not discuss why public debt should be reduced (throughout the paper, unless otherwise specified or made clear by the context, by "public debt" we mean the public debt-to-GDP ratio, sometimes referred to as debt ratio). There is certainly broad agreement that a persistently high public debt ratio has some drawbacks: it may increase rollover risks, potentially leading to a financial crisis; it may affect the long-term growth rate of the economy for example through crowding out effects, and it may prevent the use of fiscal policy to support economic activity when a negative output gap arises. Economists, however, disagree on the extent of these problems, on whether these drawbacks are affected just by the level of public debt or also by debt dynamics, on the existence of certain thresholds beyond which these drawbacks become more severe, and on whether monetary and exchange rate flexibility reduces the costs associated to a high public debt ratio. We do not take a view on these issues.

The purpose of this paper is, rather, answering the following question: assuming that a country, for whatever reason, wishes to lower its public debt ratio, what does the experience of those advanced countries that, after WWII, managed to do it, tell us about how to do it? And, as there are different approaches to reducing public debt, how frequent have certain approaches been? We do not have the ambition of assessing all the implications of following a certain approach. While we will highlight some macroeconomic developments associated with following a certain approach to debt reduction, we will not deal systematically with the analysis of those developments. Our purpose is more limited, but yet, we believe, useful. Can it be done in a certain way? In how many cases of successful debt reduction was a certain approach followed? How did this frequency change over time? Were certain approaches, perhaps currently advocated, ever followed successfully over the last 70 years? We believe this is useful because, although history is not destiny, history should tell us something about the feasibility of following certain paths to debt reduction. [2] This issue is particularly relevant at a time when public debt in most advanced countries lingers well above its pre-2008 level, and indeed often at unprecedented levels in peacetimes.

More specifically, we will look at the experience of the countries that are currently regarded as "advanced" by international organizations. We focus on advanced economies to narrow down the

[2] We only focus on successful debt reduction cases. For an analysis of failed debt reduction cases see Mauro (2011).

sample, although we recognize that, some decades ago, the economic features of the countries currently regarded as advanced resembled those of the countries currently regarded as emerging, for example in terms of degree of development of financial markets.

The plan of the paper is as follows. Section 2 provides a brief taxonomy of different approaches to public debt reduction, using, as a starting point, the standard debt dynamics equation. Section 3 illustrates the trends in public debt dynamics since WWII, identifying the cases in which public debt was reduced by large amounts. In our sample of 23 countries, we find 30 cases in which public debt declined by at least 25 percentage points of GDP (some countries experienced more than one debt reduction episode). We then classify these cases according to the taxonomy provided in the previous section. Sections 4-6 discuss the three main forms through which public debt was lowered, namely inflation (particularly common after WWII), a mix of growth, moderate inflation and financial repression (more common during the 1950s, the 1960s and the 1970s), and orthodox fiscal adjustment (more common in the 1980s, the 1990s and early 2000s). Section 7 considers the role of asset management (primarily through the sale of government assets, i.e. through privatization) in supporting the decline in the debt ratio. Section 8 looks at the "surgical" approach to public debt reduction, debt restructuring by focusing on Greece, the only significant case of debt restructuring in our sample. Debt restructuring is, essentially, a tax on the wealth invested in government securities (albeit a tax that is also paid by non-residents). By analogy, this section also discussed the role of one off wealth taxes in lowering public debt. Section 9 focuses on the "dog that did not bark", an approach to debt reduction that is currently advocated by some but for which there are no successful examples: fiscal stimulus to raise GDP and boost the denominator of the public debt ratio. Section 10 deals with the second silent dog: debt mutualization across members of a certain monetary area. Section 11 draws the main conclusions.

2. Brief taxonomy of the approaches to lower the public debt ratio

A useful point starting point to present the various approaches through which the public debt ratio can be lowered is the standard debt dynamics equation:

$$\Delta d_t = -pb_t + \frac{(i-g)}{(1+g)} d_{t-1} - oneoff$$

Where d_t is the public debt-to-GDP ratio at the end of period t, pb_t is the primary balance at time t, i is the average nominal interest rate on public debt computed as interest payments at time t over the debt stock at the end of t-1, g is the nominal GDP growth rate and $oneoff$ summarizes various

identifiable temporary factors (privatization revenues, debt restructuring) reducing the debt ratio in a one off way.

Some clarifications on the above equations are in order:

- The public debate on public debt is, at least in Europe, focused on the debt of the "general government" (the central government, including the social security administration, plus sub-national governments). [3] This is also the definition monitored by the European Commission and, usually, by the International Monetary Fund. Reported data, including those in this paper, refer to this aggregate. The general government does not include some public entities, such as the central bank. This means that the public debt data currently used include the debt that the government has contracted towards the central bank. This will have to be taken into account when we consider one important way of lowering public debt, namely printing money. Printing money to repay public debt will not lead to an open decline in the public debt ratio as currently measured (at least not directly) but this is just because the standard debt definition does not consolidate between the general government and the central bank. Even without consolidation, however, printing money does help reduce the debt ratio by providing resources (seigniorage) to reduce interest payments to the private sector. [4] Most importantly, by creating inflation, or by validating inflationary pressures existing in the system, printing money does affect directly the debt ratio through the *i-g* term (as *g* rises with inflation, while *i* may lag behind). We will come back to all this in more detail.

- The above equation does not usually hold exactly because of the so-called stock-flow adjustment, which includes a set of factors that create a gap between the change in debt and the fiscal deficit. The above equation only considers explicitly some (one off and usually large) factors included under the term *oneoff*. In practice, however, other components of this stock-flow adjustment exist (for example, differences between cash and accrual accounting that emerge as long as the deficit is measured based on the latter). The following analysis ignores these other components, as they are relatively small and unlikely to affect trend declines in the debt ratio.

[3] The debt is usually reported on a consolidated base that is often cancelling the amount of debt held within the general government itself.
[4] These revenues typically take the form of a transfer of profits from the central bank to the government and, hence, result in an improvement in the primary balance, which includes those transfers.

- In the above equation, Δ refers to changes with respect to the previous period, that is the previous year, as we use annual data, but a similar equation applies in a multi-year context. [5] As the variables that appear in the one period equation and in the multi-period equation are the same, we can simply focus on the above equation to discuss the factors that affect the decline in the debt ratio over a multi-year horizon.

Let us, therefore, consider the following issue. Suppose the government intends to lower the public debt ratio by a certain amount over the next N years. What are the available options? The debt dynamic equation gives us the list of variables the government can try to affect for this purpose. Only four variables (*pb, i, g and oneoff*) are involved, although a certain strategy may impact on more than one of them at the same time. Broadly speaking, seven, and only seven, strategies, possibly combined, are feasible to achieve this end.

First: improving the primary balance *pb*. [6] We will call this "orthodox fiscal adjustment", which usually requires raising tax rates or cutting spending. The key issue, here, is what would happen to *i-g* when fiscal policy is tightened. The concern may be that the fiscal tightening may cause a decline in *g*. This could happen through demand effects, although this should be a short-term effect related to the increase in the primary balance: *g* would be affected only temporarily. It could also happen through more long-lasting supply-side effects as distortionary taxes or cuts in pro-growth spending (e.g. public investment) may affect the potential growth rate of the economy. So, declines in *g* may partly offset the improvement in *pb*. Note that *pb* can be improved also by saving revenues arising from higher growth (in turn prompted by structural reforms). Indeed, the characterizing feature of this approach is maintaining *pb* at a sufficiently high level regardless of whether this is achieved through discretionary actions or structural measures that, by boosting growth, would allow

[5] Leaving aside the *oneoff* term, the corresponding formula for a multi-period interval is:

$$d_N\text{-}d_0=[(\text{i-g})/(1+\text{g})]\, Nd^{ave}\text{-}Np^{ave}$$

where d_N and d_0 are, respectively, the final (after N years) and the initial debt ratios, p^{ave} is the average primary balance between 1 and *N*, d^{ave} is the average debt ratio between 0 an *N-1* and it is assumed, for simplicity that the nominal interest rate and GDP rate are constant during the period (see Escolano, 2010, pp, 3-4).

[6] The formula for the primary balance that allows the debt ratio to be lowered from d_0 to d_N^* within *N* years is given by:

$$pb^* = \frac{\lambda}{(1+\lambda)^{-N}-1}[(1+\lambda)^{-N}d_N^* - d_0]$$

where $\lambda = (\text{i} - \text{g})/(1 + \text{g})$ (see Escolano, 2010, pp. 5).

a less painful increase in *pb*. [7] Of course, if the increase in *pb* is due to higher growth *g* would also rise in the debt dynamics formula. Whether this will be accompanied by a decline in *i-g*, which, for a given primary balance, would accelerate the decline in the debt ratio, depends on several factors. Indeed, one could even argue that the process of fiscal strengthening would, at least after a lag, lower market interest rates and hence *i*, giving rise to a virtuous circle. [8]

Second: raising inflation, usually stimulated or allowed by a rise in the money supply. Printing money helps the fiscal accounts in various ways. The first one is through seigniorage, the benefits arising from the fact that the private sector is willing to accept pieces of paper of no intrinsic value (or zero-interest rate deposits at the central bank) issued by the central bank in exchange for goods or services or, in present days, interest bearing assets. This allows central banks to make profits, the bulk of which are transferred to the government raising its primary balance. [9] This would happen regardless of whether an excessive printing of money causes (or allows) a rise in inflation. When inflation does rise, however, the impact of money printing on the fiscal accounts can be even more powerful. Leaving aside the possible impact of inflation on the primary balance (which may be of a short-term nature or even be negative in the presence of lags in tax collection, the so-called Tanzi effect), the main benefit in terms of the debt dynamics equation would come from the rise in *g*, the growth rate of nominal GDP, due to inflation. This erodes the debt ratio as long as the rise in inflation is not accompanied by an equal surge in *i*. Even assuming the Fisher effects operates on the new public debt issued (i.e. that the interest rate on new debt issues rises in line with expected inflation), *i* is unlikely to respond *pari passu* to an increase in inflation, due to the existence of long-term securities in circulation, for which interest payments do not change in the short run. Therefore, *i-g* would usually decline sharply when inflation surges. [10]

[7] Indeed, one could distinguish cases in which the improvement in *pb* is achieved through discretionary actions or by saving revenues from higher growth, but the distinction is not so relevant from a political economy point of view. The decision not to spend revenues from higher growth does anyway require a policy decision.

[8] Conversely, one can envisage situations in which a sharp initial fiscal tightening would bring about such a decline in g to cause an adverse market reaction that would lead to a rise in interest rates. In such a case, a fiscal tightening may turn out to be counterproductive if not supported by an expansionary monetary policy. See, for the discussion of such a case Cottarelli and Jaramillo (2012), especially the Appendix.

[9] As noted above, when government debt is considered without consolidating the government and the central bank balance sheet, the impact of seigniorage is felt solely through the transfer of central bank profits and the improvement in the primary balance. If, instead, we looked at the consolidated balance sheet of the government and the central bank seigniorage would consist of two components: the lower issuance of government paper (corresponding to direct central bank credit to the government) and the interest payments received from the private sector (normally banks) arising from central bank lending to this sector.

[10] Monetary policy operates also by keeping interest rates low: *i* would decline. Until recently, however, most economists would believe that this would sooner or later lead to higher inflation and inflation expectations which would

Third: relying on financial repression. By this term, we mean various kinds of administrative controls aimed at keeping *i* below its equilibrium level in the absence of those controls. These include measures ranging from ceilings on interest rates (on assets alternative to government bonds) to controls on capital movements towards the rest of the world to investment requirements on banks to purchase government paper. These measures often come in disguise, as prudential regulation measures. Financial repression can be particularly powerful if coupled with some, even moderate, degree of inflation. Moderate inflation, even if prolonged, is economically and socially more acceptable than high inflation, but would unlikely affect *i-g* significantly because investors would have time to demand higher interest rates on newly issued bonds to compensate for higher expected inflation. However, the rise in interest rates can be prevented or reduced through financial repression.

Fourth: asset and liability management. The most relevant form of asset management is privatization, which may contribute to the reduction of the debt ratio both by reducing debt – a one off effect– and by improving economic efficiency. Liability management aims at lowering the average interest rate on the debt by offering securities that may be more appealing to investors.

Fifth: restructuring public debt. Debt restructuring involves replacing bonds in circulation with new bonds that typically have a lower face value, lower interest rates or longer maturity. The first leads to a one off decline in the debt ratio. The second to a decline in *i*. The third may also lead to a decline in *i* because the interest rate on these new bonds would be lower than what the market would request for similar maturities. Debt restructuring may come with a number of unpleasant side effects, operating through *i-g.* The interest rate on new bond issues would likely increase. The growth rate may also be affected at least in the short run because debt restructuring involves a loss of wealth for private bondholders. If these bondholders are residents, domestic demand would suffer at least for some time. Indeed, as noted above, debt restructuring is like a tax on wealth, the component of wealth held in government securities, and thus has recessionary effects as long as this tax is paid by residents. More comprehensive one off wealth taxes can also be used to lower public debt. Formal wealth taxes, however, would be recorded as an improvement in the primary balance. While such an improvement would be a one off, it would still raise the average *pb* during the adjustment period.

cause a reversal of the monetary policy stance. The last ten years, however, have been characterized by both low interest rates and low inflation, a result that was perhaps achieved because the expansionary effect of monetary policy was muffled by tight bank regulation policies (reducing the impact that base money creation has on bank loans and deposits). All this facilitated the decline (or contained the rise) in debt ratios over the last ten years.

Sixth: the "denominator" approach. The denominator approach comes in two variants. The first one consists of structural measures to boost the GDP growth rate *g*. If revenues from higher growth are saved the primary balances would rise. If they are not, the debt ratio would still decline but, as we will see, its impact on the debt ratio will be much smaller. The second variant instead tries to raise *g* through a fiscal expansion. This means that *pb* will weaken at least initially, and, for this approach to work, *g* would also have to rise and by a sufficient amount for the debt ratio to decline. We will later see why this is unlikely to happen and, indeed, it has never happened in our country sample. Note also that the hope that a fiscal expansion, through an increase in GDP and hence in revenues, would instead lead to a stronger *pb* is not only unlikely to happen in practice, but it is also theoretically impossible (except under extreme conditions): pulling yourself up by your bootstraps is impossible (more on this later).

The seventh and final approach is debt mutualization. In the proposals put forward in Europe, debt mutualization typically takes the form of a replacement of market credit with credit granted by European institution, at below market interest rates. This European institution would finance itself from the market at low interest rates as it would benefit from the "joint and several" guarantee of all euro area members (hence the mutualization of debt). In terms of the debt dynamics equation, the effect would be a decline in *i*. More extreme forms of debt mutualization would involve grants, in which case the debt stock would decline immediately.

3. Public debt reductions since WWII in advanced economies: key data and facts

Our analysis focuses on the group of countries regarded as "advanced" in the standard definition used by international organizations. Broad trends in the public debt ratio for advanced countries in the last 140 years are presented in Figure 3.1. [11] We focus on large declines in the public debt ratio during the second half of this period, more than 70 years after the end of WWII.

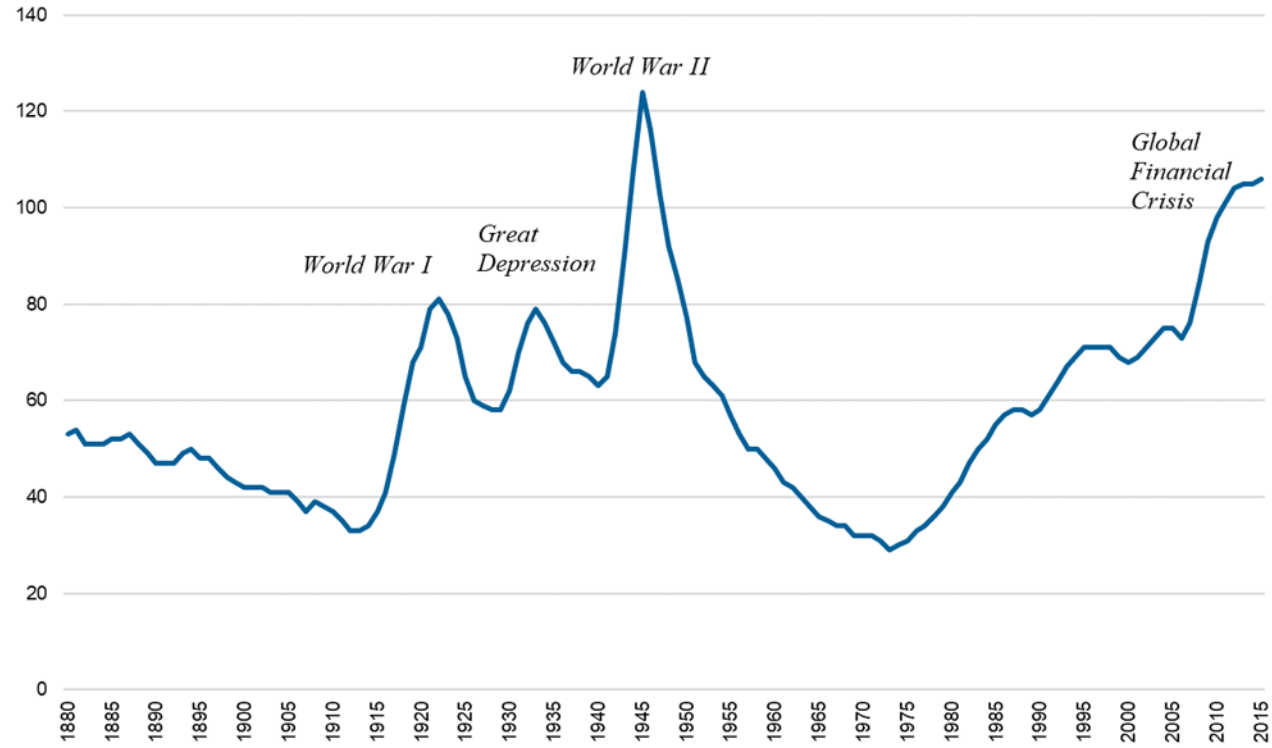
The advanced countries group, according to IMF's World Economic Outlook, includes 39 economies. Our subset, however, includes only 23 countries, as we have dropped some specific country groups (such as the economies that moved away from central planning during the last 70 years), as well as individual countries for which data were not fully available from the end of WWII or contained severe discontinuities. [12] As mentioned, we focus on large debt deductions, by which

[11] The figure, taken from Abbas and others (2010), actually reports the average public debt-to-GDP ratio for the largest advanced countries (those belonging to the G20 group).

[12] The 23 countries are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece**,** Iceland, Ireland, Israel, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United

we mean reductions of public debt-to-GDP ratio greater than 25 percentage points. In addition, we include in our sample two debt reduction cases where the debt reduction did not exceed the threshold, yet they were very close to it and we found interesting to explore them, namely France from end-1949 to the end-1966 (-23.4 percentage points) and Finland from end-1994 to end-2008 (-23.5 percentage points). We also consider the Greek public debt restructuring that took place in 2012 with a debt reduction of 12.5 percentage points. The Greek experience is not included among our case studies in Table 3.1, because the decline is much smaller than 25 percentage points; yet we discuss it in section 8 since it is the only example of debt reduction through debt restructuring in advanced economies since WWII. Thus, we focus on 30 debt reduction cases that occurred in 23 countries (some countries experienced more than one debt reduction and two countries never experienced large debt reductions). [13]

Figure 3.1: Advanced economies' Public Debt-to-GDP Ratio, 1880-2015. Source: Cottarelli (2017). IMF data



Kingdom and the United States. For some of these countries, data are available only starting a few years after the end of WWII.

[13] The two countries in our 23 countries sample that never experienced large debt reductions according to our definitions are Portugal and Germany. One clarification on the latter: data for Germany are available only starting in 1950 so we do not consider what happened to the debt ratio in Germany soon after WWII, although most likely it dropped rapidly as a result of high inflation, as it happened in other losers in WWII. We also do not consider the decline in the debt ratio in Germany after 2010, as, while large, it falls significantly short of the threshold (the debt ratio declined by 21.2 percentage points from end-2010 to end 2018). Finally, we also do not consider the debt reduction in Israel in the early 1950s in the absence of sufficient information on budget developments in those years.

These cases are reported in Table 3.1, together with some basic statistics and a simple characterization of the debt reduction strategy based on the taxonomy identified in section 2. It is remarkable that, during the same period, debt reduction strategies are similar across countries, whereas they vary according to the considered period, with only a few exceptions.

Table 3.1: Cases of debt reduction in advanced economies since WWII

Country	Period [1]		Number of years	Initial public debt *	Final public debt *	Public debt variation *	Annual average public debt variation *	Average primary surplus *	Average contribution of i-g and other components * [2]	Average real GDP growth rate *	Average interest rate on public debt *	Average inflation rate [3]	Maximum inflation	Strategy [4]
Italy	1945	1947	2	73.2	24.9	-48.2	-24.1	-7.3	-31.4	24.3	1.2	40.0	62.1	I
France	1945	1948	3	146.4	31.9	-114.5	-38.2	-7.4	-45.5	22.6	1.0	53.4	58.6	I
Finland	1945	1951	6	66.2	21.6	-44.6	-7.4	1.2	-6.3	6.1	1.3	25.9	59.3	I
Canada	1945	1953	8	155.9	67.5	-88.5	-11.1	4.6	-6.4	4.1	2.7	5.5	14.6	M
Switzerland	1945	1963	18	78.8	10.7	-68.1	-3.8	1.8	-1.9	4.8	1.1	1.6	4.8	M
Belgium	1946	1951	5	142.1	73.3	-68.9	-13.8	0.7	-13.1	5.4	1.7	5.0	9.4	M
Japan	1946	1951	5	57.5	13.4	-44.1	-8.8	8.0	-0.9	10.2	0.3	81.0	195.1	I
Australia	1946	1964	18	86.8	21.9	-64.8	-3.6	1.6	-2.0	4.6	1.2	5.3	22.8	M
New Zealand	1946	1974	28	147.6	40.6	-107.0	-3.8	2.0	-1.8	4.4	1.7	4.9	10.5	M
Netherlands	1946	1974	28	229.8	37.8	-192.0	-6.9	0.7	-6.2	5.6	1.9	4.8	10.2	M
United Kingdom	1946	1983	37	233.9	46.2	-187.6	-5.1	1.4	-3.7	2.3	4.0	7.1	24.2	M
United States	1946	1974	28	121.2	41.2	-80.0	-2.9	1.2	-1.7	3.7	1.5	3.4	14.4	M
Norway	1947	1953	6	70.5	41.3	-29.2	-4.9	1.1	-3.8	4.6	0.9	5.3	17.0	M
Austria	1948	1957	9	37.5	10.7	-26.9	-3.0	-2.7	-5.7	8.5	0.2	10.2	28.1	I
France	1949	1966	17	38.9	15.5	-23.4	-1.4	-1.2	-2.6	5.1	1.0	5.5	16.7	M
Belgium	1959	1974	15	80.5	54.4	-26.1	-1.7	-0.6	-2.3	4.9	2.8	4.4	15.7	M
Israel	1984	2000	16	283.8	79.6	-204.2	-12.8	1.8	-11.0	2.2	9.0	32.7	304.6	I
Ireland	1987	2006	19	109.4	23.6	-85.8	-4.5	3.8	-0.7	6.5	4.2	2.9	5.3	O
New Zealand	1992	2007	15	64.6	14.5	-50.1	-3.3	4.5	1.1	3.5	2.5	2.2	3.8	O
Belgium	1993	2007	14	134.4	87.0	-47.4	-3.4	4.9	1.5	2.4	6.4	1.8	2.7	O
Denmark	1993	2007	14	80.5	27.3	-53.2	-3.8	4.4	0.6	2.4	3.8	1.9	2.7	O
Netherlands	1993	2007	14	74.8	43.0	-31.9	-2.3	2.1	-0.2	2.9	3.7	2.2	5.1	O
Norway	1993	1998	5	52.4	22.8	-29.6	-5.9	6.3	0.4	4.5	2.5	2.0	2.6	O
Finland	1994	2008	14	56.1	32.7	-23.5	-1.7	4.6	2.9	3.7	2.6	1.6	3.9	O
Iceland	1995	2005	10	58.2	24.5	-33.7	-3.4	2.7	-0.6	5.1	3.1	3.5	6.4	O
Canada	1996	2007	11	100.6	66.8	-33.7	-3.1	3.4	0.4	3.3	6.1	2.1	2.7	O
Spain	1996	2007	11	65.6	35.6	-30.0	-2.7	2.2	-0.5	3.8	2.8	2.9	3.6	O
Sweden	1996	2008	12	70.2	37.7	-32.4	-2.7	3.7	1.0	3.2	2.8	1.7	3.3	O
Iceland	2011	2017	6	92.0	42.5	-49.5	-8.3	5.4	-2.8	3.9	4.3	2.7	5.2	O
Ireland	2012	2017	5	119.9	68.5	-51.4	-10.3	0.5	-9.8	9.4	3.0	0.2	0.6	O
Average			*13.3*	*104.3*	*38.6*	*-65.7*	*-6.9*	*1.8*	*-5.1*	*5.9*	*2.7*	*10.8*	*30.5*	

[1] The period starts when the maximum debt-to-GDP ratio is reached and it ends in the last year of public debt reduction.

[2] "i-g and other components" is computed as the difference between the annual average reduction in the debt-to-GDP ratio and the primary balance.

[3] Consumer Price Index. More details can be found in the Appendix.

[4] I=inflation; M=Mix of fianncial repression, sustained economic growth and moderate inflation; O=orthodox fiscal adjustment.

* These data are expressed as percent of GDP.

The first approach used to lower public debt was high inflation. This method found broad application soon after WWII to the early 1950s, with five cases (Italy, 1945-1947; France 1945-1948; Finland 1945-1951; Japan, 1946-1951 and Austria 1948-1957). The only case falling outside that period was Israel (1984-2000). However, here very high inflation in the early years was followed by a long period of high yet declining inflation when debt reduction was also helped by financial repression.

The second approach to debt reduction was a mix of economic growth, moderate inflation and financial repression. This includes ten cases, all of them occurring during the 1950s through the 1970s: Canada (1945-1953), Switzerland (1945-1963), Belgium (1946-1951), Australia (1946-

1964), New Zealand (1946-1974), Netherlands (1946-1974), UK (1946-1983), USA (1946-1974), Norway (1947-1953), France (1949-1966) and Belgium (1959-1974).

The third approach was the one that in section 2 we called orthodox fiscal adjustment, i.e. an improvement in primary balance usually by cutting expenditures or raising taxes. This method became popular during the 1990s. Our dataset presents 13 applications of this strategy: 11 cases occurred before the 2008-09 global financial crisis (Ireland, 1987-2006; New Zealand, 1992-2007; Norway, 1993-1998; Belgium, 1993-2007; Netherlands, 1993-2007; Finland, 1994-2008; Iceland, 1995-2005; Denmark, 1993-2007; Canada, 1996-2007; Spain, 1996-2007; Sweden 1996-2008) and two occurred after the crisis: Iceland, 2011-17, and Ireland, 2012-17.

Finally, we considered debt restructuring in Greece (2011-2012), the only episode of large debt restructuring in an advanced economy since WWII. [14]

It is useful to compare some features of these debt decline cases across adjustment strategies:

- The magnitude of the debt declines: in the 30 cases, the average public debt reduction is 65.7 percentage points of GDP. In 22 cases, decreases range from 25 (or close to 25) to 75 percentage points, in five cases they range from 75 to 125 percent of GDP and in three cases reductions exceed 125 percentage points (the Netherlands, 192 percentage points between 1946 and 1974; the United Kingdom, 187.6 pp between 1946 and 1983; Israel, 204.2 pp between 1984 and 2000). The strongest reductions (-85.1 percentage points on average) are associated with the second strategy (mix of financial repression, economic growth and moderate inflation), while the other two strategies show smaller values on average (-80.4 percentage points in reductions through high inflation, -42.5 percentage points in orthodox adjustment cases).
- The duration of debt declines: its average is 13.3 years. Declines through high inflation do not last long: only 6.8 years on average, against 11.5 years for orthodox fiscal adjustment and 18.9 years for the mix of financial repression, economic growth and moderate inflation, by far the strategy that shows more endurance.

[14] Some databases include also Ireland and Portugal as cases of debt restructuring, because of a technicality. In 2012 the European institutions agreed to improve the terms at which they were lending to Greece, which required technically a change in the initial terms of the lending agreement (and hence technically a debt restructuring). Similar improvements were also applied to Ireland and Portugal, which were also borrowing at that time from the European institutions. Hence, there was a revision in the initial terms of the lending agreement also for them and, therefore, technically, a debt restructuring. This said, the Greek debt restructuring that is discussed in the text refers to the major haircut that was applied in the case of Greece to the private debt, which involved neither Portugal nor Ireland. The German restructuring of 1953 reduced the debt (which was entirely external) by about 9 percentage points of GDP, hence it does not come close to fulfilling the 25 percent criterion adopted in this paper.

- The annual public debt reduction: its average is 6.9 percentage points, a very high level in light of current discussions on the difficulty of lowering public debt ratios. Consistently with what previously discussed, inflation allows very fast reductions even though they do not last long (15.7 percentage points per year). The mix of financial repression, economic growth and moderate inflation ranks second (5.3 percentage points), whereas the slowest strategy is orthodox fiscal adjustment, with an annual average debt reduction equal to a remarkable 4.3 pp.
- The starting level of the debt ratio: its average is 104.3 percentage points. In general, in 18 cases reductions are achieved by countries with a starting level of public debt smaller than 100 percent of GDP; in 9 cases, initial levels range from 100 to 200 points; in three cases, starting values exceed 200 points (Netherlands, 229.8 in 1946; United Kingdom, 233.9 in 1946; Israel 283.8 in 1984). It is worth noting that the three countries where the strongest reductions took place are the same ones where the starting levels of public debt are the highest. Indeed, while there is no correlation between the starting level and the average annual reduction, a strong correlation (0.94) exists between the initial debt ratio and the decrease in the debt ratio.
  If we consider the different debt reduction approaches, in case of debt reduction through inflation the average starting level was 110.7 percent of GDP. However, excluding Israel that had an initial level equal to 283.8 percentage points, the average starting level was 76.1 percent. This suggests that perhaps high inflation was not motivated by the high debt level but it was the result of the post-war disruption process and it had a "beneficial side effect" in terms of debt reduction. The starting level of public debt in cases of reductions through a mix of financial repression, moderate inflation and economic growth was 126, whereas in cases of orthodox fiscal adjustment it was 83 percentage points.

4. Monetization and inflation

In the aftermath of WWII until the beginning of the 1950s, several countries were affected by strong inflationary waves. In our sample, in five cases such major increases in prices led to large public debt reductions. [15] In France, the public debt to GDP ratio fell by 114.5 points, in Italy by 48.2 points, in Finland by 44.6 points and in Japan by 44.1 points. In Austria, the reduction was smaller (26.9 points), but it must be considered that Austria had a very low initial level of debt (37.5 in 1948). In addition to the reductions realized in the aftermath of WWII, a very large reduction, by 204.2 points, happened in Israel after 1984. This is the only case of reduction through inflation after the 1950s.

[15] This is probably a subset of the countries that actually reduced their debts through inflation because there are missing data for several countries in the immediate postwar period.

As it can be seen in Table 4.1, all the reductions through inflation happened extremely fast, with an average duration of 6.8 years: indeed, the average annual reduction of the debt-to-GDP ratio is extremely high, namely 15.7 percentage points per year. It should be noted that the debt reduction in Israel took 16 years, but 59 percent of the debt reduction was achieved in the first two years. Excluding Israel, the average duration declines from 6.8 years to 5 years. Overall, reductions through inflation are considerably faster than the ones reached with other strategies.

As discussed in Section 2, inflation affects the debt ratio mainly through the differential between the interest rate on public debt and the nominal GDP growth rate. As shown in Table 4.1, the differential is strongly negative for almost all the countries that managed to reduce public debt through inflation. Despite heterogeneity, the average contribution of *i-g* and other components is equal to -16.8 percentage points. In Italy and France the differential reaches extremely high values (respectively -31.4 and -45.5 percentage points), while in Israel, Finland and Austria it is smaller but still sizeable (-11.0, -6.3 and -5.7) and it is small but still negative in Japan (-0.9). Beyond the effects on *i-g*, inflation affects the primary balance through different channels.

On the one hand, inflation can improve the primary balance in two ways. First, when inflation is high, government revenues increase while expenditures defined in nominal terms do not change. In relation to this point, one should consider that (i) this effect works just in the short-term because the government needs to raise nominal expenditure in the succeeding periods and that (ii) it works only on the fixed share of government expenditure, i.e. not indexed to inflation. Second, the elasticity of the fiscal system with respect to inflation is not necessarily equal to one, i.e. in progressive tax systems, inflation tends to push taxpayers to higher brackets, increasing the average tax rate and improving the primary balance.

On the other hand, high inflation could affect the primary balance negatively because of lagged tax payments. For high inflation levels, during the tax collection lag the real value of government revenues decreases (Tanzi, 1977). That is, the longer is the collection lag and the higher the inflation, the stronger is the loss of real value in government revenues. Therefore, in principle, the effect of high inflation on primary balances is ambiguous and depends on circumstances. Indeed, while in Italy, France and Austria high inflation is associated with negative primary balances (respectively -7.3, -7.4 and -2.7 percentage points), in Finland, Japan and Israel the average primary balance during the inflationary wave is positive (respectively 8.0, 1.8 and 1.2). [16]

All these things considered, one central point should be clarified: although inflation appears to be extremely effective in reducing public debt, it is not possible to properly define it as a *strategy* to

[16] Note that beyond inflation many other elements affect the primary balance. This contributes to making extremely difficult to study the impact of inflation on primary balance.

reduce the debt. High inflation results from specific economic circumstances, such as the supply disruptions of the WWII, and in general governments attempt to reduce inflation as soon as possible. From this point of view, the case of Austria is of some interest, since, as mentioned above, this is a country where inflation reached almost 30 percent, although there was no need to reduce the debt that was already quite low.

Table 4.1: Inflation and Debt-to-GDP ratio (Italy, France, Austria, Finland, Japan and Israel)

Country	Period [1]		Number of years	Initial public debt *	Final public debt *	Public debt variation *	Annual average public debt variation *	Average primary surplus *	Average contribution of i-g and other components * [2]	Average real GDP growth rate *	Average interest rate on public debt *	Average inflation rate [3]	Maximum inflation
Italy	1945	1947	2	73.2	24.9	-48.2	-24.1	-7.3	-31.4	24.3	1.2	40.0	62.1
France	1945	1948	3	146.4	31.9	-114.5	-38.2	-7.4	-45.5	22.6	1.0	53.4	58.6
Finland	1945	1951	6	66.2	21.6	-44.6	-7.4	1.2	-6.3	6.1	1.3	25.9	59.3
Japan	1946	1951	5	57.5	13.4	-44.1	-8.8	8.0	-0.9	10.2	0.3	81.0	195.1
Austria	1948	1957	9	37.5	10.7	-26.9	-3.0	-2.7	-5.7	8.5	0.2	10.2	28.1
Israel	1984	2000	16	283.8	79.6	-204.2	-12.8	1.8	-11.0	2.2	9.0	32.7	304.6
	Average		*6.8*	*110.7*	*30.3*	*-80.4*	*-15.7*	*-1.1*	*-16.8*	*12.3*	*2.2*	*40.5*	*118.0*

[1] The period starts when the maximum debt-to-GDP ratio is reached and it ends in the last year of public debt reduction.
[2] "i-g and other components" is computed as the difference between the annual average reduction in the debt-to-GDP ratio and the primary balance.
[3] Consumer Price Index. More details can be found in the Appendix.
* These data are expressed as percent of GDP.

5. Debt reductions after WWII: a mix of financial repression, growth and moderate inflation

Starting in the late 1940s through the end of the 1970s, several countries managed to reduce their debt-to-GDP ratio by sizable amounts through a mix of financial repression sustained growth and moderate inflation. More specifically, in our dataset, ten countries managed to lower their debt ratio by more than 25 percentage points from the 1940s to the late 1970s (see Table 5.1). Some common features stand out regarding the drivers for the debt reductions in this period:

- Inflation was well below the levels reached in the debt reduction cases considered in the previous section, exceeding 6 percent in one case only. Moderate inflation close to 5 percent, instead, was more common.
- The average interest rate on government debt was low and sometimes well below the inflation rate, thus implying negative real interest rates. Indeed, the nominal interest rate was below 2 percent in all cases, except the UK and Canada.
- The average growth rate was 4.5 percent. Altogether, the interest rate – growth differential (and other factors) was largely negative and, thus, its contribution to the decline in the debt ratio was large.
- Primary surpluses were positive in all cases except in the French one and in the second case of Belgian debt reduction, yet they were fairly low. Indeed, the average surplus was equal to 1.2 percent of GDP, which was less than a half the levels of the average primary surplus of the countries that reduced their debt ratio in the period considered in the next section.

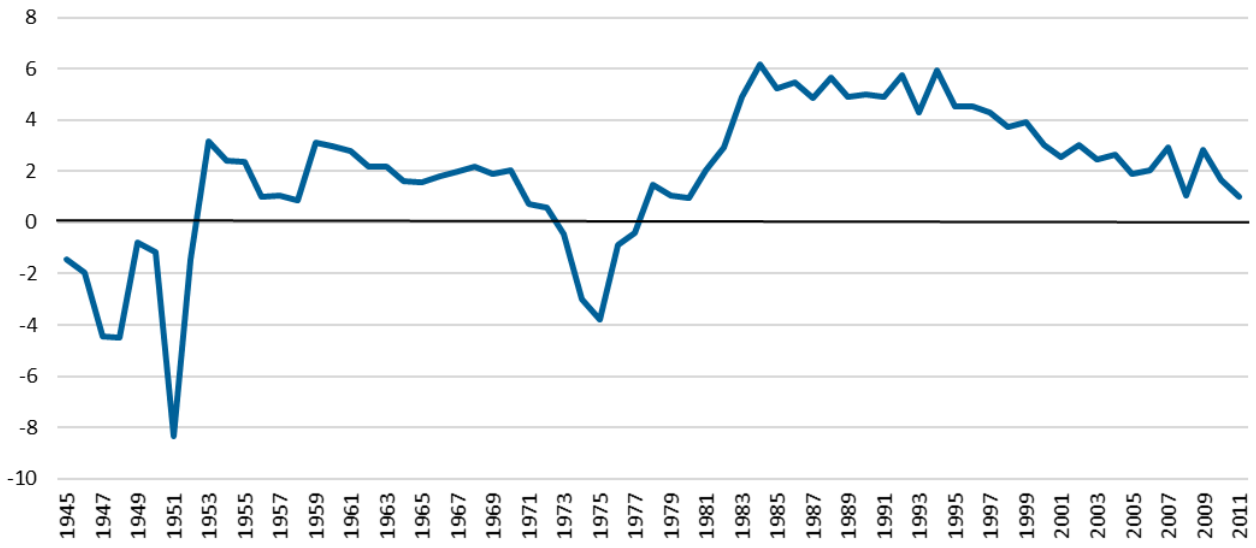
Table 5.1: episodes of debt reduction from 1945 to 1981 through a mix of financial repression, economic growth and moderate inflation [17]

Country	Period [1]		Number of years	Initial public debt	Final public debt	Public debt variation	Annual average public debt variation	Average primary surplus	Average contribution of i-g and other components [2]	Average real GDP growth rate	Average interest rate on public debt	Average inflation rate [3]
Canada	1945	1953	8	155.9	67.5	-88.5	-11.1	4.6	-6.4	4.1	2.7	5.5
Switzerland	1945	1963	18	78.8	10.7	-68.1	-3.8	1.8	-1.9	4.8	1.1	1.6
Belgium	1946	1951	5	142.1	73.3	-68.9	-13.8	0.7	-13.1	5.4	1.7	5.0
Australia	1946	1964	18	86.8	21.9	-64.8	-3.6	1.6	-2.0	4.6	1.2	5.3
New Zealand	1946	1974	28	147.6	40.6	-107.0	-3.8	2.0	-1.8	4.4	1.7	4.9
Netherlands	1946	1974	28	229.8	37.8	-192.0	-6.9	0.7	-6.2	5.6	1.9	4.8
United Kingdom	1946	1983	37	233.9	46.2	-187.6	-5.1	1.4	-3.7	2.3	4.0	7.1
United States	1946	1974	28	121.2	41.2	-80.0	-2.9	1.2	-1.7	3.7	1.5	3.4
Norway	1947	1953	6	70.5	41.3	-29.2	-4.9	1.1	-3.8	4.6	0.9	5.3
France	1949	1966	17	38.9	15.5	-23.4	-1.4	-1.2	-2.6	5.1	1.0	5.5
Belgium	1959	1974	15	80.5	54.4	-26.1	-1.7	-0.6	-2.3	4.9	2.8	4.4
Average			*18.9*	*126.0*	*40.9*	*-85.1*	*-5.3*	*1.2*	*-4.1*	*4.5*	*1.9*	*4.8*

1 The period starts when the maximum debt-to-GDP ratio is reached and it ends in the last year of public debt reduction.
2 "i-g and other components" is computed as the difference between the annual average reduction in the debt-to-GDP ratio and the primary balance.
3 Consumer Price Index. More details can be found in the Appendix.
All the data are expressed as percent of GDP, except for the number of years in public debt reduction periods.

Altogether, the key features of these debt reduction episodes are the low level of nominal interest rates and the largely negative real interest rates in the presence of a high real growth rate of GDP. Hence, countries experienced a negative interest rate-growth differential. Other things being equal, a high real growth rate would be consistent with a high real interest rate because of the high marginal yields of real investment. Yet, real interest rates were low, even negative, as shown in Figure 5.1. Why were real interest rates so low in spite of sustained real growth?

Figure 5.1: Average real long-term government bond yield as a percent of GDP in the 10 countries listed in Table 5.1 (1945-2011). Source: Public Finance in Modern History, IMF



Financial repression is likely to have played a major role. By financial repression, we mean policies, laws, regulation, taxes that prevent agents from deciding freely how to invest their money. After

[17] During 1946-1951, the figures for Belgium reflect an extraordinary operation that was carried out in 1948.

WWII, economic and historical conditions were particularly favourable to an effective use of financial repression to lower the public debt-to-GDP ratio. First, most of the public debt was domestic and denominated in national currencies: Reinhart and Rogoff (2009 and 2012) assess that in advanced economies 88 percent of public debt was domestic. [18] Second, from 1944 to the early seventies, capital controls were considered the rule rather than the exception, in the context of the Bretton Woods agreements and their fixed exchange rates. Reinhart and Sbrancia (2015) discuss more in detail how financial repression was used to facilitate the decline in the public debt-to-GDP ratio in the post WWII period. In particular, financial repression tools included:

- Ceiling on interest rates and bond yields.
- Establishment of a captive domestic audience to facilitate direct credit to the government. This goal was achieved through restrictions on capital movements, as well as prudential regulation, which compelled financial institutions to hold government paper in their portfolios. Moreover, bans on gold trades and transaction taxes on equities induced investors to buy government debt instruments. [19]
- Direct ownership/management of banks and financial institutions by the public sector and barriers to entry in this sector.

Financial repression measures were widespread in the countries listed in Table 5.1. Battilossi (2005) measures the intensity of financial repression in Europe by constructing a financial repression index for a panel of sixteen countries from 1950 to 1991. [20] Table 5.2 shows Battilossi's results, where the higher is the index the more financially repressed was the economy.

[18] As advanced economies, Reinhart and Rogoff consider Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, United Kingdom and the United States.

[19] Often the main motivation of such restrictions was avoiding capital flights, exchange rates devaluations and domestic inflation. See Cottarelli et al. (1986).

[20] Countries included in the sample are Austria, Belgium, Denmark, Finland, France, West Germany, Greece, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the UK.

Table 5.2: Financial Repression Index: Ranking of European Countries. The ones in yellow had a score above the group mean. Source: Battilossi (2005)

1950-1958	1959-1971	1972-1979
UK	UK	UK
Greece	Belgium	Ireland
Belgium	Greece	Greece
Netherlands	Portugal	Italy
Germany	France	Belgium
Portugal	Netherlands	Germany
Austria	Germany	Portugal
France	Austria	France
Spain	Italy	Norway
Norway	Ireland	Denmark
Denmark	Spain	Spain
Ireland	Norway	Austria
Italy	Denmark	Sweden
Finland	Finland	Finland
Sweden	Sweden	Netherlands
Switzerland		Switzerland

The UK was the country with the highest financial repression index (FRI) from 1950 to 1979. Indeed, this country experienced strong and long-lasting measures of financial repression: the Bank of England and the government kept guiding lending rates until the early 1980s and controls on capital movements were pervasive (the "Exchange control act" was abolished only in 1979). Capital account and exchange rate controls were in place also in France, together with several measures aimed at facilitating the placement of the public debt. Some of these measures were already in place between WWI and WWII. For instance, domestic savings were directed to the government through the "Treasury circuit", a binding system to make government securities the main component of banks' portfolios. Moreover, diverse authorities, such as the "Conseil National du Crédit", defined allocation and policies concerning credit, plus quantity and time of issuance of equities and bonds in the financial market (Aloy et al., 2014). Interest rates were administratively influenced by the regulations on deposit rate and public bond yields were managed by the Caisse des Dépôts, which operated in the bond market buying short-term public debt and exchanging them at the Treasury against long-term securities (Aloy et al., 2014).

Similar instruments were used also in non-European countries. Canadian financial markets were repressed until the 1970s, through interest rate ceilings, capital account and exchange rate restrictions, and foreign banks could not enter the market until the 1980s. Analogous measures existed in Australia: interest rates were controlled through deposit rate limits and loan rate ceilings until the 1980s. Finally, in the USA financial repression measures introduced after the Great

Depression, were lifted only in the 1980s. Regulation Q in the United States is the most prominent measure affecting bank interest rates. [21] Other legacies of the Great Recession were gold restrictions and capital controls, which were in force for forty years, from 1933 to 1974. Last but not least, moral suasion and dealings between the Fed and commercial banks spread in the 1960s (Reinhart and Sbrancia, 2015).

What was the effect of these financial repression tools? One key consequence was to keep interest rates on government debt artificially low, contributing to the decline in the public debt ratio. Reinhart and Sbrancia (2015) compute the benefit that artificially low interest rates had of the fiscal accounts by computing what they call *financial repression tax*, a tax that, being less transparent to voters than other taxes may have been politically more appealing). They calculate the financial repression tax as the product between the negative level of real interest rates (in the years when the real interest rate was negative) and the stock of public debt, and, hence as the interest rate saving arising from the ability of the government to push real interest rates in negative territory through financial repression tools. They claim that this is an underestimation of the actual tax as, in a period of high real growth, equilibrium real interest rates were probably well above zero. Among their main findings, Reinhard and Sbrancia conclude that:

i. Interest rates were negative on average in half of the years during 1945-1980 (i.e. liquidation years). In particular, the percentage of years with negative real rates was 44 percent for Australia, 50 for the US, 28 for Belgium, 65 for France and 67 percent for the UK. [22] The financial repression tax via negative real interest rates was particularly high in the subperiod 1945-1956 for the countries with a large build-up of debt during WWII. [23]

ii. The financial repression tax was between 10 and 40 percent of tax revenues during years with negative interest rates in three-fourths of considered countries. For instance, it reached 37.2 percent in France and 23.2 in Belgium, whereas it was around 10 percent in both the UK and the US. Finally, the financial repression tax was also large as a percent of GDP. Indeed, the annual debt reduction via negative interest rates was 6.1 percent of GDP in France, 4.6 in Belgium, 3.5 in the UK and 2 percent in the US, in the years when real interest rates were negative.

[21] "Regulation Q" was introduced in 1933. This measure not only limited interest rates on diverse types of bank deposits, but also restrained bank competition until 1986.

[22] The considered period for Belgium is 1945-1974.

[23] These countries are Australia, Belgium, France, Italy, Japan, UK, US.

These results show the non-trivial effect of financial repression in reducing public debt in advanced economies after the Second World War. [24]

6. Debt declines through orthodox fiscal adjustment

Our debt reduction cases include 13 episodes of orthodox fiscal adjustments, namely declines in the public debt ratio achieved primarily by strengthening the primary balance. Of these 13 episodes, 11 occurred in the quarter of a century between the 1980s and the mid-2000s, which can be truly regarded as the years of fiscal orthodoxy. [25] Two occurred after the 2008-09 crisis (Iceland, 2011-17 and Ireland, 2012-17).

Because of the different macroeconomic environment in which the fiscal adjustment took place, particularly with respect to the level of interest rates and, partly, regarding the level of growth rates before and after the global financial crisis, we focus initially on the first 11 cases. In all these cases, inflation did not feature prominently as a cause of the reduction in the debt ratio. Nor did financial repression, most countries having completed a process of financial liberalization in this period, including the attainment of full capital mobility. Instead, all these cases featured a sizeable strengthening of the primary balance through fiscal adjustment measures (revenue increases and/or spending cuts). Moreover, the primary balance was maintained throughout the period of debt reduction at fairly high levels.

Table 6.1 summarizes these 11 episodes. As already mentioned, the average decline in the debt ratio in these cases was sizable (-41 percentage points, ranging from -23.5 percentage points in Finland to -85.8 percentage points in Ireland). [26] The average annual decline was also sizable (-3.3 percentage points). The primary surplus during the adjustment years averaged 3.9 percentage points across countries, ranging from 2.1 percent of GDP in the Netherlands to 6.3 percent of GDP in Norway.

The evidence that countries involved in fiscal adjustment maintained their average primary surplus at high levels for prolonged periods contradicts the view, which has become quite common during

[24] While financial repression instruments were dismantled in advanced economies from the late 1970s, financial repression remains a key policy tool in emerging economies, which may explain their low level of real interest rates on government paper as well as their persistently negative interest rate-growth differential. On this topic, see Escolano et al. (2017).

[25] Others may call these episodes cases of "fiscal austerity" but this is an overly abused, and by now almost meaningless, term.

[26] In the case of Ireland, the decline was not continuous, as it was interrupted by an increase in the debt ratio in 1993. The rate of reduction of debt before 1993 was lower than in the subsequent one. Thus, one could also consider the end of 1993 as the beginning of the Irish public debt decrease episode. The results, however, would not change much.

the last few years, that large primary surpluses are rare events and that, therefore, bringing down public debt may require more drastic actions, such as debt restructuring. The view that prolonged primary surpluses are rare events was reflected in influential papers such as Eichengreen and Panizza (2016) and in the position taken by the International Monetary Fund during the discussion regarding the need to restructure the Greek debt towards the European institutions (International Monetary Fund, 2016). These views, however, are flawed for three reasons:

- First, they typically look at very broad country samples, in which most cases are represented by countries that were not in need of fiscal adjustment and therefore did not need to keep a large primary surplus. [27]
- Second, even for countries that are involved in fiscal adjustment there is no need to maintain the primary surplus at high levels once a sizable decline in the public debt ratio has been achieved. Once such a decline has been achieved, the primary surplus is often lowered by country authorities not necessarily because of "fatigue", but because maintaining a surge surplus is no longer needed. This is clear also in our 11 cases of orthodox fiscal adjustment: the level of the primary surplus reported in Table 6.1 would often be significantly higher if we excluded the later years of the adjustment period. Indeed the primary surplus in the first half of the adjustment period was higher than in the second half in seven out of our 11 cases of orthodox fiscal adjustment without derailing the decline in the debt ratio.
- Third, even countries in search of fiscal adjustment may temporarily pause their effort for cyclical reasons. Again, this is very clear in several cases considered in Table 6.1: in Ireland, Belgium, Netherlands, Finland, Iceland, Canada, Sweden and Denmark the primary surplus declined during the 2001-2003 advanced economies recession, while recovering in the following years (except in Belgium, where, anyway, the primary surplus was maintained at average levels of 3, 5-4 percent).

[27] For example, International Monetary Fund (2016) includes the following statement (box 1, p. 12): "Cross-country evidence also shows that a 3½ percent of GDP primary surplus is difficult to achieve and sustain in the long run especially after long recessions and when faced with high structural unemployment. In a sample of 55 countries in the last 200 years, there have been only 15 episodes of recessions longer than 5 years, and no country sustained a primary surplus larger than 2 percent of GDP after such a long period of negative growth."

Table 6.1: Episodes of decline in public debt from the 1980s to mid-2000s through fiscal adjustments

Country	Period [1]		Number of years	Initial public debt	Final public debt	Public debt variation	Annual average public debt variation	Average primary surplus	Average contribution of i-g and other components [2]	Average real GDP growth rate	Average interest rate on public debt
Ireland	1987	2006	19	109.4	23.6	-85.8	-4.5	3.8	-0.7	6.5	4.2
New Zealand	1992	2007	15	64.6	14.5	-50.1	-3.3	4.5	1.1	3.5	2.5
Belgium	1993	2007	14	134.4	87.0	-47.4	-3.4	4.9	1.5	2.4	6.4
Denmark	1993	2007	14	80.5	27.3	-53.2	-3.8	4.4	0.6	2.4	3.8
Netherlands	1993	2007	14	74.8	43.0	-31.9	-2.3	2.1	-0.2	2.9	3.7
Norway	1993	1998	5	52.4	22.8	-29.6	-5.9	6.3	0.4	4.5	2.5
Finland	1994	2008	14	56.1	32.7	-23.5	-1.7	4.6	2.9	3.7	2.6
Iceland	1995	2005	10	58.2	24.5	-33.7	-3.4	2.7	-0.6	5.1	3.1
Canada	1996	2007	11	100.6	66.8	-33.7	-3.1	3.4	0.4	3.3	6.1
Spain	1996	2007	11	65.6	35.6	-30.0	-2.7	2.2	-0.5	3.8	2.8
Sweden	1996	2008	12	70.2	37.7	-32.4	-2.7	3.7	1.0	3.2	2.8
Average			*12.6*	*78.8*	*37.8*	*-41.0*	*-3.3*	*3.9*	*0.5*	*3.8*	*3.7*

[1] The period starts when the maximum debt-to-GDP ratio is reached and it ends in the last year of public debt reduction.
[2] "i-g and other components" is computed as the difference between the annual average reduction in the debt-to-GDP ratio and the primary balance.
All the data are expressed as percent of GDP, except for the number of years in public debt reduction periods.

In almost all cases, the primary surplus remained not only fairly high during the adjustment period, but also improved significantly with respect to the pre-adjustment period. Table 6.2 shows the change in the primary balance in the first three years of the adjustment with respect to the previous three years. The average improvement was 3.8 percentage points, excluding Denmark and the Netherlands. The latter are special cases: in both countries, the primary balance remained broadly constant because the adjustment had actually started a few years earlier, in 1991 in the Netherlands and during the 1980s in Denmark (see for the latter Giavazzi and Pagano, 1990). However, the decline in the debt ratio was delayed in the Netherlands and momentarily derailed in Denmark by the 1992-93 decline in economic activity in advanced Europe due to the crisis of the European Exchange Rate Mechanism.

One key issue is the extent to which the improvement of the primary balance at the beginning of the adjustment period was driven by adjustment measures introduced by the authorities or by a possible surge in economic activity that caused a decline in the spending-to-GDP ratio (for a given revenue-to-GDP ratio in the absence of an increase in tax rates). To some extent, as noted in section 2, this is an academic issue as keeping the growth of spending below the actual growth rate of the economy does, in any case, involve political challenges, even when it does not involve a fiscal tightening in its conventional definition. [28] This said, following the standard approach, we have considered what

[28] Recall that a fiscal tightening is defined normally as an improvement in the cyclically-adjusted balance. Using standard elasticities with respect to GDP (broadly 1 for revenues and broadly 0 for spending), this would occur when revenue rises faster than actual GDP (i.e. when tax rates are changed) and when spending increases faster than potential GDP. Thus, a rise in spending below actual GDP growth does not necessarily imply a fiscal tightening, in the standard definition. Yet, it may involve investing some political capital to resist pressure from spending lobbies to raise spending at least in line with GDP.

happened to the cyclically-adjusted balance between the three years preceding the beginning of the debt reduction period with respect to the debt reduction period (see also Table 6.2). [29] The cyclically-adjusted primary balance strongly improved in all countries for which data are available, except for Iceland, where the balance remained stable, and Denmark, which temporarily reduced the primary surplus during the ERM crisis with a rise in the primary balance to the earlier high levels thereafter.

Was the improvement in the primary balance achieved primarily by increasing the revenue-to-GDP ratio (i.e. by raising taxes) or by lowering the spending ratio (i.e. by keeping the growth of spending below the growth rate of GDP)? Table 6.2 splits the improvement in the primary balance between the three years before the adjustment period and the first three years of the adjustment period. With just a few exceptions, the adjustment involved a cut in the spending-to-GDP ratio, sometimes sufficiently large as to allow a sizable reduction in the tax ratio (Netherlands, Ireland, and New Zealand). Indeed, the contribution of primary expenditure cuts to the improvement of the primary balance was 70 percent on average, not considering the Netherlands and Denmark in the sample. As already noted, these countries started their fiscal adjustments (in terms of improvement in the primary balance) a few years before public debt started declining: the adjustment involved mostly revenue increases in the Netherlands and spending cuts in Denmark. The contribution of revenue increase, however, was not trivial in some cases. Some revenue increases took place in Norway and Canada. In Iceland, the adjustment in the primary balance was equally split between spending cuts and revenue increases, whereas in Belgium and Spain the adjustment was driven entirely by increases in the revenue-to-GDP ratio. [30] As noted, the adjustment in the Netherlands was on the revenue side.

[29] Data for average cyclically adjusted primary balance are available only for Belgium, Canada, Finland, Iceland, the Netherlands and Sweden, source Fiscal Monitor, IMF. In particular, for the Netherlands data are available only since 1995. Denmark is a specific case: data are taken from the AMECO database and they are available since 1995.

[30] The case of Spain is somewhat tricky because at least part of the revenue increase was due to the buoyancy of revenues in the presence of an asset price and real estate boom. In other words, the elasticity of revenue to GDP was probably well above one during the adjustment period.

Table 6.2: Average primary surplus, average primary expenditure and cyclically-adjusted primary balance in the first three years of debt reductions and in the three previous years

Country	Year of maximum public debt	Average primary surplus after	Average primary surplus before	Average primary expenditure after	Average primary expenditure before	Average revenue after	Average revenue before	Δ primary surplus	Primary expenditure cut	Revenue increase	Primary expenditure cut / Δ primary surplus	Cyclically adjusted primary balance after	Cyclically adjusted primary balance before
Ireland	1987	4.5	-0.7	36.2	42.8	40.6	42.1	5.2	6.6	-1.5	1.3	NA	NA
New Zealand	1992	6.0	1.3	30.8	36.8	36.8	38.1	4.8	6.1	-1.3	1.3	NA	NA
Belgium	1993	4.4	3.4	43.7	43.3	48.1	46.7	1.0	-0.4	1.5	-0.4	5.0	3.4
Denmark	1993	2.5	2.6	52.8	50.6	55.3	53.2	-0.1	-2.2	2.0	16.4	2.8	4.3
Netherlands	1993	2.0	2.1	44.2	47.6	46.3	49.7	-0.1	3.3	-3.4	-36.2	0.4	NA
Norway	1993	5.7	1.9	47.8	51.3	53.6	53.2	3.9	3.5	0.4	0.9	-7.6	-12.4
Finland	1994	0.5	-3.0	54.9	59.2	55.4	56.2	3.5	4.3	-0.8	1.2	1.3	0.2
Iceland	1995	2.6	-0.5	37.1	38.7	39.8	38.2	3.1	1.5	1.6	0.5	2.2	2.2
Canada	1996	5.1	0.1	38.4	42.3	43.5	42.4	5.0	3.9	1.1	0.8	5.4	0.6
Spain	1996	1.3	-1.1	36.9	35.3	38.1	34.2	2.4	-1.6	4.0	-0.7	1.3	0.4
Sweden	1996	4.4	-0.9	53.1	58.9	57.5	58.0	5.3	5.8	-0.5	1.1	5.0	0.2
Average		*3.6*	*0.5*	*43.3*	*46.1*	*46.8*	*46.5*	*3.1*	*2.8*	*0.3*	*-1.3*	*1.8*	*-0.1*

By "after" we mean the first three years of public debt reduction. By "before" we mean the three years before the reduction begins.
All the data are expressed as percent of GDP, except for the years.

The ability of these countries to raise and maintain over time a high primary balance, and in this way to achieve a large reduction in the public debt ratio, is remarkable, especially in light of the claim that orthodox fiscal policies ("austerity" policies) hurt the economy and can be counterproductive. This claim has achieved considerable weight in policy debates, for example in Italy, as well as in international academic circles. [31] Three points are worth making in this respect.

The first relates to the behavior of GDP during the cases of orthodox fiscal adjustment discussed here: GDP growth did not seem to suffer from the fiscal tightening and the reduction in the debt ratio. The lowest growth rate was observed for Belgium and Denmark, yet it remained above 2 percent. The average growth rate was a remarkable 3.8 percent. Leaving aside the issue of causality and of the possible other factors that affected growth, we can at least conclude that orthodox fiscal adjustment (i.e. improving and maintaining the primary balance at high levels) does not necessarily imply a collapse in economic activity, as some critics of orthodox fiscal adjustment seem to suggest.

The second point relates to the fact that the debt reduction was mainly driven by the high primary surplus. The debt reduction occurred at a time when the interest rate – growth differential was not particularly favorable. The 1980s and 1990s featured a rise in interest rates on government securities in all advanced economies, partly because of the removal of the financial repression measures discussed in the previous section. The average *i-g* in advanced economies in the ten years before the 2008 crisis was about 1 percent (Escolano et al., 2017). If we look at the countries in the table, the contribution given by *i-g* as well as other factors (the stock-flow adjustment, including, for example, privatization revenues) to the increase in the debt ratio was either largely positive or

[31] See for example the CNBC interview given by Joseph Stiglitz at https://www.cnbc.com/id/40943120.

only slightly negative. Therefore, the main driver of debt reduction was the primary surplus, not external circumstances.

A possible objection to this conclusion—which brings us to the third observation—relates to the question of whether there is a link between the ability to run large primary surpluses and the level of the GDP growth rate. Were countries able to run large primary surpluses mainly because they were living in "good times" when, for various reasons, economic growth was buoyant? This issue is the reverse of the one we discussed above: we have seen that fiscal adjustments were not accompanied by low GDP growth rates, but did the relatively sustained growth rates make it possible to run sizeable primary surpluses without major political backslashes? If this was the case, then one could raise doubts about the possibility of following an orthodox fiscal adjustment strategy in the future, given the lower growth prospects that appear to prevail now in advanced economies, reflecting also strong demographic headwinds. [32] Therefore, it is worth discussing the issue of the causality between growth and the primary balance in some detail.

In principle, there is no strong economic rationale for expecting that a higher growth rate of the economy would be associated with a higher primary surplus. The level of the primary surplus, under a policy of tax smoothing, is of course affected by the cyclical conditions of the economy (the level of the output gap). Thus, a cyclical increase in the GDP growth rate should be accompanied by an improvement in the primary balance. However, this is a short-term effect related to cyclical fluctuations and should not imply a long-term relationship between the level of the primary balance and the GDP growth rate. One could, however, argue that, from a political economy standpoint, it is easier to limit the growth rate of public spending (or to raise tax rates) when the economy is booming: voters would complain less about a fiscal tightening if things are going well. Unfortunately, there is little empirical evidence on the relationship between cyclically-adjusted primary surpluses and the GDP growth rate. [33] Moreover, the question of whether strong growth is a necessary condition for orthodox debt reduction strategies to succeed should be examined specifically with respect to cases in which governments have a strong motivation in bringing down the public debt ratio. Therefore, let us go back to our country sample of orthodox fiscal adjustments.

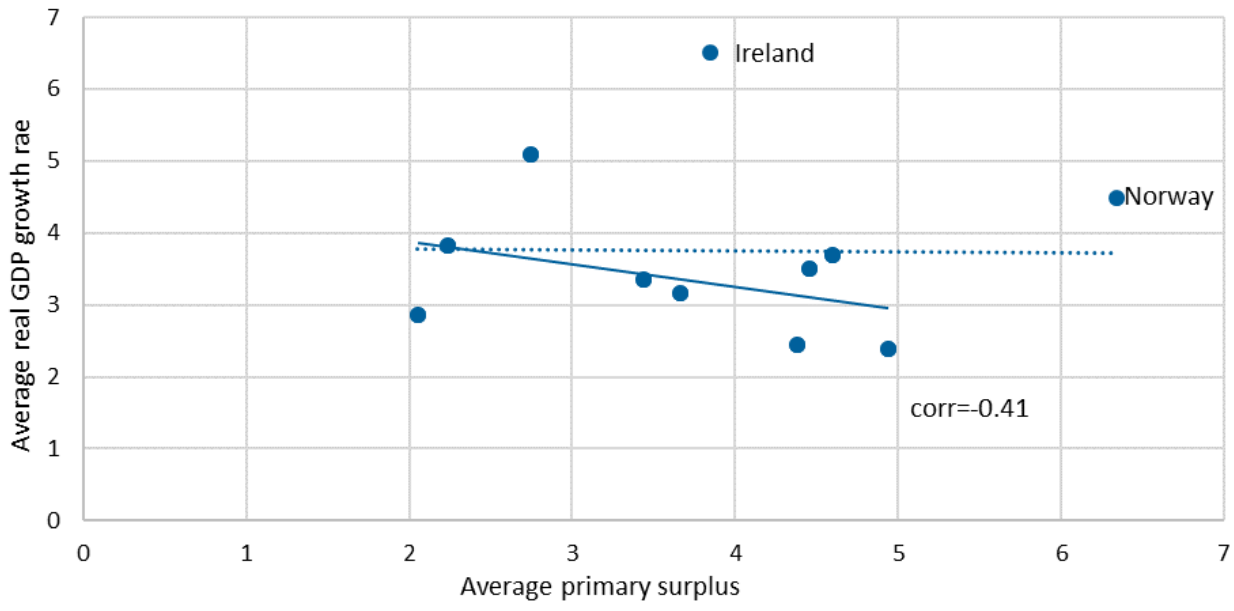
It is a fact that in all the cases in which orthodox fiscal adjustment succeeded in lowering the debt ratio presented in Table 6.1 the GDP growth rate was fairly high, at least by today's standards.

[32] The point is made in Mauro and Zilinsky (2016).

[33] Zeng (2014) and Eichengreen and Panizza (2016) find a positive correlation between the level of the primary surplus and the growth rate of the economy, but these papers do not distinguish between cyclical and long-term trend effects.

However, two points need to be made before reaching the wrong conclusion. The first relates to sample bias. Before the 2008-09 crisis growth rates in advanced economies were generally higher than in the post crisis period. The average growth rate among advanced economies during 1980-2007 was 3.1 percent, and average growth rates below 2 percent were observed only in four countries. Thus, cases of orthodox fiscal adjustment with low growth may not be found simply because cases of low growth are hard to find in the pre-2007 world. The second point is that, if we look at the specific cases of successful fiscal adjustment included in Table 6.1 we do not find any positive relationship between the size of the primary balance and the average growth rate of the economy. Indeed, Figure 6.1 shows that the relationship is negative if we exclude Ireland and Norway, which are clear outliers (the correlation line is virtually flat even in case we include them, as shown by the dotted line in the graph). Thus, it appears that relatively lower growth rates, in countries that were determined to pursue an orthodox debt reduction strategy, simply implied the need to have a stronger primary surplus. Such a stronger surplus occurred in spite of a relatively lower growth rate than the one experienced by their luckier peers. Of course, the negative correlation between the primary surplus and the growth rate shown in Figure 6.1 is that, indeed, there was a price to be paid for higher primary balances. That might as well be true, but, as noted, the fiscal adjustment did not kill the growth process (the lowest growth rate was anyway higher than 2 percent). Moreover, once the debt reduction is achieved, the primary surplus can be lowered significantly thanks to the decline in interest payments, so, is a price needs to be paid, it is a temporary price.

Figure 6.1: Correlation between average primary surplus and average real GDP growth rate (episodes of decline in public debt from the 1980s to 2008)



Before concluding this section, let us now turn to the two debt reduction episodes that followed the 2008-09 crisis: Iceland (2011-17) and Ireland (2012-17) (Table 6.3). In both cases, the adjustment took place under an adjustment supported by the IMF and both cases featured a strong fiscal adjustment with respect to the pre-debt decline period. The case of Iceland is more similar to the one of the pre-crisis period: the primary adjustment was not only large but it led the primary surplus to a high level (5.4 percent of GDP). In the case of Ireland, it did improve rapidly but was still low in the period average (0.5 percent of GDP). This finding, however, was somewhat misleading as the primary balance, starting from a strongly negative level, did reach positive levels, eventually stabilizing at over 1.5 percent of GDP by 2016-17. Yet, this level was somewhat below the primary surplus levels that characterized most of the orthodox fiscal adjustment cases discussed in this section. This happened because of two circumstances. First, the low level of interest rates prevailing in the euro area at the time, coupled with a fast decline in the interest rate spread given the credibility and the success of the debt reduction strategy. Second, Ireland's extremely high growth rate during the adjustment period (9.4 percent on average), which was affected by the relocation to Ireland of the profits of several multinational companies, which mechanically boosted recorded GDP levels and, hence, the public debt ratio, an adjustment strategy that can hardly be followed by other countries.

Table 6.3: Episodes of decline in public debt after the 2008 financial crisis through fiscal adjustments

Country	Period [1]		Number of years	Initial public debt	Final public debt	Public debt variation	Annual average public debt variation	Average primary surplus	Average contribution of i-g and other components [2]	Average real GDP growth rate	Average interest rate on public debt
Iceland	2011	2017	6	92.0	42.5	-49.5	-8.3	5.4	-2.8	3.9	4.3
Ireland	2012	2017	5	119.9	68.5	-51.4	-10.3	0.5	-9.8	9.4	3.0
Average			*5.5*	*105.9*	*55.5*	*-50.5*	*-9.3*	*2.9*	*-6.3*	*6.7*	*3.6*

[1] The period starts when the maximum debt-to-GDP ratio is reached and it ends in the last year of public debt reduction.
[2] "i-g and other components" is computed as the difference between the annual average reduction in the debt-to-GDP ratio and the primary balance.
All the data are expressed as percent of GDP, except for the number of years in public debt reduction periods.

Country	Year of maximum public debt	Average primary surplus after	Average primary surplus before	Average primary expenditure after	Average primary expenditure before	Average revenue after	Average revenue before	Δ primary surplus	Primary expenditure cut	Revenue increase	Primary expenditure cut / Δ primary surplus	Cyclically adjusted primary balance after	Cyclically adjusted primary balance before
Iceland	2011	2.7	-3.3	38.8	41.6	41.5	38.4	6.0	2.8	3.2	0.5	1.7	-4.2
Ireland	2012	-0.3	-14.2	32.0	47.8	31.7	33.6	13.9	15.8	-1.9	1.1	-0.8	-13.1
Average		*1.2*	*-8.7*	*35.4*	*44.7*	*36.6*	*36.0*	*9.9*	*9.3*	*0.6*	*0.8*	*0.5*	*-8.6*

By "after" we mean the first three years of public debt reduction. By "before" we mean the three years before the reduction begins.
All the data are expressed as percent of GDP, except for the years.

7. Privatizations and debt management

This section examines how privatizations and debt management helped reduce public debt.

Privatization plans were initially promoted by the first Thatcher's government in 1979, while it is only in the 1990s that privatizations became popular around the world as many countries struggled to reduce their debts from the high levels inherited from the 1980s. In addition, privatization, coupled with deregulation, were deemed useful to improve economic efficiency and spur economic growth. Transition economies - not considered in our sample – sold large amounts of state properties as they moved away from centralized planned economies.

In our case studies, privatization plans were present in all the eleven episodes of debt reduction that were performed through orthodox adjustments in the 1990s. Table 7.1 shows the privatization revenues, considering the eleven years from 1990 to 2000. The highest total privatization revenues were obtained by Spain (37.7 billion euros over the entire period), followed by the Netherlands (13.6 billion) and Canada (10.6). The ranking is very different if we look at the average annual revenue as a percentage of GDP. In this case, the country that has done most is New Zealand, whose average annual revenues have been 1.7 percent of GDP, implying that in 11 years its revenues were about 18 percent of average GDP in the period, which is a considerable contribution to the reduction of the debt ratio. However, New Zealand is an outlier, both because it started with a large state sector and because it pursued privatization policies with great determination. Next come Finland and Ireland, two countries that also started with a very large state sector: their average privatization revenues were 0.8 percent of GDP, implying a total contribution to the reduction of the debt ratio of about 9 percentage points. Excluding these three countries, the average of all other countries is 0.3 percent per annum; this means that the contribution to the reduction of the debt ratio was about 3 percent over the entire 11-year period.

These considerations justify the conclusion that privatization receipts may give a contribution to the reduction of the debt ratio, especially in countries that start with a large role of the state in the economy, but are at best a contribution. They cannot be the driving force of the adjustment. Indeed, the annual contribution to debt reductions given by privatization receipts is much smaller than the contribution given by primary surpluses during adjustment years (see Table 6.1).

Table 7.1: Privatizations from 1990 to 2000. Sources: OECD (2002) and IMF

Country	Privatization Revenue (Billion US$)	Average privatization revenues (% of GDP)
Belgium	9.6	0.3
Canada	10.6	0.2
Denmark	6.0	0.3
Finland	11.0	0.8
Iceland	0.4	0.4
Ireland	7.6	0.8
Netherlands	13.6	0.3
New Zealand	9.4	1.7
Norway	2.9	0.2
Spain	37.7	0.6
Sweden	17.3	0.6
Average	*11.5*	*0.6*

It is sometimes argued that countries can obtain important results by appropriate debt management techniques. For instance, the government should offer residents debt instruments that are particularly attractive to them as a way to free the country from the unsustainability of international capital markets. We have not been able to find any evidence of countries that have obtained relevant results through this sort of "renationalization" of their debts, although it may indeed be the case that a country like Japan enjoys some additional degrees of freedom in its domestic policies because its debt is almost entirely held by residents. Italy seems to be a counterexample since the share of the debt held by non-residents has fallen from about half in 2011 to about 30 percent now, yet the country does not seem to enjoy greater degrees of freedom.

Generally speaking, since the 1990s several advanced countries established independent debt management agencies or offices to reduce costs and risks associated with their debt portfolios (IMF, 2003), and have much improved their debt management techniques as well the market infrastructure so as to guarantee the liquidity and minimize the cost of placing the new debt. Such improvement in debt management helped many countries containing the cost of their public debts and are certainly important. Nevertheless, it should be clear that debt managers are powerless if the country does not make the basic political choices that are necessary to bring the budget in line with the objective of reducing public debt.

8. Debt Restructuring

Debt restructuring occurs when a government decides to (i) repay only a part of its debt, (ii) lower the coupon rate or (iii) modify the maturity of the bonds. Typically, restructuring is implemented through a swap of outstanding bonds with new bonds with less favourable terms for the creditors. While debt restructuring may be unavoidable in very severe debt crises, it is far from being a painless way of reducing public debt, for at least three main reasons.

First, debt restructuring implies a reputational damage to the country, which may lead to unacceptable increases in interest rates on newly-issued government bonds. [34] This loss of reputation forces governments to drastically improve the primary balance in order to become credible again and be able to return to the markets. The reputational damage affects domestic corporations as well, whose credit ratings are typically lower than those of the government. Because of the loss of reputation of both the government and the private sector, debt restructuring may have a negative impact on domestic demand. Other negative effects on domestic demand may stem from eventual losses imposed on banks, which may cause a credit crunch (Lippi and Schivardi, 2014).

Second, restructuring may damage domestic demand because it is a tax on bondholders. The effects of such tax depend crucially on the share of debt held by residents; clearly, if the debt is entirely held by foreigners restructuring will not imply a direct restrictive effect on demand. Although there may be negative spillover effects if the bondholders are close neighbors, in most advanced economies most of public debt is held by residents, which makes restructuring more difficult.

In our sample, Greece is the only other case of debt restructuring among advanced countries in post war times. Germany also restructured its debt in 1953, but it was a small-scale operation: the cut was only 9 percent of GDP and the restructured debt was entirely held abroad. [35]

[34] According to Cruces e Trebesch (2013), the larger is the haircut on public debt, the stronger is the reputational damage.

[35] The debt was reduced from 29.7 billion DM to 14.5. See Galofré-Vilà et al. (2018). For nominal GDP, we have used the data available on the website of the Jordà-Schularick-Taylor Macrohistory Database. See also Eichengreen B. et al (2009) and Galofré-Vilà et al. (2018).

8.1 The case of Greece [36]

The Greek crisis started in October 2009, when the government revealed that deficit and public debt levels of previous years were underestimated. Soon after, Greece lost credibility on the markets and was subject to multiple downgrades. In May 2010, it became necessary to ask for financial support to Eurozone governments and the IMF. The first agreement consisted of €80 billion of EU loans and €30 billion from IMF in exchange for a severe fiscal adjustment and structural reforms. [37] Despite an initial improvement of the primary balance, however, this first agreement was not sufficient to solve the crisis and in summer 2011, it became clear that the Greek crisis was not solved. After a long negotiation with a creditor committee composed of 12 banks, insurers and asset managers representing 32 creditors (Table 8.1), and official statements by Eurozone leaders calling for the private sector involvement, the restructuring took place in March 2012.

Table 8.1: Composition and estimated bond holdings of creditor committee [38]

Steering Committee Members		Further Members of the Creditor Committee			
Allianz (Germany)	**1.3**	Ageas (Belgium)	**1.2**	MACSF (France)	***na***
Alpha Eurobank (Greece)	**3.7**	Bank of Cyprus (Greece)	**1.8**	Marathon (USA)	***na***
Axa (France)	**1.9**	Bayern LB (Germany)	**na**	Marfin (Greece)	***2.3***
BNP Paribas (France)	**5.0**	BBVA (Spain)	**na**	Metlife (USA)	**na**
CNP Assurances (France)	**2.0**	BPCE (France)	**1.2**	Piraeus (Greece)	**9.4**
Commerzbank (Germany)	**2.9**	Credit Agricole (France)	**0.6**	RBS (UK)	**1.1**
Deutsche Bank (Germany)	**1.6**	DekaBank (Germany)	**na**	Société Gén. (France)	**2.9**
Greylock Capital (USA)	**na**	Dexia (Belg/Lux/Fra)	**3.5**	Unicredit (Italy)	**0.9**
Intesa San Paolo (Italy)	**0.8**	Emporiki (Greece)	**na**		
LBB BW (Germany)	**1.4**	Generali (Italy)	**3.0**		
ING (France)	**1.4**	Groupama (France)	**2.0**		
National Bank of Greece (Greece)	**13.7**	HSBC (UK)	**0.8**		

The restructuring consisted essentially in an offer to creditors to swap their bonds with (OECD, 2013):

i) new bonds with a face value equal to 31.5% of the face amount of the debt exchanged,

ii) cash-equivalent notes issued by the EFSF maturing within 24 months for 15% of the face value of the debt exchanged, [39]

iii) GDP-linked security which could provide an extra payment stream of up to 1 percentage

[36] Many contributions to the Greek debt restructuring have been published. Thus, we provide only a general description of the restructuring path in Greece in 2010-2012, relying mainly on Zettelmeyer et al. (2013).

[37] All the values in this section are expressed in euros at current prices.

[38] Table from Zettelmeyer, Trebesh and Gulati (2013). Values are in € billion. Estimates of bond holdings refer to June 2011, creditor committee composition to December 2011. Sources: Barclays (2011) and Institute of International Finance (http://www.iif.com/press/press+219.php).

[39] The EFSF was a temporary crisis resolution mechanism created by the euro area Member States in June 2010.

point of the face value of the outstanding new bonds if GDP exceeded a specified target path.

After the conclusion of the restructuring, the amount of exchanged debt was €199.2 billion, corresponding to 96.9 percent of the debt eligible for the swap and to 55.9 percent of total public debt outstanding at the end of 2011. [40] Thanks to the restructuring, the face value of the Greek debt declined by €107 billion. However, the haircut generated €38 billion losses for banks, which had to be compensated by the government, so this reduced the net value of the haircut to €68 billion. Overall, the debt-to-GDP ratio decreased by only 12.5 percentage points, from 172.1 percent in 2011 to 159.6 percent in 2012, because (i) official sector loans and ECB's holdings were excluded from the restructuring, (ii) €38 billion were spent in order to recapitalize banks (iii) GDP had a strong contraction.

After the March restructuring and a second bailout of €130 billion from the EFSF and the IMF, a second economic program was signed at the end of 2012. An important point of the program was a debt buyback that consisted in an invitation to all holders of Greek government bonds to submit offers to exchange designated bonds for six-month notes to be issued by the EFSF (OECD, 2013). According to the Greek Public Debt Management Agency data, €31.9 billion bonds were exchanged at 33.8 percent of their face value. The debt buyback reduced the debt ratio by further €21.1 billion.

8.2 Lessons from the Greek debt restructuring

Various lessons can be drawn from the Greek debt restructuring experience.

- First, debt restructuring does not eliminate the need for improving the primary balance, possibly for very large amounts. Greece was running very large primary deficits and, in these conditions, even a 100 percent debt cancellation would not have avoided the need to bring the primary balance at least back to equilibrium; indeed, most of the fiscal tightening was due to this need, rather than to the need of achieving a large primary surplus.
- Second, when a sizable portion of public debt is held by residents, debt restructuring is equivalent to an upfront tax that reduces the wealth of bondholders, with potentially contractionary effects on the economy. In the Greek case, some 30 percent of debt was held

[40] T-bills and loans or bonds held by the official sector (ECB, IMF, EFSF and national central banks) were exempt from the swap. The difference between exchanged debt and eligible debt was due to holdouts, i.e. creditors who did not accept the deal and went to court in order to try to see their rights fully recognized. GDP is measured at current prices, source AMECO database.

by residents, so most of the tax was paid by foreigners but, even so, the contractionary effect was probably not irrelevant.

- Third, the benefits of a debt restructuring in terms of debt reduction are smaller if part of the debt is held by domestic banks because, in order to avoid adding a banking crisis to the sovereign crisis, banks need to be recapitalized with public money.
- Fourth, picking up the time for debt restructuring is not easy. According to some commentators, the restructuring did not work as well as expected because it was implemented too late: if it had been implemented in 2010, at the outset of the adjustment program, it would have succeeded in bringing down public debt rapidly, with limited costs for the Greek economy, as the upfront decline in public debt would have required a smaller fiscal tightening and increased the credibility of the program. We will never know, but what we know for sure is that when it appeared clear, by the fall of 2011, that debt restructuring would be inevitable, such a move was far from being the decisive move it was expected to be. It is hard to believe that a delay of little more than one year was the reason for the failure.
- Fifth, complications may arise at the international level because of possible contagion effects. A common view is that the restructuring was not implemented at the outset to allow French and German financial institutions to reduce their exposure in Greek government debt. This view is, however, misleading, not only because the benefits for foreign banks were not so large, but also because other factors delayed the restructuring. [41] Indeed, the Greek authorities did not want to restructure public debt because of: i) the loss of reputation that this would have entailed for the country, ii) the contractionary effects that this restructuring would have had on the economy (see above) and iii) the minimum credit rating threshold required by the ECB for the purpose of the Eurosystem's credit operations, which would have excluded Greek banks from central bank financing. However, the most important reason that made debt restructuring problematic was related to the risks of contagion. Indeed, the countries that in 2010 opposed the restructuring included Italy and other high debt countries, as well as the ECB. For Italy, the risk that would arise from a Greek debt restructuring was huge: the restructuring would have broken the taboo that euro

[41] Regarding the presumed benefits for France and German banks, one could note that, as Table 8.1 shows, at the time of the restructuring French and, especially, German financial institutions remained largely exposed towards Greece. Moreover, those who reduced their exposure suffered fairly large losses anyway: they had invested in Greek government bonds at pre-crisis interest rate levels (the interest rate spread on Greek government debt before the 2008-09 crisis was fairly low) and ended up selling Greek paper when the spread had skyrocketed, bringing down the price of Greek bonds. Only those who were holding bonds that came to maturity in the meantime did not suffer losses.

area countries would never restructure their debt. It was feared that breaking the taboo would have led, through contagion, to a massive speculative attack. That was the very reason why the IMF decided to support an adjustment program in Greece that did not feature initially debt restructuring. Indeed, to make it possible to lend large amounts of money to a country whose debt sustainability was not fully proved, the IMF had to change its own rules: the IMF introduced the so-called "systemic exemption clause", allowing it lending to avoid contagion. [42] Unfortunately, this attempt to avoid the risk of contagion from debt restructuring was nullified by the disastrous statements made in Deauville by Angela Merkel and Nicolas Sarkozy in October 2010, which implied that debt restructuring in the euro area was no longer a taboo. That statement undermined the credibility of the first Greek adjustment program, made debt restructuring in Greece inevitable and contributed to a major speculative attack that brought Italy on the brink of collapse.

Altogether, the risks and costs arising from debt restructuring are of a multi-faceted nature. There are definitely cases in which debt restructuring becomes the less costly option for the country in question and the international community, but it is certainly not a painless or decisive solution in all cases.

8.3 An alternative to debt restructuring: the wealth levy

An alternative to debt restructuring could be a strong one-off wealth levy. However, in order for it to be considered a way to solve the problem of the debt, the wealth levy must have two main characteristics: it must be (i) large enough to reduce the debt ratio and (ii) unexpected. If these two requirements are not met and therefore the taxpayers expect the tax to be re-implemented, they could modify their economic behavior (i. e. reduce consumption), and hide their wealth or move it in other countries in order to minimize the impact of the levy. Moreover, a wealth levy could lead to serious liquidity problems for households and companies. The extent of this problem is given by the share of non-financial wealth (e.g. real estate or non-listed companies) held over the total wealth. If this share is high, problems could arise in obtaining the liquidity needed to pay the tax.

[42] The text of the systemic exemption clause was the following: "… in instances where there are significant uncertainties that make it difficult to state categorically that there is a high probability that the debt is sustainable over this period, exceptional access would be justified if there is a high risk of international systemic spillovers." On this issue (and the removal of the systemic exemption clause) see https://www.imf.org/en/News/Articles/2015/09/28/04/53/sopol012916a

9. The "denominator story"

As mentioned in section 2, a frequently advocated approach to debt reduction is what may be called the "denominator story". [43] The denominator story comes in two radically different variants. The first one consists of structural measures to boost the growth rate of GDP, *g*. We would regard this as part of the orthodox approach if it leads to an improvement in primary balances. If it does not lead to an improvement in the primary balance, the approach remains valid, but its impact on the debt ratio will obviously be much smaller.

The second variant instead tries to raise *g* through a fiscal expansion. This approach is very popular among politicians for the obvious reason that it allows them to promise paradise without any sacrifice. This section shows that this cannot happen within a standard Keynesian framework; it may instead happen in theory if supply-side considerations are taken into account. And yet, it never happened in practice, at least not in advanced economies after WWII.

We start with the Keynesian framework. The wrong version of the "denominator story" also comes in two versions, which we will call weak and strong form. The strong form claims that an increase in spending or a decrease in taxes may initially create a deficit, but after a short while it will generate an increase in GDP and in tax revenue that is so large as to actually improve the budget balance. The weak version does not claim that a larger deficit may actually generate a surplus. It claims that an expansionary fiscal policy will increase GDP by more than it increases public debt so that the debt ratio will actually decline. Let us start with the strong version.

9.1 Keynesian framework: the strong version of the "denominator story"

The strong version of the "denominator story" runs as follows: the Keynesian multiplier is so large as to allow an automatic rebalancing of the budget after an initial expansion, through increased tax revenue. The idea is that a high value of the multiplier implies that a fiscal expansion causes a very large increase in income, which in turn causes an increase in tax revenue large enough to improve over time the budget with respect to its initial situation. This, together with the rise in GDP, will lead to a decline in the debt ratio.

We are not aware of any paper in the academic literature with such a claim. However, the idea must have been around for a long time if many years ago Paul Samuelson (1940) decided to state as a theorem that such an idea was a mistake: "Under the hypotheses made, it can be stated as a theorem of the Multiplier analysis that the increase of expenditure of an extra dollar cannot result in increased tax revenues of as much as a dollar even though all succeeding time is taken into

[43] This paragraph draws on Codogno and Galli (2017).

consideration". The assumptions he refers to are those of the standard demand-led Keynesian model, plus the assumption of no "pump-priming". "Pump-priming" is an expression that was used during the great depression and has recently been used by President Trump: it indicates vague ideas such as "a large increase in spending may act as a catalyst to speed the upward movement of investment…" or may "form the spark to ignite business activity…". Paul Samuelson was very skeptical about such statements and explained that the mere presence of the investment accelerator, which he considered as an integral part of the multiplier, does not affect the theorem as stated above. [44]

The reason why the strong version of the denominator story is wrong is that for revenues to rise sufficiently the average tax ratio should be very high, but the tax ratio is a negative component of the multiplier and thus dampens the effect of spending on income. To see this more clearly, it is useful to use a reduction ad absurdum logic. Suppose for a moment that the story was correct and that indeed, after an initial increase in spending, GDP and tax revenue increase so as to balance the budget. We now have that the initial injection of spending power into the economy is exactly compensated by the increase in taxes. It is hence impossible that GDP is higher than before as the deficit (the source of higher growth in this approach) has not increased. The contradiction is even stronger if one supposes that the budget improves after an initial expansion.

The simplest way to formalize this is to write the usual textbook multiplier of government spending as:

$$\frac{dY}{dG} = \frac{1}{1 - c\,(1 - \tau)} \tag{2.1}$$

Where *Y* and *G* are income and public spending, respectively. *c* and τ are constants measuring the marginal propensity to consume (or, generally, to spend out of income, including possible effects through private investment) and the response of tax revenue to changes in national income, respectively.

The effect of a one-euro increase in spending on tax revenue is then given by the increase in income multiplied by the effective marginal tax rate:

$$\frac{dT}{dG} = \frac{dY}{dG}\tau = \frac{\tau}{1 - c\,(1 - \tau)} \tag{2.2}$$

[44] The intuitive reason is that the accelerator implies to see investment as a function of the change in income (or in final consumption). Such change affects the dynamic properties of the system but does not affect the comparative statics across steady states.

From equation 2.2 it is clear that the budget remains balanced, i.e. tax revenue rises as much as spending, only if τ is equal to unity. This is absurd because it implies a marginal tax rate of 100 percent, i.e. every euro of additional income goes to the State. A fortiori, it is impossible to attain an improvement in the deficit through an increase in spending.

The analytical point is that one cannot have a large multiplier if the government takes back all the additional purchasing power injected in the economy in the form of higher tax revenue, and yet that is exactly what would be needed to return to the initial budget position, not to mention to improve the budget balance with respect to that position. It can easily be shown that model refinements, such as introducing for example lags in tax collection as well as in the consumption function, do not alter this basic conclusion.

The simple point is that the policymaker cannot have the cake and eat it too. He or she cannot at the same time boost the economy through higher spending (or lower taxes) and have a lower deficit and a lower the debt. [45]

9.2 Keynesian framework: the weak version of the "denominator story"

The idea here is that a fiscal expansion can produce a larger increase in GDP than in debt so that the debt ratio would fall.

The problem with this idea is that it works only the short run as a deficit increase would raise GDP, but would feed continuously on the debt so that eventually the debt ratio would be bound to rise.

A clear statement of the proposition that a fiscal expansion can improve the debt ratio can be found in Nuti (2013) who derives a simple formula that states the following: if the income multiplier is greater than the inverse of the initial debt ratio, then a budgetary expansion will lower the debt ratio itself. The intuition behind this formula is straightforward. A fiscal expansion will lower the debt ratio if the multiplier is large because in this case national income will get a big boost. The inverse of the debt ratio captures the fact that if the debt is large a given increase in the deficit will have a small percentage effect on the debt but will cause a larger increase in GDP, hence the decline in the ratio.

[45] The "denominator story" is a radically different statement from the so-called "balanced budget multiplier theorem", stated in Haavelmo (1945). This theorem states that an equal increase in spending and in taxes, such that the budget is left balanced by construction, has a positive impact on national income if the multiplier of spending is higher than that of taxes. The key point made by Haavelmo is that the budget remains balanced because taxes are raised by as much as spending is. Instead, in the "denominator story" analyzed here, taxes rise as a consequence of the income increase. From a policy point of view, a radical difference arises, since in one case the government has to introduce higher taxes, while in the other taxes fall like 'manna from heaven'.

To put this reasoning in a formal setting, we consider, again, a simple Keynesian model. The shock is assumed to take the form of an increase in public spending. The dynamics of the debt ratio can be written as:

$$D_t = (1 + i)D_{t-1} + [G_t - T(Y_t)]$$

A subscript indicates time so that D_t, G_t and $T(Y_t)$ are the stock of public debt, public spending and tax revenue, all at time t. D_{t-1} is debt at time $t - 1$. For simplicity, a simple linear tax function is considered:

$$T(Y_t) = \tau_0 + \tau Y \tag{3.2}$$

τ_0 and τ are parameters, the latter being smaller than one. It is assumed, again for simplicity, that the system starts in a stationary state in which all relevant variables (in particular, debt and national income) are constant. [46] The change in national income can then be written as:

$$\Delta Y = \mu \Delta G_1 \tag{3.3}$$

where ΔY is the change in income $(= Y_1 - Y_0)$ due to the change in spending $(\Delta G_1 = G_1 - G_0)$ and μ is the Keynesian multiplier.

In turn, the deficit, which is equal to the change in debt, can be written as:

$$\Delta D_1 = (1 - \tau\mu)\Delta G_1 \tag{3.4}$$

where the term $\tau\mu$ captures the effect of a higher level of income on tax revenue and is strictly smaller than one. Note that the interest rate is assumed to be fixed. Hence, there are neither crowding out nor investors' confidence effects in this model.

The variable of interest is the change in debt ratio $\left(d_t \equiv \frac{D_t}{Y_t}\right)$.

$$\Delta d_1 = d_1 - d_0 = \frac{D_1}{Y_1} - \frac{D_0}{Y_0} = \frac{(D_1 - D_0)Y_0 - (Y_1 - Y_0)D_0}{Y_1 Y_0} =$$

$$= \frac{\Delta G_1}{Y_1}[(1 - \tau\mu) - \mu d_0] \tag{3.5}$$

If this expression is negative, a fiscal expansion has a 'perverse' effect on the debt ratio. This occurs if:

[46] This assumption avoids a rather messy notation in which all variables would have to be indexed as a function of time as well as a function of the scenario (with or without the fiscal shock).

$$\mu > \frac{[1 - \tau\mu]}{d_0} \tag{3.6}$$

The inequality is satisfied if the multiplier is larger than the change in the deficit caused by one additional euro of spending divided by the initial value of the debt ratio. [47] If both τ is set equal to zero, one obtains the simple formula of Nuti (2013), which states that the multiplier must be greater than the inverse of the debt ratio. It is clear that the possibility that 3.6 is satisfied cannot be ruled out.

As an example, consider $\tau = 0.4,\ d_0 = 100\%$ and $\mu = 1$ (a number that seems reasonable for very open economies, given the large spillovers through taxes as well as imports), the right-hand side of the inequality is equal to 0.6, smaller than the multiplier.

So, this expression establishes a rather strong presumption that fiscal policy has a perverse effect on the debt ratio, in the sense that a stimulus package may reduce the debt ratio and a restrictive package may increase it. In this model, the presumption is stronger than in Nuti's model, because of the explicit consideration of the feedback on a budget of a higher level of income (hence the budget deteriorates less than the initial increase in spending).

Note that, as in Nuti (2013), this result is stronger the higher the initial, pre-shock, level of the debt ratio.

The result that a fiscal expansion may lead to an increase in the debt ratio is not a trivial one. Indeed, a policy of excessively fast fiscal consolidation that leads to an impact rise in the debt ratio may induce financial markets to lose confidence in the country and derail the fiscal adjustment process. [48]

Note, however, that the above result holds only in the short run. What happens over time? By repeated substitution in the dynamic equation of the debt, the level of the debt at time $t = n$ can be written as

$$D_n = (1 + i)^n D_0 + \sum_{t=1}^{n} (1 + i)^{n-t} [G_t - T(Y_t)] \tag{3.7}$$

Under the same assumptions as above, the change in the debt can be written as

[47] Without the assumption of a stationary initial condition, in the denominator one would find the debt ratio that would have prevailed at time 1 (rather at time 0) if the shock had not occurred.

[48] Cottarelli and Jaramillo (2012) argue that this myopic behavior of financial markets required coupling fiscal tightening with an immediate intervention by the ECB to bring down interest rates in countries that were implementing fiscal adjustment in 2012.

$$\Delta D_n \equiv D_n - D_0 = \Delta G_1 (1 - \tau\mu) R_n \tag{3.8}$$

where $R_n = \sum_{t=1}^{n} (1+i)^{n-t}$ is the cumulative cost of one euro of additional deficit protracted for n periods. Note that, by assumption, G changes once and for all. Hence, the change after one period is the same as after n periods. This consideration holds for all other flow variables of the model (income, tax revenue and the deficit). The only variable that keeps changing over time, as it should be as a result of a permanent increase in public spending, is the stock of the debt. [49]

This formula can be used instead of formula 3.4 above to compute in the same way, the change in the debt ratio as

$$\Delta d_n \equiv d_n - d_0 = \frac{\Delta G_1}{Y_n} [(1 - \tau\mu) R_n - \mu d_0] \tag{3.9}$$

Note that this formula is a straightforward extension of 3.5 above, and it is identical to it when $n = 1$. [50] In this case, in fact, $R_n = 1$.

As above, this expression is negative if:

$$\mu > \frac{R_n [1 - \tau\mu]}{d_0} \tag{3.10}$$

The new aspect in this multi-period formula is the term R_n, which increases rapidly with time. Consider the case when $i = 0$. Then $R_n = n$. For instance, after 5 years, the remaining terms of the right-hand side of 3.10 are multiplied by 5. Consider again $\tau = 0.4$, $\mu = 1.0$, $d_0 = 100\%$ and i=0. After 2 years, the right-hand side of 3.10 is equal to 1.2 (instead of 0.6) which is greater than the multiplier. The breakeven is reached after 2 years, meaning that after 2 years the debt ratio rises following a sustained fiscal shock.
If μ is raised to 1.5, leaving all other parameters unchanged, the breakeven is reached after 4 years. Note that in this exercise the interest rate is fixed, meaning that there is no adverse reaction of financial markets to the fiscal expansion.

[49] See the previous footnote for the implication of this simplification.
[50] A similar formula can be found in Eyraud and Weber (2013). These authors note that the problem of the short run perverse effect of fiscal consolidation would not show up if one would monitor the cyclically adjusted debt ratio, as current European rule actually does.

This section suggests that, if the government wants to reduce the debt ratio steadily, it has no alternative to a reduction in the deficit. The idea that the debt ratio can be reduced through an expansionary fiscal policy is flawed. [51]

9.3 Supply-side effects of fiscal expansions

Results about the effectiveness of a fiscal expansion in lowering the debt ratio may change when supply-side effects are taken into account. There are two classic cases in this respect. The first one is the so-called Laffer Curve, named after Arthur Laffer, an advisor to US President Ronald Reagan. He claimed that reducing tax rates, especially the top marginal rates, induced individuals and companies to increase their work efforts and this might lead to such surge in national income and tax revenue as to balance the budget. [52] This approach has been completely abandoned by economists after the experiment done during the Reagan years, which did probably bring more growth, but at the expense of the federal budget. During the Reagan years, the public debt of the US rose by some 20 percentage points of GDP. The budget deficit led to a deficit in the external current account, and for many years afterwards, the US had to cope with the problem of the twin deficits, which in turn led to very large and undesired fluctuations in the exchange rate of the dollar vis-a-vis major currencies. In 2012, economists surveyed by the University of Chicago rejected the viewpoint that the Laffer Curve could bring the budget back to balance after an initial tax cut. When asked whether a "cut in federal income tax rates in the US right now would raise taxable income enough so that the annual total tax revenue would be higher within five years than without the tax cut", none of the economists surveyed agreed and 71% disagreed. [53]

The second case in which supply-side effects may be considered has to do with very productive public investment. It is often claimed that a deficit that is incurred to finance productive investment projects may be self-financing because it increases the productive potential of the economy. [54]

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[51] When the time horizon of the analysis is extended to several years, many other things may be going on in the economy, such as changing interest rates and investment, significantly modifying the effectiveness of fiscal policy. The main changes in the results concern crowding out: in the long run, the deficit feeds into debt and crowds out either capital stock and net foreign assets, thus shifting the economy to a growth path with lower income per capita. See Blinder, A. and Solow, R. (1973), Yellen J. (1989), Blinder, A. (1982).

[52] See Laffer, A. (2004) and Feige, E.L. & McGee, R.T. (1982)

[53] "Poll Results" (http://www.igmchicago.org/igm-economic-experts-panel/poll-results?SurveyID=SV_2irlrss5UC27YXi). IGM Forum.

[54] For a survey of the linkages between public investment and debt sustainability, see Berg et al. (2012). See also: Wyplosz (2007) and IMF and World Bank (2009). The possible self-financing nature of public investment is perhaps one of the reasons why many, including in Europe, are advocating the replacement of the (quasi) balanced-budget rule of the SGP with the golden rule, the constraint to balance the current budget.

In recent times, the discussion about these issues has been relaunched and redefined within the framework proposed by DeLong and Summers (2012), who stressed the role of permanent or 'hysteresis' effects of deep recessions on potential output as well as on debt sustainability. [55] This framework has been justified by the extraordinary recession that hit the world in 2008-2009 and contributed to revitalize Keynesian economics. [56]

The basic idea of DeLong and Summers (henceforth DS) is that, in times of deep recession, a fiscal expansion (preferably through public investment) may positively affect not only current income but also future potential income. Potential income would be affected either because of lower 'hysteresis' effects (the loss of skills when people remain unemployed for too long) or because of the already mentioned direct impact of public investment on potential output. [57] The higher potential output would increase future tax revenue in the long run. Under certain conditions, the enhanced tax revenue may offset the interest cost of the increased debt resulting from the original fiscal stimulus.

The importance of this result has sometimes been exaggerated. It is indeed essential to clarify what DS prove and under which assumptions. Three points are worth emphasizing.

The first one is that they are concerned about situations of deep recessions, in which monetary policy is constrained by the so-called zero lower bound, i.e. it cannot become more expansionary due to diminishing effectiveness of unconventional policies. This is an important point for DS because they state that in normal times the values of the multipliers are much smaller (or even zero) and little or no expansion can be engineered through a fiscal stimulus. Hence, the argument is that in a situation like the one that occurred in 2008-2009, it was appropriate to implement packages of fiscal stimulus, as it was done in virtually all major countries.

The second key assumption of DS is that interest rates are not affected by the decision to expand fiscal policy, both because the central bank pursues a very expansionary policy and because markets do not have doubts about the sustainability of public debt. This may well have been the situation in the United States in 2009, but it was hardly the situation of those European countries that risked losing access to market financing in the period between 2010 and 2012.

The crucial third assumption, the one that in this context is most important, is that they consider the effects of a temporary fiscal expansion. Spending is increased for a limited period, which in their

[55] See also Fatàs and Summers (2016); Ball et al. (2014) and Fatàs (2000).
[56] For a strong statement of how economists have changed their minds about the role of fiscal policy after the last recession, see Furman (2016), Blanchard and Summer (2017), Alesina et al (2019).
[57] These effects were first analyzed in Blanchard and Summers (1986).

empirical simulations is typically one year, and then reduced to its initial level. This is a fundamental qualification: it may be true that, under certain circumstances, a fiscal expansion is self-financing, but it must be clear that following any current expansion there must be a restriction at a later stage. Indeed, what does then mean that the expansion is self-financing? The answer is that the future increase in potential income is such that the increased cost of the debt may be matched by a larger tax revenue. It does not mean that the government can spend more forever and do away with it. Indeed, DS only claim that the rise in potential output would just be sufficient to cover the interest payments on the additional debt. While this would ensure debt sustainability, it would lead the debt ratio to a higher level leaving the country more exposed to shocks.

From the policy viewpoint, this theme is of fundamental importance. It must be made clear to policymakers that a stimulus package today implies a restriction tomorrow. This also implies that, when the stimulus is withdrawn from the economy, national income falls by almost as much as it rose when the stimulus was introduced. The novel aspect here is the word "almost". While in all the Keynesian models we have considered so far in this paper when the stimulus is withdrawn, income goes back exactly to its initial level, in the DS framework, it does not do so – because the state of the current cycle has lasting effects on future potential income through hysteresis effects or other supply-side effects (which, however, would require that investment in "good" investment, another important assumption).

A further critical assumption of the DS framework is that economic agents neglect the fact that the stimulus package is temporary. In practice, this may be one of the most challenging issues for a policymaker who wants to implement the suggestion of DS. On the one hand, it is widely believed that only permanent actions affect economic behavior; for instance, a temporary tax cut is very likely to lead to higher savings, not higher spending. On the other hand, it is necessary to make clear that the action is temporary to maintain confidence within financial markets. This problem becomes evident in an important IMF policy paper (Gaspar et al., 2016) that tries to design what IMF managing director Christine Lagarde defined as a "comprehensive, consistent, and coordinated approach to economic policy". In this context, it is essential for a package of fiscal stimulus to be part of a framework aimed at financial stability in the long run. At the same time, the authors do recognize that a fiscal stimulus that is perceived as temporary may not be effective. [58]

[58] The above problem is exacerbated by the fact that commitments about fiscal policy are rarely credible. A government may well state that a fiscal expansion is temporary. But experience shows that it is very easy to expand, and it is very difficult to rein in the expansion when it is no longer needed. This is indeed the main reason why most economists used to think that it was better to use monetary policy to stabilize the economy than to use fiscal policy.

What then can we conclude from this brief survey? These new theories may be useful for times when the economy is in a deep recession, as in 2009. In that case, a stimulus package was appropriate and was appropriately presented in most countries as an extraordinary measure justified by extraordinary times. There was a price to be paid: the increase in the public debt ratio. However, once economies started to recover, it was also appropriate to gradually return to fiscal discipline.[59] It can be discussed whether the pace of fiscal consolidation has been too fast, especially in Europe. However, it would not make much sense to propose a renewed fiscal expansion in normal times, especially as a way to lower the public debt ratio. Indeed, it is remarkable that in our post-WWII period no country that succeeded in lowering the debt ratio did so through a fiscal expansion neither through current, nor through investment spending, nor through tax cuts.

10. Mutualization: an unlikely solution

Given the initial large differences in debt-to-GDP ratios across member states of the Eurozone, several proposals have tried to solve the problem through mutualization, a term that has been given many different meanings over time and across countries. In this section, we review the literature on this issue and we highlight one major misunderstanding that has surrounded the policy debate: the idea that mutualization would allow high debt countries to avoid the painful path of fiscal adjustment. This is an illusion or a wrong reading of the proposals that have been put forward. Mutualization has a different purpose, that of reducing the likelihood of a liquidity crisis affecting a country that is fundamentally solvent.

In 2011, at the start of the sovereign debt crisis in the Eurozone, an important proposal was put forward by the five members of the German Council of Economic Experts.[60] The basic idea was to set up what was called a European Redemption Fund (ERF) that would buy all member countries' debts in excess of the 60 percent threshold. The ERF would finance itself on the market at very low rates because it was conceived as a European institution for which there was to be "joint and several liabilities" of all Member States. The Fund would not cancel the debt that it had initially purchased, but would roll it over for a certain number of years (it was proposed 25), in order to give sufficient time to the high debt countries to reduce their total debt, whether held by the ERF or by the market, to the 60 percent threshold. The basic idea was that the creation of the ERF would calm financial markets by demonstrating that solidarity among Eurozone members will prevail. In essence, strong countries would lend their reputation, i.e. their low risk premia in the bond market, to member

[59] See Skidelsky & Fraccaroli (2017).
[60] German Council of Economic Experts (2011).

countries with high debt and potentially exposed to liquidity crises. The interesting point is that an important voice in Germany called for more solidarity towards high debt countries, on the basis of the argument that a crisis would be detrimental to all member states. At the same time, the Council called for credible commitments to ascertain accountability, with all member countries adhering to the rules of Stability and Growth Pact. Other provisions were envisaged in order to avoid moral hazard by the high debt countries. In particular, it was envisaged that if a participant failed to honor its commitments, the roll-in of its bonds would be stopped. [61]

The ERF was hence an institutional mechanism that would find a comprise between solidarity by low debt countries and accountability by high debt countries; what is now called risk sharing in exchange for risk reduction.

This proposal did not have any success in real life. The most quoted reason was the reluctance of Germany to take on its shoulders the responsibility for the debt of countries like Greece, Italy, Spain, Portugal and Ireland. Even leaving aside extreme events like defaults by some of these countries, taking this responsibility might have made the German debt riskier and therefore more expensive for the German taxpayers. It should also be noted however that this proposal was not even considered thoroughly by high debt countries and was never discussed seriously at ministerial level meetings. Probably the reason for such cold attitude of high debt countries was the fear that the conditionality attached to the scheme would turn out to be too heavy and indeed very similar to that which the so-called Troika was than starting to impose on Greece.

Whatever the reason, the fact is that the proposal was essentially abandoned. The same fate occurred to the many other proposals that were made in the following years, to which we now briefly turn.

In 2014, Pierre Paris and Charles Wyplosz came up with a plan that was called PADRE, meaning Politically Acceptable Debt Restructuring in the Eurozone. The basic idea was to let the ECB do the job that in the previous proposal was done by the ERF. The ECB would acquire public debts of all Eurozone member countries in proportion to each country's share of its capital, which determines how profits and losses are passed on to governments. But profits would no longer be passed to the governments. The idea is that the ECB would use its profits (coming from seigniorage) in order to service the public debt acquired. In practice, each government will 'pay back' the ECB the total amount – in the present value sense – of the initial debt purchased in the form of reduced distributed

[61] See Bofinger P.et al (2011).

profits. This is a smart idea because it eliminates the risk of some countries defaulting on their obligations towards the ERF. By so doing, it also eliminates in principle debt mutualization. The proposal, however, did not go through, possibly because of the uncertainty on seigniorage revenues. In the absence of such certainty, some form of guarantee by member countries, and hence mutualization, would still be needed. An additional reason for skepticism on this plan is the fact that it uses the central bank for a purpose that is very far from its institutional mandate. This fact raises the fear that at the end of the story there would be monetization of public debts and inflation.

Several other plans have been proposed since. [62] We will only spend a few words on the latest one that has been put forward by researchers of the Bank of Italy last January. [63] The basic aim of the paper is to make a redemption fund even more politically acceptable than in the previous proposals. For that purpose, they abandon the idea of using the central bank and go back to the original idea of creating ex-nihilo an ERF. The fund would be similar to the one envisaged in 2011 by the German Council, except for one crucial feature: the contributions of member countries to the ERF would be linked to the interest rate that they pay in the financial market at the initial time, when the ERF is set up. Therefore, a country like Italy would pay a higher contribution per unit of debt sold to the Fund than a country like Germany or the Netherlands. This feature is meant to eliminate the transfer of resources from high debt to low debt countries that is implicit in all other schemes, in which all countries pay the same interest rate to the Fund, regardless of their perceived riskiness as measured by interest rates spreads in the markets. Another interesting feature of the plan is that member states payments to the Fund would be indexed to national GDP, which would reduce the burden of the debt during recessions. As to the issue of moral hazard, the authors recognize that the ERF would not reduce moral hazard. However, they put forward two interesting proposals. The first one follows Delpla and Von Weizsäcker (2010) who suggest it could be possible to give an explicit seniority structure to the stock of debt. In particular, it could be explicitly agreed that national debt would be junior to ERF debt. The claim is that the very fact that national bonds have junior status should lead investors to raise their cost and in this way incentivize fiscal discipline at the margin. The second idea follows Corsetti et al. (2015, 2016) and consists in introducing a Sovereign Debt Restructuring Mechanism (SDRM) in the euro area. An SDRM can be seen as the counterpart of a 'bankruptcy code' for the public sector. It defines a set of procedures and institutions spelling out 'who has the power to do what' in the event of a sovereign default.

[62] See Corsetti G.et al. (2015); Parello, C. and V. Visco (2012). For a survey, see Longobardi E. and Pedone A. (2015) and Cottarelli, C. (2016).
[63] Cioffi, M. et al. (2019).

As can be seen, this proposal is not a free lunch for high debt countries. Indeed, an interesting point that is strongly emphasized in the Bank of Italy paper is that the creation of an ERF is not a way to make it possible to relax fiscal discipline in high debt countries. In fact, the path of the primary deficit that is needed to make sure that the debt is sustainable is essentially the same with and without the ERF. Under reasonable assumptions about the basic set of variables, the authors compute that the primary surplus should be increased to a little more than 4 percent, which is the same figure that the Bank of Italy has put forward as a necessity for Italy in any case. What then is the purpose of an ERF? The answer is that it reduces the likelihood of a country, which is fundamentally solvent to be thrown into insolvency because of a liquidity crisis.

Summing up, mutualization, in the sense of pooling together parts of national public debts, is not a completely impossible perspective. However, it is unlikely to be accepted in practice because low debt countries take up the risk that some high debt countries default on their obligations. In any case, each country picks up part of the risk of default of other countries, which is a very difficult idea to accept politically. Another feature that makes an ERF an unlikely proposal is that in order to avoid transfers of real resources from high to low debt countries, the former would have to contribute proportionally more to the fund then the latter. This feature, whose characteristics are spelled out most clearly in the recent contribution of the Bank of Italy, is likely to make the Fund unattractive also for high debt countries.

The key take-out message from this review of the literature is that there is no free lunch. An ERF would in no way reduce the need for fiscal consolidation in high debt countries. Achieving a sufficiently high primary surplus is thus necessary, regardless of what is decided in Europe about mutualization.

Of course, in economic history, there have been cases of debt mutualization, typically after a war that changed the structure of nations. For instance, after the war in 1861 that led the unification of Italy under the monarchy of Savoy, the newly formed Kingdom of Italy decided to recognize the debts of the Kingdom of the Two Sicilies, formerly ruled by the Bourbon dynasty. [64] The US Government did the same thing in 1790, under the Presidency of George Washington: the war debts of the constituent states were taken up by the central government, whose debt increased by 76 million dollars. [65]

[64] According to Cassese (2018) and Pedone (2011), this was done because the new Kingdom of Italy did not want to antagonize with the noble classes of Southern Italy, which held of much of the debt. The result was that after 1861 all Italians were burdened with high debt, of about 80 percent of GNP (Zamagni, 1998).
[65] See Cary Brown (1989).

The conclusion is that shifting the burden of the debt across countries is a very rare event and, to the best of our knowledge, has never occurred during peace times. Hence, an adjustment has to take place in a standard manner by creating a sufficiently large primary surplus and maintaining it for a prolonged period.

11. Conclusions

Our analysis has focused on 30 cases in which the public debt-to-GDP ratio fell by more than 25 percent or so. In all such episodes, debt reduction was achieved through: very high inflation (which typically occurred at the end of WWII), a mix of financial repression, high growth and moderate inflation (which prevailed in the golden age of the Bretton Woods system), orthodox adjustment through lower spending or higher taxes (a strategy that many countries followed from 1980 onwards) and debt restructuring, which has been rather common in developing countries, but among developed countries it occurred only in the case of Greece in recent times.

Some of these strategies cannot be reproduced at the present time. In particular, it would now be inconceivable to wipe out the debt through "surprise inflation", as it occurred in many countries in the aftermath of WWII. In fact, high inflation was probably not a strategy to reduce the debt, but a painful necessity due to the supply disruptions brought by the war. Indeed, in most countries whose debts were wiped out by inflation, the initial level of the debt was not very high and lower than 80 percent. In any case, high inflation in the euro area is a highly unlikely scenario.

Another strategy that does not seem reproducible today is the one that prevailed in the golden age of Bretton Woods. For that, strategy to work one needs three ingredients: high growth rates, moderate inflation, and financial repression, i.e. a system of controls that can effectively oblige investors to accept rates of return considerably lower than inflation. It should be considered that modern technologies make it very difficult for governments to prevent investors to find the best investment opportunities anywhere around the world. In any case, this strategy implies the levy of a tax on bondholders: there is no free meal even in this case.

Other potential debt reduction strategies were not found in the case studies, meaning that such strategies were either not tried or, if tried, did not work; some of them may have helped the reduction of the debt, but were not the key factors of success. The key example is privatization: the evidence shows that it did help, but never had a key role in reducing high debts.

Another strategy that did not play a key role was "liability management". All countries have more or less sophisticated debt management offices or agencies that try to issue the types of the debt

(long or short term, indexed or plain vanilla, etc.) that can minimize the cost of borrowing for the government and achieve other relevant objectives – such as lengthening the duration of the debt. These are important tasks that must be performed on a routine basis, but cannot do miracles: thus, for instance, the idea of inducing residents to buy the debt with the aim of reducing the dependence from volatile international markets does not seem to have ever obtained important results.

Another approach that does not show up in the data of the last seven decades is debt mutualization. Although some of the proposals that have been put forward in the context of the reform of the European Monetary Union in the last few years – for example the one of the German Council of Economic Experts – do not seem unreasonable on paper, in economic history debt mutualization has occurred only after wars that have led to major changes in the structure of nations, such as the unification in Italy in 1861 and the revolution of the thirteen colonies that founded the United States of America.

Another strategy that does not have successful precedents is the one that is sometimes proposed around the world by politicians before elections, a strategy that allows them to promise paradise without any sacrifice: reducing the debt through an increase in the deficit. This idea comes in a left-wing version – increasing spending – by politicians who often characterize themselves as Keynesian. Moreover, it comes in a right-wing version – cutting taxes – by politicians who hate to be considered Keynesian. Both versions are supposed to do miracles, but they do not.

Indeed, from the 1980s, in the context of real rates of interest higher than the growth rates, the only successful strategy has been the orthodox strategy that consists in improving the primary balance. There are 13 cases in which this strategy turned out to be successful. Of these 13 episodes, 11 occurred in the quarter of a century between the early 1980s and the middle of the 2000s. Two occurred after the 2008-09 crisis (Iceland, 2011-17 and Ireland, 2012-17), in the context of extraordinarily low interest rates due to expansionary monetary in all major areas and fast recoveries after a deep recession. In all these cases, debt reduction required raising the primary surplus and maintaining it at high levels for prolonged periods. In most cases, the adjustment was driven by cuts in spending, but in several cases (Norway, Iceland, Belgium and Spain) increases in taxes played an important or even a predominant role.

The ability of so many countries to raise and maintain over time a high primary balance, and in this way to achieve a large reduction in the public debt ratio, is remarkable especially in light of the claim that orthodox fiscal policies (often labelled “austerity” policies) not only hurt the economy

but are also counterproductive, a claim that has achieved considerable weight in policy debates as well in academic circles. In this respect, two points are worth making.

The first one is that GDP growth did not seem to have suffered from the policies aimed at reducing public debt. In the pre-global crisis period, the lowest growth rate was observed for Belgium and Denmark, yet it remained above 2 percent. Thus, we can at least conclude that orthodox fiscal adjustment (and maintaining the primary balance at high levels for a long period of time) does not necessarily imply a collapse in economic activity, as some critics of orthodox fiscal adjustment have suggested.

The second point is that there is no evidence that countries were able to run large primary surpluses primarily because they were leaving in "good times": there is no evidence that the level of the primary balance was affected by the growth rate of the economy. If anything, we found a negative correlation between primary balances and growth, suggesting that countries that were living in a less favorable growth environment, but were determined to pursue a debt reduction strategy, maintained a stronger primary balance.

The basic conclusion is that a debt reduction has never been achieved by cutting taxes or increasing spending. To reduce debt, it is necessary to achieve a sufficiently strong primary balance. Furthermore, while in the short run one can let automatic stabilizers worsen the budget in the face of adverse cyclical conditions, when growth is structurally low, i.e. it remains low for a decade or more, the opposite is unfortunately true: to a low structural growth a responsible policy maker must respond by improving the budget so as to maintain debt on a sustainable path. Of course, this should be accompanied by structural reforms aimed at raising the growth rate through stronger productivity growth and competitiveness.

One final word on a debt reduction strategy that was implemented in Greece: debt restructuring. From the analysis of the Greek case, we draw three lessons. The first lesson is that restructuring may have recessionary effects on domestic demand because it is a tax on wealth and because it may cause a credit crunch due both to bank losses and to the loss of reputation that affects domestic companies when the sovereign defaults. The second one is that even large haircuts may have a small effect on the debt to GDP ratio, because of the fall in GDP and the need to prevent the collapse of the banking system. Even smaller debt reductions would occur if the debt is held mostly domestically, as in the case of Italy. The third lesson, perhaps the most important, is that restructuring may be a necessary and painful complement of a return to fiscal rectitude, but it is not an alternative to it: whatever one thinks about the timing of the restructuring and the size of the

austerity packages that were asked by the Troika, there can be no question that Greece badly needed to return to fiscal responsibility. These are important factors to keep in mind when talking about restructuring as a way to “solve the debt problem”.

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Appendix

I. Methodology and sources

As concerns the public debt-to-GDP ratios, we merged the European Commission's AMECO database with two datasets of the International Monetary Fund: the Global debt database, in particular the data on general government debt, and the Historical public debt database.

As regards government primary balance, revenues and primary expenditure, we merged data from AMECO and the IMF dataset Public finance in Modern History, whereas data on cyclically adjusted primary balances were taken from AMECO and the IMF's Fiscal Monitor. The sources of interest paid on debt and real GDP growth rate, instead, is the IMF dataset Public finance in Modern History and the IMF's Fiscal Monitor. However, some exceptions occurred. Data on the Canadian primary balance were taken from the Fiscal Monitor and data on case studies of debt reduction after the financial crisis (e.g. Greece, Iceland and Ireland) have all AMECO sources, except for the IMF's Fiscal Monitor real GDP growth rate.

Finally, the rate of inflation is measured as the percent change in the average Consumer Price Index and the sources are:

- Appendix of Reinhart and Sbrancia (2015) for Australia, Belgium, Canada, France, Italy, Japan, UK, USA.
- Oesterreichische National Bank for Austria (https://www.oenb.at/en/Statistics/Standardized-Tables/Prices--Competitiveness/Consumer-Prices.html)
- National sources, BIS Consumer price series for Netherlands and Switzerland (http://www.bis.org/statistics/cp.htm.)
- Hjerppe (1989) for Finland
- Statistics Canada (https://www150.statcan.gc.ca/n1/pub/62-604-x/62-604-x2015001-eng.htm)
- Statistics New Zealand (http://archive.stats.govt.nz/infoshare/)
- Statistics Norway (https://www.ssb.no/en/kpi)
- IMF's World Economic Outlook (https://www.imf.org/external/datamapper/PCPIPCH@WEO/OEMDC/ADVEC/WEOWORLD)