# CHAPTER 6

# Reducing Debt Short of Default[1]

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*The views expressed in this paper are those of the authors and do not necessarily represent the views of the IMF, its Executive Board, or IMF management.*

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# I. Introduction

Since the global financial crisis, government debt-to-GDP ratios have increased substantially in advanced and emerging economies (Figure 1). In this chapter we discuss the strategies available to governments seeking to reduce debt to more historically normal levels. We begin by focusing on the conventional options – fiscal consolidation and growth-promoting policies – before moving to more unconventional means of debt reduction, including debt monetization and financial repression. We leave perhaps the most radical options in a government's arsenal, outright default and debt restructuring, to the next chapter.

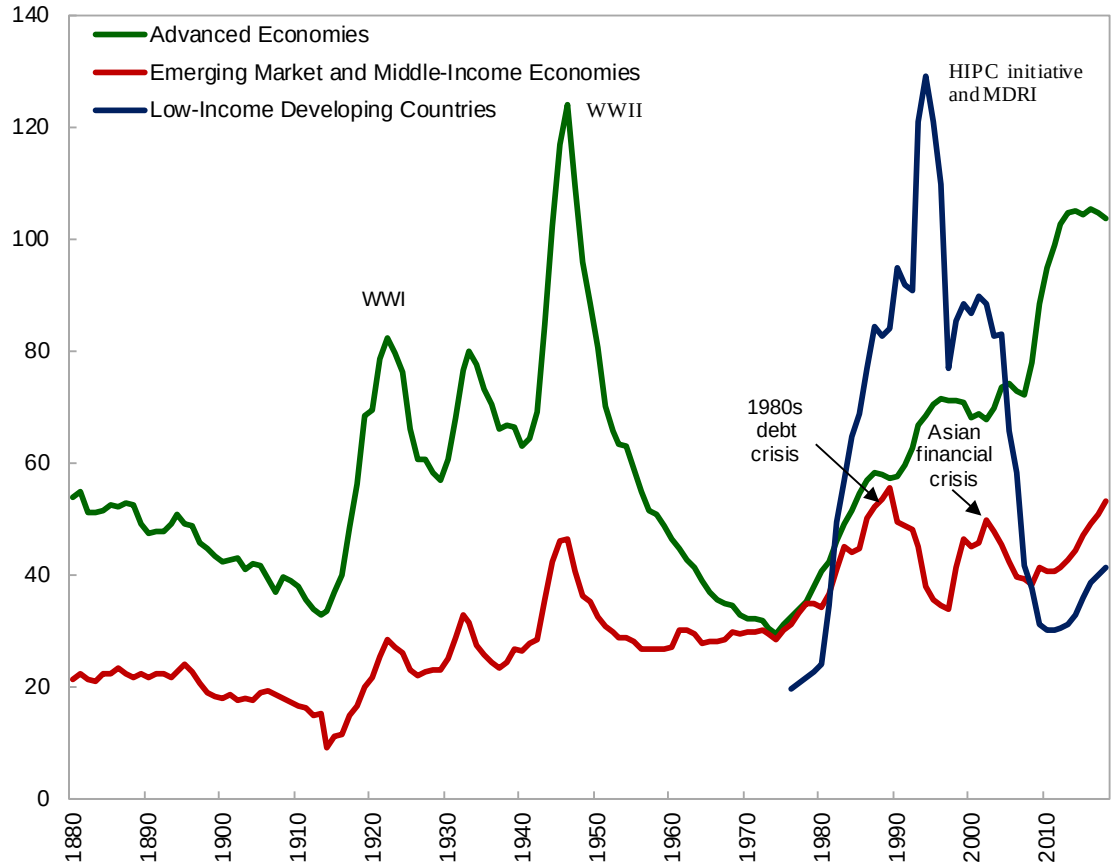
**When is public debt reduction needed?**

While some take it as given that public debt should be reduced from today's elevated levels, in fact there has been a vigorous debate over whether and when debt reduction is appropriate, particularly in advanced economies. The starting point for this debate is that lower public debt is not desirable for its own sake, but rather because high public debt can generate costs and risks. Debt reduction may be appropriate when the costs and risks of high debt outweigh those associated with debt-reducing policies.

The most pressing argument for debt reduction arises when there is a danger of an acute sovereign debt or fiscal crisis. The economic and political costs of outright sovereign default or debt restructuring are usually substantial (see chapter 7), and even if they can be avoided, high debt levels may expose a country to spikes in its funding costs and the need for sharp policy adjustments at times when the economy is already being buffeted by other shocks. As a result, when the existing level of debt leaves a country facing a considerable risk of a sovereign debt crisis, or when sovereign financing costs are already causing disruption, there is usually a strong case (or even an imperative) to pursue rapid debt reduction.[6]

[6] Taking this argument a step further, a prudent government may prefer to build up sufficient 'fiscal space' to react to future economic fluctuations, without running the risk of prompting a fiscal crisis. However, this kind of 'pre-emptive' debt reduction, or accumulation of fiscal buffers, is harder to justify at times when the economy is already weak and economic slack is substantial (see Ostry et al, 2015).

**Figure 1: General Government Debt since 1880** (Percent of GDP)




Sources: Abbas and others 2010; Bolt and others 2018; IMF, Historic Public Debt Database; Maddison Project Database, version 2018; and IMF staff estimates and projections.
Note: Average is calculated using GDP at purchasing power parity. Dashed lines refer to the debt level in 2017. WWI = World War I; WWII = World War II; GFC = global financial crisis; HIPC = heavily indebted poor countries; MDRI = Multilateral Debt Relief Initiative.
Advanced economies: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Hong Kong SAR, Ireland, Italy, Japan, Korea, Netherland, New Zealand, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, Taiwan Province of China, United Kingdom, and United States.
Emerging market and middle -income countries: Argentina, Brazil, Bulgaria, Chile, China, Colombia, Egypt, Hungary, India, Indonesia, Iran, Jordan, Kazakhstan, Kenya, Malaysia, Mexico, Morocco, Pakistan, Peru, Philippines, Poland, Romania, Russia, South Africa, Sri Lanka, Thailand, Turkey, Ukraine, Uruguay, Venezuela.
Low-income developing countries: Bangladesh, Benin, Burkina Faso, Cameroon, Chad, Democratic Republic of the Congo, Côte d'Ivoire, Ethiopia, Ghana, Haiti, Honduras, Kenya, Madagascar, Mali, Myanmar, Nepal, Nicaragua, Niger, Nigeria, Papua New Guinea, Rwanda, Senegal, Tanzania, Uganda, Vietnam, Zambia, Zimbabwe.

There are a range of frameworks for determining what constitutes a sustainable or "safe" level of public debt (see chapter 4), which may be useful in determining a targeted debt reduction,[7] although unfortunately, there is no consensus on how to determine these "safe"

[7] In general, these frameworks produce either a (country or policy-dependent) threshold level of debt, above which default is inevitable, or in probabilistic frameworks, an estimate of the likelihood of default (or 'fiscal stress') at any given level of debt. In the former case, it may be useful to combine these deterministic "debt

debt levels. However, this literature does point to factors that can result in higher or lower levels in different countries, including policy credibility and debt composition (e.g. by currency, maturity, and the residency of investors).

Even if outright crisis can be avoided, high levels of public debt may carry costs, such as the need to levy higher rates of (distortionary) taxation. Chapter 3 discusses the literature on "optimal" public debt levels that balance these costs with potential benefits.[8] Again, there is a lack of consensus on what levels are "optimal", and there is likely to be cross-country variation. However, one robust finding is that rapid adjustments to bring debt back to targeted levels are unlikely to be the best option (Aiyagari and McGrattan, 1998; Bhandari et al., 2017). The reason is that debt-reduction strategies have their own costs, and rapid policy adjustment is likely to be particularly costly. Thus, where debt is judged to be above its long-term optimum, but a government has substantial space relative to a "safe" debt level, a policy of gradual adjustment would typically be preferred, and rapid adjustments, particularly at times when the economy is already weak, should generally be avoided.

In some countries, policymakers have another motive for debt reduction: the existence of legislative limits, or targets, for the level of public debt. These fiscal frameworks may also provide guidance on the amount of debt reduction to be achieved, and the appropriate timeframe. Table 1, based on the IMF Fiscal Rules Dataset (2016), summarizes some existing debt limits and targets, which are most common in the context of currency unions.

**Table 1: National and supranational public debt ceilings and targets**

| Country/ region | Ceiling/target | Debt defintion | Countries affected |
|---|---|---|---|
| European Union | 60 percent of GDP | Nominal Public Debt | 28 |
| West African Economic and Monetary Union | 70 percent of GDP | Nominal Public Debt | 8 |
| Central African Economic and Monetary Community | 70 percent of GDP | Nominal Public Debt | 6 |
| East Caribbean Currency Union | 60 percent of GDP | Nominal Public Debt | 6 |
| East African Community | 50 percent of GDP | Public debt in NPV terms | 5 |
| | | | |
| Botswana | 40 percent of GDP | Nominal Public Debt | |
| Ecuador | 40 percent of GDP | Non-financial Public Sector Debt | |
| Georgia | 60 percent of GDP | State Debt | |
| Mongolia | 40 percent of GDP | Public debt in NPV terms | |
| Namibia | 25-30 percent of GDP | Nominal Public Debt | |
| Peru | 30 percent of GDP | Non-financial Public Sector Debt | |

limits" with a stochastic model of the debt stock (e.g. Celasun et al, 2006) to determine a "target" level of debt at which the probability of default or stress is sufficiently low.

[8] For example, households and firms may derive value from holding public debt, to the extent that it can act as a "safe asset" and relax their borrowing constraints (Woodford, 1990).

## The mechanics of public debt reduction

Once a policymaker has determined that debt needs to be reduced, the next question is what combination of measures should be used to bring about that adjustment. A natural starting point for this discussion is the debt-dynamics identity.

### *The debt dynamics identity*

The debt dynamics identity describes how the evolution of (gross) public debt depends on key economic and policy variables. There are many forms of this equation[9], but we start with the simplest, in which all variables are expressed as a percentage of GDP:

$$(1) \quad \Delta d_t = \frac{1}{1+g_t}\left(\frac{i_t-\pi_t}{1+\pi_t} - g_t\right) d_{t-1} - pb_t + sfa_t$$

This equation shows that changes in public debt ($\Delta d_t$), depend on the inherited debt level ($d_{t-1}$), the government's primary balance[10] ($pb_t$), the nominal (effective) interest rate on public debt ($i_t$), inflation[11] ($\pi_t$) and real growth ($g_t$). As will be discussed, the interest-growth differential $\left(\frac{i_t-\pi_t}{1+\pi_t} - g_t\right)$ is particularly critical as a determinant of long-term debt dynamics. The final term in this equation, the stock-flow-adjustment ($sfa_t$) is a residual item, capturing all other factors that affect the debt level, including changes to other government assets and liabilities.

When discussing the impact of inflation, it can be useful to distinguish between the ex-post real interest rate in this equation $\left(r_t^P = \frac{i_t-\pi_t}{1+\pi_t}\right)$, and the ex-ante real interest rate anticipated by investors $\left(r_t^A = \frac{i_t-\pi_t^e}{1+\pi_t^e}\right)$. The former is the real return realized by investors in government bonds in period t, determined by the nominal effective interest rate set when the debt was

[9] See appendix A for derivations of the various debt dynamics equations presented in the chapter.

[10] Throughout the chapter, the "primary balance" is defined as the different between the government's revenues and its primary (non-interest) expenditures.

[11] As measured by the percentage change in the GDP deflator.

issued and the realized inflation rate, $\pi_t$. The ex-ante real interest rate is the real rate of return that investors *expected* to earn at the time debt was issued, determined by the nominal interest rate, $i_t$, and the expected inflation rate, $\pi_t^e$.

For countries, with foreign currency denominated debt, a variant of the debt dynamics equation accounts for the effect of exchange rate fluctuations on the debt stock:[12]

$$(2) \quad \Delta d_t = \frac{1}{1+g_t}\left(\frac{i_t^d - \pi_t^d}{1+\pi_t^d}\alpha_{t-1}^{dc} + \left(\frac{i_t^f - \pi_t^f}{1+\pi_t^f} + \frac{\Delta q_t}{q_{t-1}}\right)\alpha_{t-1}^{fc} - g_t\right)d_{t-1} - pb_t + sfa_t$$

This equation is similar, but distinguishes between domestic and foreign currency debt, which typically have different nominal interest rates (denoted by the d and f superscripts). For countries with foreign currency debt, a depreciation of the real exchange rate (positive value of $\Delta q_t$) increases the debt-to-GDP ratio, with the magnitude increasing in the share of foreign currency debt ($\alpha_t^{fc}$).[13]

***The role of economic policies***

The dynamics identity provides a lens to consider the distinct roles played by the four different policies discussed in this chapter:

- **Fiscal consolidation** is the most direct policy tool by which a government can reduce its debt, and impacts debt dynamics mainly via the primary balance, although the "headline" primary balance is also affected by business cycle fluctuations.

- **Growth-enhancing policies** typically aim at raising the growth rate of "potential" GDP, usually defined as the level of output consistent with stable inflation.

[12] The full version of this equation also includes a cross term in $\left(\frac{\Delta q_t}{q_{t-1}}\frac{r_t^f}{1+g_t}\right)$, which is typically small. Again, see appendix A for an exact derivation.

[13] Note that public debt must be denominated in either domestic or foreign currency, so $\alpha_t^{fc} = 1 - \alpha_t^{dc}$.

- **Monetary policy** can act through several channels, including by boosting short term output growth, by generating surprise inflation that reduces real interest rates on (domestic) government debt, and by generating seigniorage revenues.[14]

- **Financial repression** typically acts by reducing the rate of return on domestic government debt, by creating frictions in financial markets and/or captive audiences for government debt.

- Various other policies can also impact debt dynamics but are not discussed in detail in this chapter. Most prominent are changes in the government's ownership of assets, particularly privatization of state owned enterprises.[15] Such policies can reduce gross debt and may generate efficiency gains, but they also reduce government assets and therefore may have more limited effects on government solvency.

In this chapter we explore these four policy tools in turn, examining the mechanisms by which they affect debt, and discussing effective policy design in each area, informed by the theoretical and empirical literature. However, before moving to a detailed discussion of these policies, a brief discussion of their relative roles in past reductions is warranted.

**How have large debt reductions been achieved?**

The historical contribution of different policies to debt reductions has varied widely, depending on country circumstances, and the international context (Figure 2). The main historical episodes of public deleveraging were discussed in detail in Chapter 1:

- Advanced economy debt reductions prior to WWI relied mainly on primary surpluses, and were often conducted in the context of modest growth and low inflation.

[14] Some presentations (e.g. Reinhart and Sbrancia, 2015) consolidate the central bank in the debt accumulation equation, with central bank money issuance as an alternative source of financing. In the form of the equation we show, revenues from seigniorage appear in the primary balance when they are paid to the government as profits.

[15] A related issue is that the government may achieve superficial debt reduction by using off-balance sheet financing, for example through public-private partnerships, which can create new and less transparent fiscal risks.

- In the interwar period, debt overhangs were initially addressed through a mixture of hyperinflations (Germany, Austria), and primary surpluses (France, United Kingdom), but ultimately, defaults were widespread (Reinhart and Trebesch, 2014).

- The post-WWII debt reductions relied primarily on very favorable interest-growth differentials thanks to a combination of rapid growth, financial repression, and persistent inflation, while primary surpluses played only a small role.

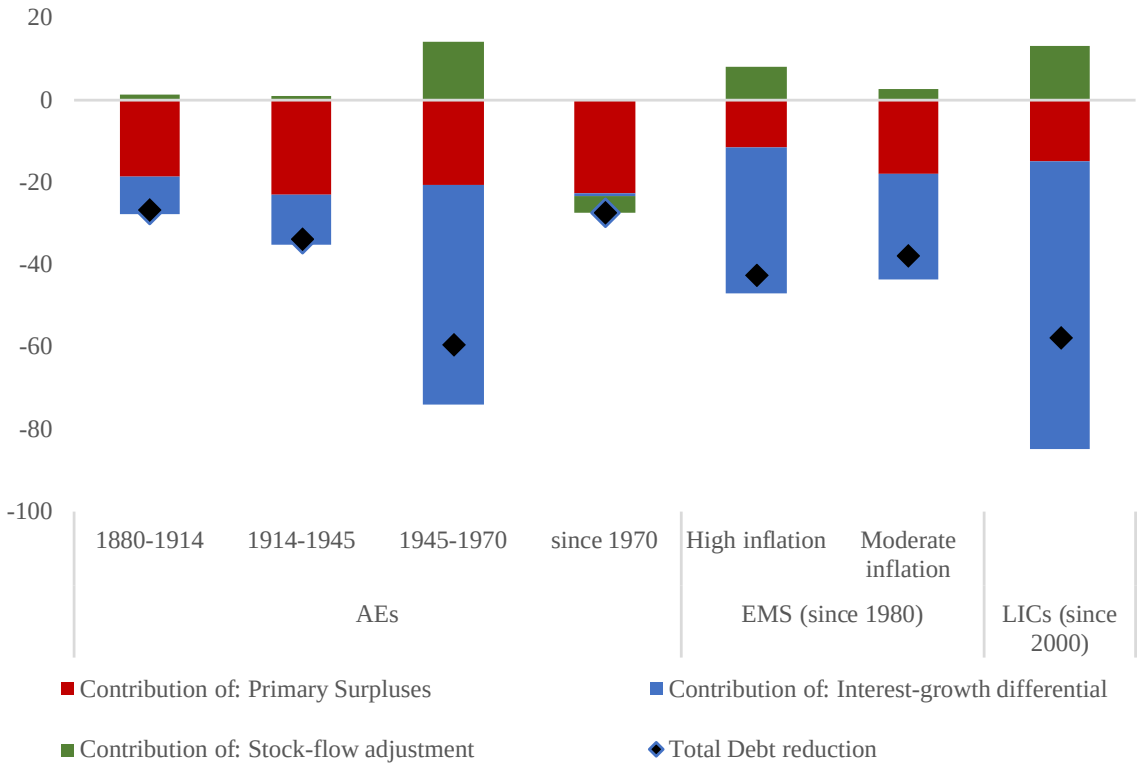
In the period since the 1970s, episodes of coordinated debt reduction in Emerging and Low-Income countries were driven primarily by debt restructuring, in the former case mainly through the Brady plan and in the latter through the HIPC initiative. However, it is also worth examining cases of debt reduction without default in this period:

- Since the 1970s, large debt reductions in advanced economies have been infrequent (examples include Ireland and New Zealand from the 1980s, Belgium and Denmark from the 1990s), and relied primarily on fiscal consolidation (Abbas et al., 2013). Inflation typically fell during these episodes, and average interest-growth differentials were close to zero. However, growth often accelerated at the outset amid favorable monetary conditions, including depreciating real exchange rates.

- Since the 1980s, non-default EM debt reductions have generally fallen into one of two broad categories: high inflation episodes (e.g. Poland and Hungary in the 1990s and Serbia in the 2000s), in which negative real interest rates were the main driver of debt reduction; and moderate inflation episodes (e.g. Indonesia and Uruguay in the 2000s), in which real growth rates typically accelerated, and the contribution of primary surpluses and growth to debt reduction was similar (Abbas et al, 2010).

- A recent study (IMF, 2018) identifies seven sustained non-default debt reductions in low-income countries since 2000. The drivers in these cases were quite diverse, including rising commodity revenues (Papua New Guinea, Uzbekistan and Solomon Islands), high investment levels that delivered strong GDP growth (Djibouti, Lao), fiscal consolidation (Nepal) and a combination of high inflation and financial repression (Myanmar).

**Figure 2: Contributions to public debt reduction in non-default episodes**
(change in public debt as a percent of GDP)




Sources: Abbas et al (2010); Abbas et al (2011); IMF (2018); WEO and authors' calculations.

## II. Fiscal Consolidation

Fiscal consolidation—also referred to as fiscal adjustment or fiscal tightening in this chapter—denotes budgetary measures taken by the government to improve its fiscal position and reduce the debt-to-GDP ratio. Fiscal consolidation has two main characteristics. First, fiscal consolidation entails actions taken as part of the budget, that is revenue-enhancing and expenditure containment measures. Second, fiscal adjustment is, by definition, discretionary. This means that an automatic improvement of the government's fiscal position due to favorable economic conditions is not viewed as fiscal consolidation.

Fiscal consolidation is generally measured using a "top-down" approach that identifies discretionary fiscal policy as the annual change in the cyclically-adjusted primary balance

(CAPB) from one year to the next (Fedelino et al, 2009).[16] However, this approach is not without drawbacks; for example, it attributes all changes in the CAPB to discretionary budgetary actions and may overestimate them when non-traditional cycles, such as asset or commodity price fluctuations, are not properly filtered out (Bornhorst et al, 2011). Conversely, it may miss cases where adjustment is implemented to avoid a deterioration that would have occurred under existing policies, for example due to age related spending. In addition, the estimation of potential output, which is crucial for computing the cyclical adjustment, is highly uncertain and dependent on the statistical technique used.

At the center of the policy debate on consolidation is how to design a "successful" fiscal adjustment. By successful, the literature generally means three things. First, fiscal adjustment should be *sufficiently large* to put debt on a sustainable path. Second, adjustment should be *durable* and difficult to reverse. And third, the efficiency cost of consolidation should be minimized; in particular consolidation should not be too detrimental to economic growth.[17] Success depends on a range of factors and characteristics related to the design and implementation of consolidation plans. It is common to organize the discussion around three main pillars: size, speed, and composition of adjustment (Daniel et al 2006).

**Size of the Adjustment**

The first question in the design of a fiscal consolidation is how much adjustment is needed. This section focuses on how to compute *total* adjustment needs,[18] leaving aside for the moment the pace and composition.

[16] The main alternative is the "bottom-up" or "policy action approach" (Romer and Romer, 2010; Devries et al. 2011), which uses estimates of fiscal measures announced in the budget and other official documents, but this approach has its own drawbacks. For example, it relies on the existence of credible official estimates of discretionary policy actions, and the benchmark of "unchanged policy" is not always clearly defined.

[17] This is sometimes described as ensuring fiscal consolidation is "growth-friendly".

[18] The term "adjustment needs" denotes the change in the fiscal position needed to achieve a debt target by a certain date. Thus, it refers solely to the contribution of fiscal policy to debt reduction, and does not consider other policies described in the chapter (growth-enhancing measures, monetary policy, or financial repression).

***Calculation of the fiscal "adjustment needs"***

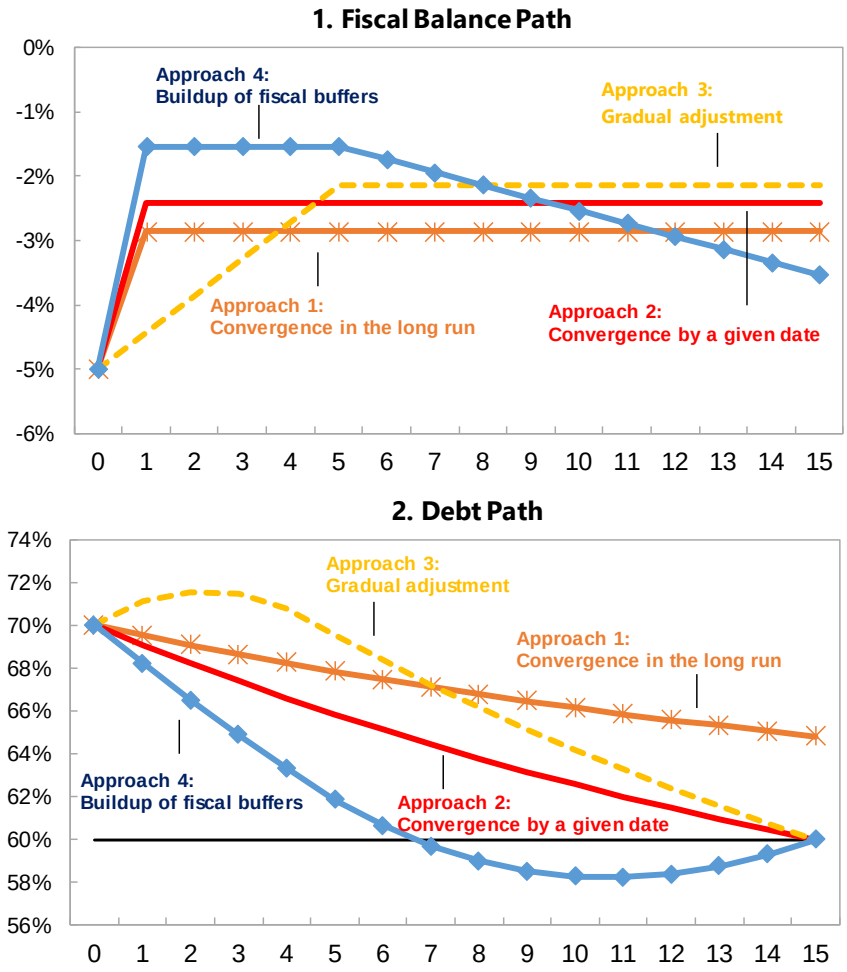
Practitioners usually adopt a pragmatic approach to compute the required size of the fiscal adjustment. The first step is to determine a reasonable debt target, guided by some of the concerns mentioned in the introduction. Once this target is determined, the policymaker can calculate the discretionary change in the fiscal position that would bring debt to its target at a predetermined horizon (IMF, 2018), taking the setting of other policies as given. If the initial fiscal position is weaker than what is needed to achieve the debt target, a fiscal consolidation will at some point be needed. The opposite case would lead to a fiscal loosening.

From an operational point of view, there are various ways of computing the size of adjustment (that is, the change in the CAPB) necessary to bring debt to target. IMF (2018) summarizes four alternative approaches to determining the CAPB path (Figure 3), depending on whether (i) the debt target is achieved asymptotically in the long term or by a given date; (ii) consolidation is gradual or concentrated in a single year; and (iii) pressures on the fiscal position are expected in the future (for instance due to population ageing), which could call for extra buffers upfront.[19] Depending on the approach taken, fiscal consolidation needs will

[19] To accommodate future spending increases, fiscal space has to be created in the short-term. The long-term fiscal sustainability gap of the European Commission (also known as S2 indicator) is used to quantify the adjustment to the CAPB required to fulfil the infinite horizon inter-temporal budget constraint, including paying for additional expenditure from an ageing population.

vary; for instance they would be larger if the debt target needed to be reached sooner or if there were long-term fiscal pressures.

**Figure 3. Alternative Computations of Fiscal Adjustment Needs**




Source: IMF (2018).

Assumptions: nominal growth, 5%; interest rate, 3%; initial debt, 70%; debt target, 60%; initial balance, –5%.

### *Short-term effects of fiscal adjustment*

In general, the methods used to calculate adjustment needs abstract from short-term and cyclical considerations. They assume that fiscal adjustment translates one-for-one into an improvement of the fiscal balance and a reduction in the debt ratio. But the relationship between fiscal consolidation and debt is more complicated when the short-term effect of fiscal consolidation on growth is taken into account.

The issue is that fiscal tightening typically reduces GDP in the near-term— in other words the "fiscal multiplier" is usually positive. Lower GDP in turn affects the debt ratio through two separate channels: it reduces the denominator; and it also triggers automatic stabilizers (lower revenue and higher expenditure) that limit the improvement in the fiscal balance in the numerator. As a result, the debt-to-GDP ratio does not decrease one-for-one with fiscal consolidation. The mitigating effect of growth is increasing in the fiscal multiplier, the initial debt ratio, and the automatic stabilizers (Eyraud and Weber, 2013).

When fiscal consolidation takes place in a depressed economic environment, fiscal multipliers may be higher than usual (Auerbach and Gorodnichenko, 2012), and the adverse effect on GDP may be so strong that fiscal consolidation initially *raises* the debt ratio. If the fiscal consolidation is maintained then the debt ratio will eventually decline, but its slow response to fiscal adjustment can be problematic if financial markets react to its short-term behavior. There is some evidence that this effect is important empirically; for example, Abbas et al (2013) show that in advanced economies since 1980s, large increases in the CAPB are typically associated with rising debt ratios.[20]

While these findings may have implications for the timing of consolidation, they do not imply that fiscal consolidation is undesirable or that debt is unsustainable. The short-term effect of fiscal policy on economic activity is only one of the many factors that need to be considered in determining the appropriate size of fiscal adjustment. However, ignoring or underestimating multipliers may lead policymakers to set unachievable debt targets and miscalculate the amount of adjustment necessary to bring the debt ratio down in the short-term, sometimes resulting in repeated rounds of tightening. Missing announced targets can impact the credibility of adjustment programs and increase uncertainty about the future path of fiscal policy.

[20] While there is potential for reverse causation here (ie. primary balances increase in response to shocks that push up on debt, such as a worsening in the interest-growth differential), Grazia Attinasi and Metelli (2016) also find evidence for this effect in an econometric setting (a panel VAR) in which they attempt to control for other factors for a sample of European countries since 2000. They also find that this effect is much stronger with revenue-based than expenditure-based consolidation.

***Feasibility of the adjustment***

The methods presented above compute adjustment needs without considering whether the adjustment is feasible or not. In some cases, the required consolidation may be unrealistically large. A look at historical precedents can put the required fiscal effort into perspective. Escolano et al (2014) offer a comprehensive review of the empirical literature on the size of past adjustments. They show a great diversity of results across studies, depending on the criteria and thresholds used to select fiscal adjustment episodes.

Some studies focus on the *change* in the primary balance while others look at the *level* of the primary balance achieved. Among the first type of studies, a typical finding is that large fiscal adjustments, of 3-5 percent of GDP, are quite widespread, occurring in around half of consolidation episodes (Guichard et al., 2007; Tsibouris et al., 2006; Escolano et al., 2014). Fewer studies focus on the maximum achievable primary balance, but a tentative conclusion from those that do is that high primary surpluses are easier to achieve than to maintain (Escolano et al, 2014; Zheng, 2014). For example, IMF (2013b) looks at the maximum primary surplus individual countries have attained since the 1950s, and while the median of this distribution is relatively high at 6½ percent of GDP for advanced economies and 6¼ for emerging market economies, this falls to 3½–4 percent of GDP when considering five-year averages, and declines further to 2¾-3¼ over a 10-year period. Similarly, Eichengreen and Panizza (2016) examine the behavior of the primary balance over five-year windows in a sample of advanced and emerging economies, and find that primary surpluses of 4 percent or more were observed only 8 percent of the time.[21]

Of course, history is not destiny: countries may not have run and sustained large primary surpluses in the past because they did not need to, since their debt ratios were much lower. High and durable primary surpluses are only required when debt ratios are elevated and the

[21] Their sample contains 235 (non-overlapping) observed five-year windows in which data for the primary balance data is available. An average primary surplus of at least 4 percent was only observed in 18 of these (i.e. 8 percent of the sample), while there were 36 observations (ie. 15 percent) with an average surplus of at least 3 percent, and only 12 observations with an average surplus of 5 percent or more (i.e. 5 percent)

interest-growth differential is positive and large (Mauro, 2015). This does not mean that countries would not be able to run large primary surpluses under different circumstances.

**Pace and Duration of Adjustment**

So far, we have discussed the *total* size of consolidation, without examining whether consolidation should be spread over multiple years. However, there has been a lively debate since the global financial crisis about the "optimal" pace of adjustment (Corsetti, 2012), with the IMF (2012b) for example initially arguing in favor of an adjustment of about one percent of GDP per year. While the general considerations on adjustment speed discussed in the introduction apply here as well, there are also more practical issues.

Fine-tuning the timing of consolidation is not an option for all countries. Countries facing financing constraints often have no choice but to frontload fiscal adjustment. In fact, the intensity of market pressures is an important determinant of the speed at which consolidation is conducted: the cross-country variation in the pace of adjustment is correlated with differences in sovereign bond yields (Blanchard, Dell'Ariccia, and Mauro, 2013). But for countries with fiscal space, getting the pace of consolidation right is perhaps as important as calibrating its size.

Unfortunately, the literature on "successful" fiscal consolidations does not provide clear guidance as to whether upfront adjustment is more or less likely to succeed than gradualism. For example, Tsibouris et al (2006) find a broad balance between upfront and gradual approaches among a sample of successful adjustments. Similarly, in a sample of European countries, European Commission (2007) does not find a statistically significant link between the likelihood of success and the type of fiscal adjustment (gradual versus frontloaded).

Given this limited empirical evidence, determining the pace of adjustment is a complex policy decision that should take into account several, potentially conflicting, considerations. For example, the adverse growth-effect of faster consolidation in the short run, could be set against the decline in risks, and perhaps the higher credibility, stemming from lower debt levels in the medium term. Three main factors stand out in this decision:

- *Fiscal multipliers*: To minimize the impact on growth, fiscal adjustment should, to the extent possible, be concentrated in the years when multipliers are low. The literature on multipliers indicates that they tend to be higher when monetary policy is constrained and cannot offset the fiscal shock; the financial sector is impaired; and the economy is in a severe economic downturn (with a high proportion of credit-constrained agents). Based on these findings, fiscal consolidation should generally be postponed until interest rates are positive, the financial sector functions well, and the output gap is positive (Blanchard and Leigh, 2013). In these more favorable circumstances, the adverse impact of consolidation could be partly offset by a monetary expansion and the response of the private sector, which can borrow or sell assets to smooth out expenditure.

- *Credibility and market perceptions:* Excessive backloading could potentially decrease the credibility of fiscal adjustment. The empirical evidence in support of "confidence effects" from front-loading adjustment is limited (Perotti, 2013), but if credibility is instead measured by sovereign spreads, the econometric evidence highlights a clear tradeoff. Smaller deficits tend to reduce spreads, while lower growth increases them (Cottarelli and Jaramillo, 2012). Thus, frontloading fiscal consolidation only reduces spreads when the direct effect of fiscal adjustment on the deficit dominates its negative effect on economic growth.

- *"Adjustment fatigue"*: Intense fiscal efforts are typically difficult to maintain, both because they have high political and electoral costs, and because easy-to-implement measures ("low-hanging fruit") tend to be adopted first. *S*ustaining adjustments over long periods can also be challenging, even when yearly fiscal efforts are relatively moderate. A longer consolidation period increases the probability of ending and reversing the adjustment, holding the total size of adjustment constant (von Hagen, 2001; Tsibouris et al, 2006; and Guichard et al, 2007).

When fiscal consolidation occurs over a relatively long period (for instance, because the initial debt is high and there is a long way until debt is down to safe levels) and backloaded (for instance, to protect the economic recovery), fiscal institutions are essential for setting a

credible medium-term plan. Successful fiscal consolidation has typically been accompanied by institutional reforms: several countries established medium-term expenditure frameworks, introduced fiscal rules, or reformed intergovernmental fiscal arrangements (IMF, 2009). Tsibouris et al (2006) note that several of the more institutionally advanced economies have established medium-term expenditure frameworks to help governments set and meet multiyear priorities and build credibility in the context of adjustment plans.

**Composition of Adjustment**

A key ingredient for the success of a fiscal adjustment is the choice of policy measures supporting it. In some cases, policymakers opt for quick fixes, because they face constraints that preclude the implementation of high-quality reforms—for instance, when an immediate fiscal tightening is needed to avoid an imminent debt crisis. However, under normal conditions, fiscal adjustment is more likely to be successful when it is supported by measures perceived by markets and the population as durable and growth-friendly.

There is no one-size-fits-all prescription to improve the quality of adjustment. Reforms must be tailored to country circumstances, particularly initial fiscal conditions. For instance, many advanced economies with high taxation levels have focused on expenditure containment after the stimulus of 2009-10, partly because of the limited scope to raise taxes further (IMF, 2012). Pressures from population aging also imply that entitlement spending has to be reformed. In low-income countries, tax ratios are often very low, leaving ample room for greater revenue mobilization.[22]

The economic literature has established some general principles that are relevant when determining the composition of consolidation. Three aspects in particular are important in assessing the policy mix: its impact on short-term growth, its effect on long-term growth, and its implications for the durability of the adjustment

[22] See Besley and Persson (2014) for a discussion of the reasons for these low tax ratios, particularly the link between development and the State's capacity to tax. Fenochietto and Pessino (2013) model country-specific tax capacity empirically.

***Impact on short-term growth***

Perhaps the most common criterion used in assessing the cost and quality of a fiscal adjustment is its impact on short-term growth.

There is a large debate in the literature on whether growth is more impacted by revenue or spending measures. The literature on "expansionary fiscal contractions" claims that expenditure-based fiscal adjustments are less recessionary and could even be expansionary (Giavazzi and Pagano, 1990; Alesina and Perotti, 1996; and Alesina and Ardagna, 1998, 2010). But this finding has been disputed in the past decade. Because of methodological shortcomings, the early studies may not accurately capture exogenous fiscal shocks (IMF 2010). Also, the result seems to be conditioned on certain factors that allow private sector demand to recover after the fiscal consolidation—for instance, a decline in the monetary policy rate or an exchange-rate depreciation (Perotti, 2013).

The model-based and empirical literature on fiscal multipliers tends to support the opposite conclusion that government spending has a larger impact on economic activity than revenue measures, although there is no consensus (see literature reviews in Mineshima et al, 2014 and Ramey, 2016). The lower revenue multipliers are often explained with reference to Keynesian theory, under which households accommodate part of any increase in the tax bill by reducing their savings, and therefore do not reduce spending by the full amount of the tax increase. Economic theory suggests that revenue multipliers are likely to be particularly low if the underlying measures are temporary and do not affect permanent income, and if agents are forward-looking and are not liquidity constrained.

When it comes to specific revenue and spending instruments, the comparison of multipliers becomes even more tricky. Macroeconomic models, provide a hierarchy of fiscal instruments (European Commission, 2010; OECD, 2010; Coenen et al., 2012; Kilponen et al, 2015). On the spending side, investment has the highest short-term multiplier, followed by government wages and government purchases, while untargeted transfers to households are associated with the lowest output impact among spending instruments. On the revenue side, the ranking of taxes reflects their perceived distortionary effects: corporate income taxes and personal income taxes have the most negative effects on GDP; consumption taxes do relatively better;

and property taxes seem to be the most growth-friendly instrument. However, empirically, it is more difficult to identify robust differences between instruments. The few available studies point to a ranking quite different from the model-based hierarchy (Batini et al, 2014). They suggest that labor income taxes are associated with larger multipliers than corporate income taxes; and that increases in consumption taxes are associated with sizeable short-term output losses. There is also no clear evidence that government investment is associated with larger multipliers than government consumption in advanced economies (Perotti, 2004).

***Impact on long-term growth***

Short-term growth impacts should not be used as the sole determinant of the fiscal adjustment mix; long-term effects on potential output should also be taken into account. Considering both time horizons is likely to raise tradeoffs. While spending multipliers may be higher than revenue multipliers in the short term, the opposite could be true in the long term, owing to supply-side effects. For instance, raising labor taxes may have small multiplier effects in the short run (relative to expenditure cuts) but can reduce work incentives and have adverse effects in the longer term. Similarly, reducing unemployment benefits could have a significant negative short-run impact during a downturn but could eventually lead to higher participation rates and employment in the long-term.

From a long-term perspective, it seems that both revenue and spending measures can bring growth benefits when aimed at reducing inefficiencies (IMF, 2015a):

- Broadening the tax base and cutting tax exemptions can enhance the overall efficiency of the tax system by creating room for cutting rates (which reduces the deadweight loss of taxation) and removing incentives for taxpayers to change their behavior to take advantage of the tax reliefs. For instance, many low-income countries use costly tax holidays and income tax exemptions to attract foreign investment and boost growth, but with limited success (IMF, 2015b), perhaps because tax incentives are not sufficient to counterbalance the poor business climate (e.g. due to poor infrastructure, weak governance and unclear property rights).

- Similarly, improvements to the efficiency of spending would enhance the delivery of essential public services while saving resources. Durable cuts in unproductive spending can also boost market confidence and foster the credibility of fiscal adjustment. Empirical evidence suggests that the productivity of government expenditure is perhaps more important than its size in ensuring sustainable growth and development (Angelopoulos et al, 2008; Wu et al, 2010).

***Durability***

Another criterion to consider when selecting consolidation measures is whether they are durable and difficult to reverse.

Fiscal adjustment is more lasting when attained through reforms that reflect well-thought-out strategic choices on the role of the public sector. An examination of fiscal adjustment efforts in the main advanced economies during the past few decades shows that adjustments were more successful when based upon reviews aimed at reducing inefficiencies and reorienting the role of government, rather than across-the-board cuts (Mauro, ed., 2011).

Although early studies had argued that expenditure-based consolidations were more durable (Alesina and Perotti, 1996; Alesina and Ardagna, 1998, 2010), more recent evidence shows that revenue-based adjustments can be equally lasting when they rely on increases in tax rates or broadening of tax bases (Mauro, ed., 2011).[23] Large adjustment efforts are also found to be more successful when they include revenue-enhancing measures that avoid inefficient across-the board expenditure cuts (Baldacci, Gupta, and Mulas-Granados, 2012).

Adjustments are more likely to be durable when policymakers avoid some common implementation pitfalls. While most large planned consolidations in recent decades were designed to be expenditure-led, often in the context of large public sectors, less than half of the envisaged spending cuts typically materialized (Mauro, ed., 2011). Actual spending cuts

[23] Early studies defined large fiscal adjustments based on ex-post deficit reductions. However, almost no fiscal adjustment plan envisaged a large role for revenue increases. Thus, (ex-post) revenue-based consolidations identified in the early studies resulted from revenue increases stemming not from reforms but rather from asset price booms or other cyclical factors that—by their very nature—were unwound after a few years.

often fell short of plans; and governments frequently relied on revenue increases (last-minute increases, in some cases) to get closer to their deficit-reduction targets. Technical methods to reduce such implementation risks include appropriate design and monitoring of multiyear spending limits (IMF, 2011).

## III. Growing out of debt

Of the many ways of escaping a debt burden, surely the most attractive is to focus on growing the economy. While many of the other policies considered in this chapter are associated with significant costs, raising growth sounds like a "free lunch" that raises welfare at the same time as it erodes the debt burden. Unfortunately, the very attractiveness of this option is a clue that raising growth may not be straightforward.

In this section, we begin by exploring the mechanisms through which higher growth can reduce debt, and the potentially mitigating role of interest rates, before discussing some of the policy options and considerations for governments seeking to raise growth.

There are two main channels by which increases in economic growth can contribute to debt reduction. First, growth boosts the denominator in the debt-to-GDP ratio. In the context of equation (1), this effect operates through an improvement in the interest-growth differential. Since this differential affects the change in debt in *every* period, persistent shifts in the GDP growth rate are compounded, and have powerful implications for long-term debt dynamics, particularly when initial debt levels are high.[24]

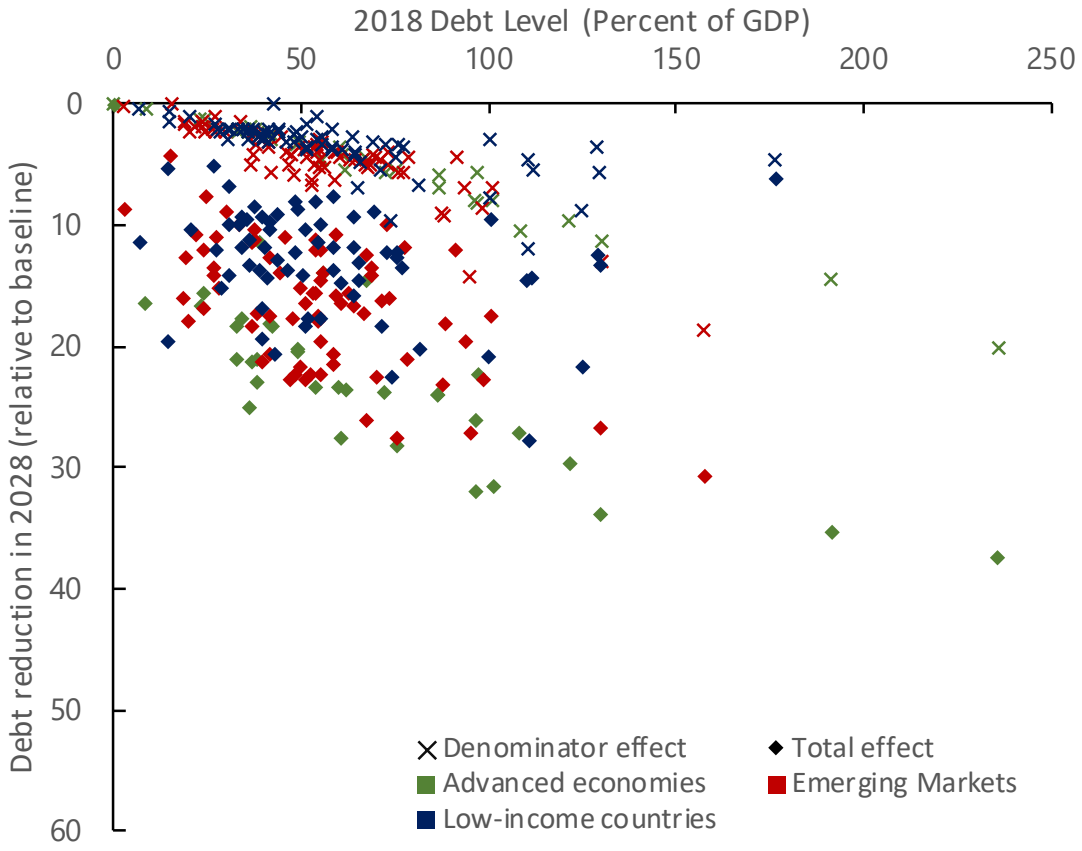
A second effect occurs indirectly, via the primary balance. Higher real growth boosts the government's revenue base without generating expenditure pressures, at least in the short run. As a result, increases in growth can generate an "automatic" improvement in the primary balance, without any active changes to tax or expenditures policies.[25] Even if the government

[24] For the purposes of the discussion here, we assume that real interest rates are unaffected by higher growth.

[25] Note that this effect will be transient for cyclical shocks that do not affect GDP in the long term, but permanent for policies that boost potential GDP.

chooses not to save all this windfall, sustained primary surpluses generated in this way are likely to be more feasible politically.

**Figure 4: Impact on debt of a 10 percent increase in GDP by 2028** (percent of GDP)




Source: World Economic Outlook, April (2018) and authors calculations.
The baseline debt-to-GDP ratio in 2028 is constructed using the debt dynamics identity (1), and WEO projections to 2023, holding all variables at their 2023 values thereafter. Simulations report the reduction in the public debt resulting from of a 1 percent increase in GDP growth rates from 2019-28. The "denominator effect" is calculated holding all variables except real GDP growth constant. The "total effect" also captures the impact of growth on the primary balance, using the methodology of Mauro and Zilinsky (2016).

Illustrative simulations show that increases in growth rates could potentially generate sizeable debt reductions through these two channels, particularly for the most indebted economies (Figure 4). A one percent increase in GDP growth in the period 2019-28 (amounting to a 10 percent increase in the level of GDP) could reduce public debt in advanced economies by an average of 5 percent of GDP through the interest-growth differential, and a further 18 percent through the primary balance. The average debt reductions in EMs and LICs would be lower, but still substantial.

**Growth and interest rates**

In the foregoing, we assumed that increases in the GDP growth rate translate one-for-one into changes in the interest-growth differential. However, this link merits further discussion, since many economic models predict a relationship between interest rates and growth.

In the neo-classical growth model,[26] there is a tight connection between the long-term growth rate and the equilibrium real interest rate. Indeed, under certain assumptions[27] this framework implies that interest rates fluctuate one-to-one with growth rates, so that changes in equilibrium growth have no implications for the interest-growth differential. However, there are good reasons to doubt the relevance off this result in practice. First, in open economy models with some degree of financial integration, equilibrium interest rates are typically determined at the global level, so that the influence of an increase in growth in any individual economy is limited (e.g. Eggertsson et al, 2016). Second, many policies that would boost GDP would deliver only transitory boosts to growth, and so may not have implications for the equilibrium interest rate. Finally, even when there are changes in global growth, the relationship with interest rates is probably not on-to-one.[28]

Empirically, the link between movements in real interest rates and growth rates appears quite weak, and there is evidence of both large cross-country differences and shifts over time (Hamilton, 2016). For example, real interest rates in advanced economies have fallen substantially since the 1980s, and by more than equilibrium growth according to most accounts (Holston et al, 2017).[29] This observation is consistent with the view that other factors besides expected growth have implications for real interest rates, and can drive

[26] The benchmark representative agent neo-classical growth model is known as the Ramsey-Cass-Koopmans model. See e.g. Romer (2012) for an exposition.

[27] In particular, if household's intertemporal elasticity of substitution in consumption is equal to one.

[28] Rachel and Smith (2017) argue that a one percentage point increase in global productivity growth could increase interest rates by two percent, so that debt dynamics would actually deteriorate, while Mehrotra (2017) finds a similar effect in a quantitative lifecycle model calibrated to the US. However, a one-to-one relationship is probably an upper-bound for changes driven by population growth.

[29] Another conclusion from this work is that the future evolution of real interest rates is highly uncertain, presenting an additional argument for precautionary debt reduction and/or lengthening debt maturity.

variation in the interest-growth differential. Candidates include demographics (Gagnon et al, 2016), the relative price of capital (Thwaites, 2015) inequality (Rachel and Smith, 2017), risk premia (Del Negro et al, 2017), and high debt levels (Clarida, 2014). We will discuss one further factor, financial repression, (Escolano et al, 2017), in detail later.

**Boosting economic growth:**

Having made the case that economic growth can contribute to successful debt reductions, a next step is to consider what policies can deliver higher growth.

In this section, we focus mainly on supply-side measures to boost medium and long-term "potential" output, rather than demand management policies to boost short-term growth; indeed, some of the policies discussed may even have adverse short-run effects.

Policies which raise short-term growth without boosting long-term "potential" output have only minor *economic* implications for long-term debt reduction. Nonetheless, to the extent that they offset the adverse (short-term) economic impact of other debt-reducing measures, or increase their political feasibility, such policies can play an important supporting role. In any case, the main instruments here are fiscal and monetary policy. In the case of fiscal policy, the new borrowing required to finance a temporary fiscal loosening can usually be expected to offset the favorable impacts on the debt-to-GDP ratio in the medium term.[30] Monetary policy faces different trade-offs, since loose monetary policy targeted at stimulating short-term growth might conflict with a central bank's other objectives, such as an inflation target or exchange rate peg. If fiscal policy is tightening, or the output gap is negative, then loose monetary policy might already be warranted, but otherwise such stimulus may not be possible without a deviation from the monetary policy framework.[31]

[30] Delong and Summers (2012) explore the conditions in which this will not hold, which include high fiscal multipliers, low interest rates, and crucially, persistent effects on output ("hysteresis"). In a sample of advanced economies, Auerbach and Gorodnichenko (2017) find some evidence that government spending shocks can lower the debt-to-GDP ratio if implemented when the economy is weak, although the effect is small.

[31] The possibility of deviating from or changing the monetary framework based on a debt reduction objective is discussed in the next section.

A useful framework to examine the impact of different growth-enhancing policies is the growth accounting decomposition developed by Solow (1957) and others.[32] In this framework, the drivers of economic growth are separated into three components: labor supply growth, physical capital accumulation, and a residual, often called total factor productivity (TFP).

Applied growth accounting exercises typically find that while human capital differences (10-30 percent) and physical capital (around 20 percent) help explain cross-country GDP differences, residual TFP (50-70 percent) is the most important factor, particularly when it comes the differences between advanced and developing countries (Jones, 2016). One implication of these exercises is that the scope for structural reforms to deliver a large boost is larger for emerging markets and developing countries than for advanced economies, since their distance to the global "technological frontier" is much greater.

The literature on large "growth accelerations" (Hausmann et al, 2005; Berg et al, 2012) generally support this conclusion; large, sustained increases in growth in the countries currently classified advanced are infrequent, particularly since the 1970s. Growth accelerations are more common among developing countries, but a chastening finding is that these growth accelerations are quite unpredictable. While economic reforms increase the *probability* of growth accelerations, only a minority of reform episodes ultimately result in a sustained pick-up in growth.

The growth accounting framework suggests separating policies to boost long-term growth into three broad categories: (i) those that boost the size and skills of the labor force; (ii) those that seek to boost investment and therefore promote accumulation of physical capital; and (iii) policies to boost the allocation of capital and labor both across and within industries, and encourage the development and adoption of new technologies. We briefly discuss some of the main policy instruments in each of these areas, many of which fall under the category of

[32] While the assumptions required to support aggregate production functions of the sort assumed in growth-accounting exercises are strong, and unlikely to hold in practice, the framework is nonetheless useful in assessing the roles of different policies. Since TFP is calculated as a residual, it captures other factors besides technology, including for example the (mis)-allocation of capital and labor.

so-called "structural reforms", although a full survey of possible channels and impacts is beyond the scope of this chapter.[33]

A first set of reforms aims to increase the size and skills of the labor force:

- *Policies to reduce structural unemployment* usually focus on increasing the demand for labor and boosting unemployed worker's ability and incentives to find jobs, for example through reforms to unemployment benefits and the labor-tax wedge.
- *Measures to boost labor force participation* often target under-represented groups such as women, young and older workers, and include enhancements to child-care provision, youth-specific minimum wages and increases in state retirement ages.
- *Improving the skills and health of the workforce* through enhancing health and education systems can deliver significant growth benefits in the long-term, particularly where social returns to education are high.
- *Population growth* is most affected by migration policy in the near-term, but some governments have sought to raise fertility rates, often through financial incentives.

A second set of reforms aim to increase the private and public capital stock:

- *Strategies to promote private investment* typically focus on the financing and business environment, including reducing barriers to entry.[34]
- *Increasing public investment* has a direct fiscal cost but should boost GDP. Under certain conditions,[35] public investment can be "self-financing", in the sense that it reduces the debt-to-GDP ratio in the medium term even if it is financed by borrowing.

[33] For recent studies with quantitative estimates of returns to various growth-enhancing measures, see for example Ostry et al (2009) and Barkbu et al. (2012).
[34] Polices which boost aggregate demand may also impact investment in the short-run through the "accelerator" effect. However, if these policies are implemented when output is already at or above "potential" output, they are likely to increase macroeconomic volatility and the amplitude of the economic cycle, which could depress investment in the long run.
[35] Including where there are large infrastructure needs (low initial capital stock), cheap government borrowing costs, high fiscal multipliers (high economic slack and accommodative monetary policy), and a high elasticity of output to the public capital stock (Abiad et al, 2016).

- *Improving the efficiency of public investment* could potentially deliver a boost to growth even at existing investment rates (IMF, 2015c), by promoting better project appraisal, selection and execution, particularly in developing countries.[36]

A third set of reforms targets the allocation of resources[37] and the use of technology:

- *Strategies to encourage the reallocation of capital and labor* include enhancing the flexibility of labor and product markets, reforms to improve the allocation of resources by the financial sector, [38] and industrial policies.
- *Promoting the development of new technologies* can involve changes to intellectual property laws, but there may also be gains from encouraging research and development expenditure, for example through tax incentives (IMF 2016).
- *Common strategies to promote the adoption of technologies from abroad* include capital account and trade liberalization, which expose firms to foreign competition and learning opportunities, although empirical evidence on these effects is mixed.[39]

***Reform prioritization and sequencing***

Given the huge variety of policy options, a critical issue for policymakers prioritizing debt reduction is to determine where the potential gains are largest. Some of the studies mentioned above can provide guidance as to the types and magnitude of effects from different policies, but there are likely be large differences across countries, depending for example on their level of economic and financial development and their position in the business cycle.

[36] Gupta et al. (2014) find that across low and middle-income countries, once efficiency is accounted for, only about half of public investment over the period 1960-2009 was translated into productive public capital.

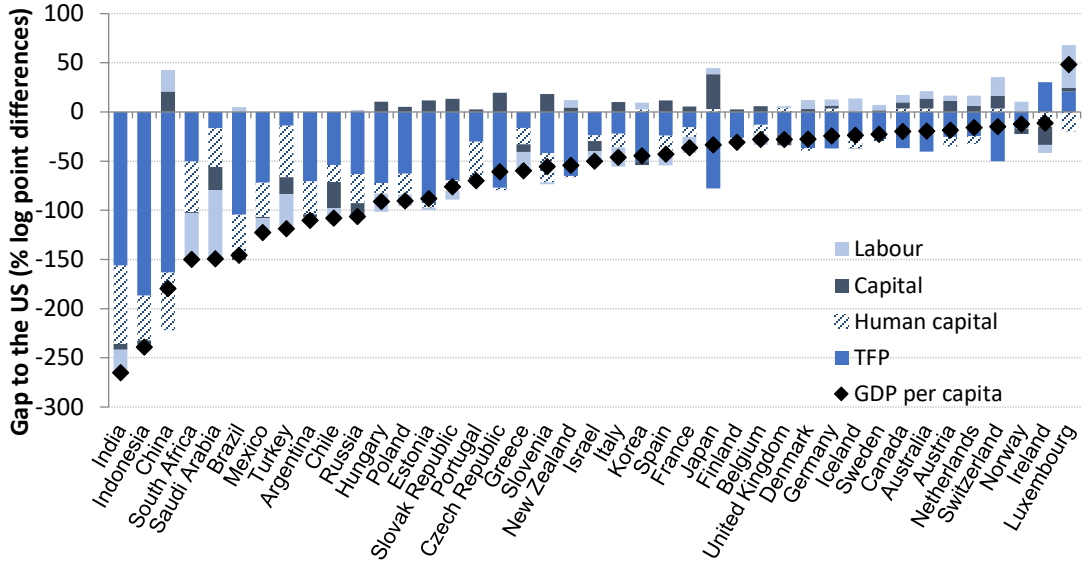
[37] Structural transformation that shifts resources from traditional sectors such as agriculture to the modern economy has often played a key role in large growth accelerations (McMillan et al, 2017), while factor misallocation within industries can also weigh on TFP (Hsieh and Klenow, 2009).

[38] A large literature finds evidence for the importance of financial sector reforms, see for example King and Levine (1993) and Galindo et al. (2005).

[39] See Rodrik and Rodriguez (2001) and Eichengreen (2002) for reviews of the literature on trade and capital account liberalization, respectively.

Results from the growth accounting framework can provide a high-level overview of priority areas (see for example figure 5 from the OECD), but to translate this into practical policy advice, a more granular approach is usually needed. In this regard, institutions such as the IMF, OECD and World Bank produce country-level assessments of reform priorities. Often these views draw on metrics of existing structural policies, which can be used to identify where gaps to peer countries or international best practice are largest. Alternative approaches include Hausmann et al.'s (2005) "growth diagnostics", which involves instead assessing the distortions that are acting as the "binding constraints" to growth in an economic framework.

**Figures 5: Contributions to GDP per capita gaps relative to the United States[1]**




[1]OECD estimates for 2011 at constant 2005 PPPs

Source: Long-term Growth Scenarios, OECD Economics Department Working Paper No. 1000, 2012

The short-term impact of reforms may also have implications for sequencing. A recent literature examines these short-term effects and possible interactions with a country's business cycle position, with a focus on advanced economies. This work typically finds that the short-term boost from structural reforms is modest, and that some reforms, such as those to employment protection and unemployment benefits, can even have adverse impacts if implemented when the economy is already weak (Bouis et al, 2012), or when fiscal and monetary policy are constrained (Duval and Furceri, 2018).

Perhaps more important in the context of debt reduction are interactions with fiscal policy. Some reforms, such as cuts to the labor tax wedge, or increased spending on public

investment and active labor market policies, entail direct fiscal costs Where the primary motive is debt reduction, the decision to pursue such reforms would need to be grounded in a careful assessment of both direct costs and plausible growth benefits. Where financing constraints are tight, these reforms may need to be implemented in a budget neutral manner, through offsetting savings elsewhere in the budget. Conversely some reforms, such as cuts to unemployment benefits, generate direct fiscal savings, but these could be outweighed by the indirect consequences for growth if implemented when there is substantial economic slack (Banerji et al., 2017). Similarly, when reforms have particularly sharp distributional impacts, targeted fiscal measures to help offset these consequences may be appropriate.

A final consideration for the design of reforms are the political implications. Olsen (1965) argued that public policy often suffers from a "collective action" problem; the costs of reform are typically immediate, and concentrated on particular groups in society, whereas the gains are usually more diffuse and may take longer to materialize. As a result, the potential "losers" from reform have stronger incentives to lobby politicians against reform and prevent their adoption.

As such, one way to overcome the obstacles to reform is to attempt to compensate the "losers". Here the "golden age" of growth in Western Europe provides an interesting example. Eichengreen (1996) has argued that many countries' postwar settlements developed "social contracts" in which wage moderation, trade liberalization, increased social insurance and high investment rates all went together, and helped create the conditions for rapid catch-up growth in this period.

***GDP and welfare***

So far in this section, we have largely treated welfare and GDP as synonymous. While reforms that boost GDP will in many circumstances also raise welfare, a few caveats are worth mentioning. The first concern relates to factors not captured in the calculation of GDP, including consumption of finite natural resources; negative externalities, notably pollution; and the exclusion of non-market output (particularly household production). A second caveat is that reforms to boost growth have distributional consequences that make society's poorest worse off. Granular studies suggest that trade (Goldberg and

Pavcnik, 2007) and capital account (Larain, 2015) liberalization, financial deregulation (Ostry et al, 2018), and reforms that reduce the bargaining power of labor (OECD, 2015) can give rise to these growth-equity tradeoffs. Finally, the desirability of reforms targeted at boosting the labor supply often depend on societal preferences; for example, between job security for those in work and the overall level of unemployment.[40]

## IV. Monetary Policy

In *A Tract on Monetary Reform*, John Maynard Keynes famously set out two ways monetary policy can come to a fiscal policymaker's aid: first, "by printing money" and second "by reducing the burden of its pre-existing liabilities in so far as they have been fixed in terms of money" (Keynes, 1923). Aggressively using monetary policy for this purpose tends to be a last resort. On printing money, Keynes commented that "a Government can live by this means when it can live by no other. It is the form of taxation which the public find hardest to evade and even the weakest Government can enforce, when it can enforce nothing else". On reducing the real burden of government debt, he claimed that "it would be too cynical to suppose that, in order to secure the advantages discussed in this section, Governments (except, possibly, the Russian Government) depreciate their currencies on purpose. As a rule, they are, or consider themselves to be, driven to it by their necessities".

This section considers the two chief impacts of monetary policy on government debt sustainability, followed by some other potential effects. Then it considers the costs of this strategy. Monetary policy also has short-term impacts on real GDP, but this does not *directly* help governments to achieve sustained reductions in the debt burden, so is not discussed here.

In practice, using monetary policy to alleviate the government debt burden usually requires either a temporary deviation from an existing monetary policy framework or a new framework altogether. Most of this section focusses on temporary deviations, for example a

[40] Jones and Klenow (2016) find that on a broad measure of economic wellbeing (incorporating consumption, leisure, mortality and inequality), welfare in Western Europe is much closer to US levels than implied by GDP per capita, suggesting that the failure to pursue some growth-enhancing policies that would close the per capita GDP gap may in part reflect differing social preferences.

temporary period of high inflation under an inflation targeting regime, or a devaluation in a fixed exchange rate regime.

**Seigniorage**

In some countries, governments rely heavily on the issuance of central bank money as a source of revenue. Because most central banks do not pay interest on money, they make a profit by holding interest-bearing assets such as government debt and funding themselves with money.[41] Typically, this profit is passed to the government and counts towards government revenue. This is an attractive source of income and, along with other types of revenue, can help alleviate the government debt burden. The change in the amount of central bank money – the amount of money printed or credited to the accounts of commercial banks – is known as "seigniorage" and is, on average, close to the revenue earned from issuing money.[42]

However, printing money is not a free lunch. If the central bank, let's say the Federal Reserve, creates a lot of new money and purchases government debt with it (for example), the public will spend the money. In the short run, this might lead to a boom in production and jobs.[43] But after a few years, the main impact is higher prices – in other words, $1 no longer buys as much. The reason printing money isn't a free lunch is precisely that those people who held money over the period of inflation have lost out. As Keynes pointed out, this is equivalent to a tax on money. As discussed below, money holders might not be the only people who lose out from higher prices.

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[41] Central bank money consists of notes and coins in circulation and deposits held at the central bank by commercial banks. In the last ten years, many central banks including the Federal Reserve have started to pay interest on banks' deposits.

[42] Buiter (2007) discusses in detail the connection between seigniorage and central bank revenue. Central bank revenue is equal to the nominal interest rate times the money stock ($R = i * M$). On average, the interest rate is roughly equal to the growth rate of the money stock ($i \approx dM/M$). Therefore central bank revenue is on average roughly equal to the change in the money stock, i.e. seigniorage ($R = i * M \approx dM$). However, central bank revenue and seigniorage can move in different directions in the short term. For instance, if the central bank cuts the interest rate, it earns less revenue in the short run, but the money supply increases, meaning higher seigniorage.

[43] Although this effect may be hidden by the problems which led to fiscal problems in the first place.

Furthermore, there are limits to the revenue that can be raised by the seigniorage tax. In a famous paper, Phillip Cagan (1956) explained that increasing the rate of money printing is like raising a tax rate. There is a direct effect: a higher rate of tax on existing money holders transfers more funds to the government for any given tax base. However, increasing the tax rate also reduces the tax base.[44] The tax base is the real value of money in circulation – the value of money in circulation measured in terms of what it can buy. Higher money growth (the tax rate)[45] means higher inflation – money loses its value faster. In response, people try to economize on their money holdings by holding assets which make a return instead; in other words, the tax base shrinks. Above some rate of money printing, the impact on the tax base dominates the direct impact of a higher tax rate. At this rate of money printing, real seigniorage revenue is at its peak.

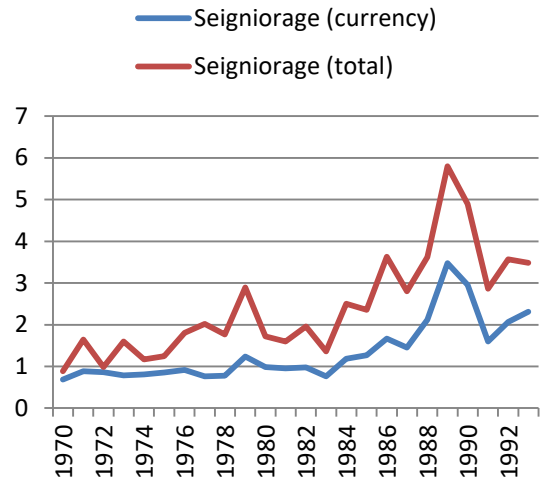
Israel and Brazil are two countries which have experienced high inflation and raised significant seigniorage revenue in the post-WWII period (Figure 6). Inflation peaked at over 350 per cent in Israel and around 3000 per cent in Brazil, while seigniorage revenue peaked at 8 and 6 percent of GDP respectively. *Total* seigniorage was boosted by mandatory reserve requirements in both countries, which when used in this way is a form of financial repression. It is harder to force residents to hold currency, so seigniorage revenue from currency issuance is a better measure of how large this source of revenue would have been in the absence of repression. This peaked at around 2 percent in Israel and around 3 percent in Brazil, so while significant, this was not a large share of total government revenue. Figure 6: Panels B and D show that the size of the tax base (the currency to GDP ratio) fell as currency growth rose, consistent with Cagan's theory.

[44] Expressed mathematically, this decomposition is: real central bank revenue = $\frac{R}{P} \approx \frac{dM}{P} \approx \frac{dM}{M} * \frac{M}{P}$, i.e. real central bank revenue is approximately equal to growth in central bank money (the tax) times the real value of central bank money (the tax base).

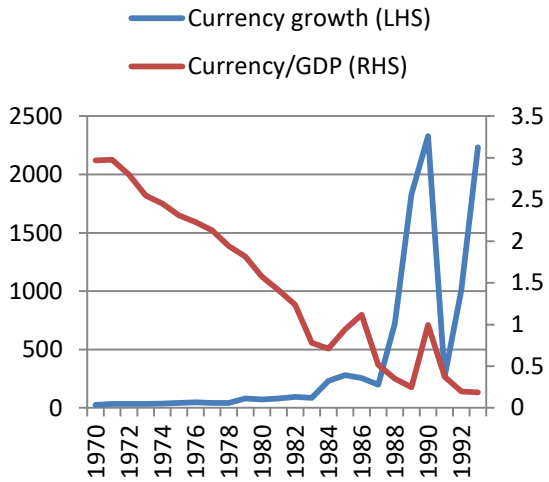
[45] Strictly speaking, the interest rate is the tax rate, as it measures the interest investors could earn if they held safe short-term bonds instead of money. In steady-state, however, higher money growth implies a higher interest rate and therefore a higher rate of tax on money.

**Figure 6**

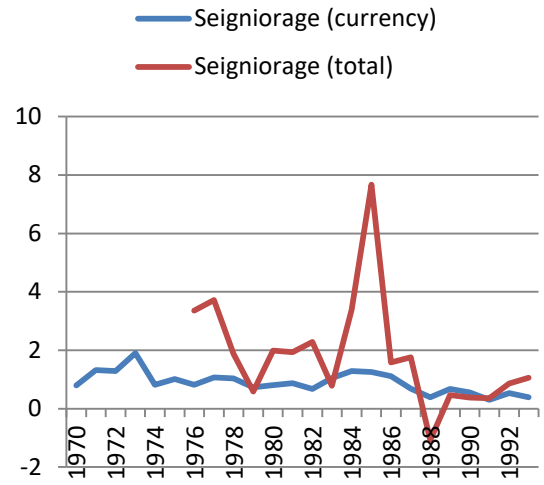
**Panel A: Seigniorage in Brazil (percent of GDP)**



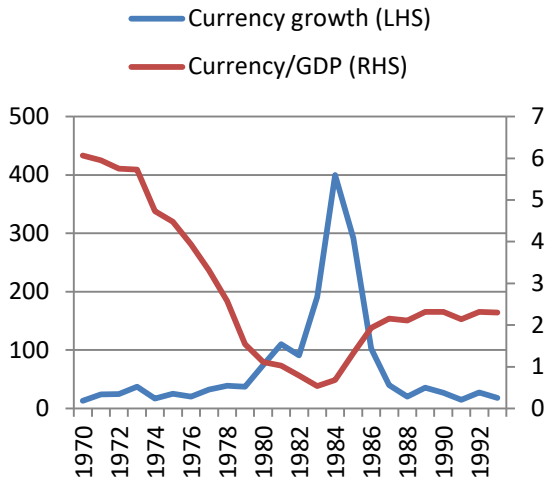

**Panel B: Currency growth (percent) and currency to GDP ratio (percent) in Brazil**




**Panel C: Seigniorage in Israel (percent of GDP)**




**Panel D: Currency growth (percent) and currency to GDP ratio (percent) in Israel**




Sources: IMF, Banco Central Do Brasil, Bank of Israel.

Economists have tried to measure the rate of inflation (and thus money growth) that maximizes seigniorage revenue. Cagan, studying the interwar hyperinflations, found that this rate was between 10 and 60 percent *per month*. He reported that the amount of seigniorage revenue collected during periods of hyperinflations varied between 0.5 and 20 percent of national income per year. Other economists have estimated that in modern high and hyperinflations seigniorage peaks at around 6 per cent of national income per year, when the rate of inflation is around 170 percent per year (Fischer et al., 2002).

Why is there so much variation between different estimates of the rate of inflation which maximizes seigniorage, and the maximum value of seigniorage itself? Ultimately the peak rates depend on how much people try to economize on money holdings when inflation rises, which varies across countries and over time. In countries with high financial development and literacy, people are likely to be more sensitive to changes in inflation. Another factor is the degree to which the government forces people to hold money, for instance via reserve requirements.[46]

**Inflating away**

Central banks can also reduce the debt burdens of governments which have issued debt denominated in domestic currency. By engineering a surprise increase in inflation, they can reduce the real value of debt. Equivalently, they can raise the nominal value of GDP and therefore the tax revenue used to pay back government debt. In this sense, domestic currency debt can be "inflated away". Debt denominated in foreign currency or a commodity such as gold is considered below.

Just as in the case of seigniorage, inflating away debt is a form of tax, but in this case, the tax base consists of the holders of government debt.

Debt dominated in domestic currency can be inflated away completely: the central bank just needs to set the interest rate at zero and wait until the price level becomes arbitrarily high.[47] Less extreme cases raise an interesting question: how much inflation, for how long, is needed to reduce the real value of debt by any given proportion?

If we make some simplifying assumptions,[48] the analysis is straightforward: the amount and timing of inflation depends on the maturity of the debt. The crucial insight is that inflating away can happen so long as inflation turns out higher than investors expected when the debt

[46] A third reason is that some cross-country data on central bank reserves include liabilities which pay interest.

[47] At a zero interest rate, inflation starts to rise, reducing the real interest rate further and accelerating the inflation. This assumes that the economy is not in a permanent liquidity trap.

[48] Expectations are rational, prices are flexible, and investors have a free hand. See Reis (2017) for a formal analysis of this simple case.

was issued. When the central bank starts to inflate away, inflation expectations, and therefore interest rates, rise. So debt issued after the central bank changes policy is protected against higher inflation.[49] Only the debt issued before the change in policy – before higher inflation was expected – can be inflated away. Once debt is redeemed and new debt is issued to replace it, the opportunity to inflate away is over.[50]

If government debt is short-term, there must be a short burst of high inflation to inflate away a significant portion of the debt before it is redeemed and replaced.[51] If debt is very long-term, the central bank can either engineer a short burst of high inflation or it can inflate away the debt more gradually. If there is a mixture of short and long-term debt, the central bank still has some flexibility, but gradual inflation implies more inflation overall.

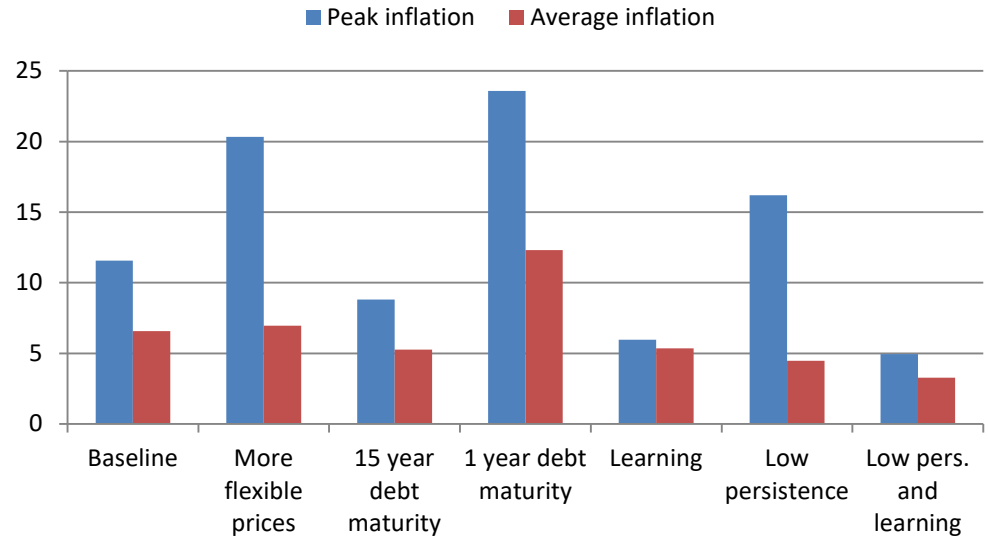
Reality isn't quite this simple. Work by Michael Krause and Stéphane Moyen (2016) sheds light on these questions in a more realistic setting. They use a calibrated model to investigate the impact of temporary changes in the inflation target on the US government debt burden. Figure 7 shows the results of simulations using their model. In each simulation, the inflation target is raised sufficiently high to reduce government debt by 20 per cent of GDP over a period of 10 years. The chart shows the peak rate of inflation and the average rate of inflation over those ten years. Further details are in Appendix B.

[49] In the debt dynamics identity, both i and $\pi$ rise, cancelling each other out.

[50] Unless a further surprise in central bank policy follows. Under the assumption of rational assumptions, central banks cannot expect to surprise investors in the same direction continuously.

[51] This analysis assumes that debt has a fixed coupon. If in fact the coupon varies with money market rates, inflating away is impossible under the assumptions above.

**Figure 7: How much inflation is needed to reduce government debt by 20 per cent of GDP?**




Sources: Krause and Moyen (2016) and authors' calculations

In the baseline simulation, prices are sticky, the average debt maturity is just over 5 years, the public's expectations are rational and the increase in the inflation target is quite persistent. Under these assumptions, inflation rises from 2 per cent to a peak of almost 12 per cent and then falls back slowly, averaging almost 7 per cent per annum over the 10 years.[52] If instead prices are quite flexible, the peak in inflation required to reduce the debt by 20 per cent of GDP almost doubles. Longer debt maturity reduces the required rate of inflation, while shorter debt maturity increases it. If investors are slow to learn that the Fed is trying to inflate away, the peak rate of inflation is halved. If the Fed decides to inflate away quickly, then the peak rate of inflation rises to 16 per cent, while the average is lower than in the baseline simulation (4.5 per cent compared to almost 7 percent). Strikingly, if the Fed tries to inflate away quickly and the public doesn't realize straight away, both the peak and the average rates of inflation are lower, because more of the inflation that does occur is unexpected.

[52] Hilscher et al. (2018) show that financial markets put a very low probability on this much debt being inflated away. Furthermore, they account for the fact that a significant portion of US government debt is not held by the private sector. This is a caveat to the simulations here.

Debt denominated in foreign currency or a commodity such as gold cannot be inflated away.[53] Many emerging market governments have a mixture of both domestic and foreign currency debt. In these countries, the impact of unexpected inflation on the government debt burden is commensurately lower. Furthermore, inflating away domestic currency debt in countries with large foreign exchange exposures can be very difficult to manage. The exchange rate, and hence the local currency value of foreign exchange debt, tends to depreciate ahead of any rise in nominal GDP. So there is a period in which the ratio of debt to GDP may *rise*. It is possible that the country might be pushed into default before the rise in nominal GDP brings the debt to GDP ratio back down.[54]

Seigniorage and inflating away are distinct concepts, but in practice they often occur together. When there is a surprise rise in inflation, this tends to be accompanied with higher money growth. So long as both debt and money are denominated in local currency, both effects will operate. If debt is not denominated in local currency but money is, then only seigniorage is possible.[55] If debt is denominated in local currency, but there is no government-issued money, then only inflating away is possible (Cochrane, 1999).

**The impact of inflation on the primary balance**

As well as affecting the primary balance in nominal terms, inflation can also affect it relative to GDP. In fact there are different effects which work in opposite directions. First, high inflation can reduce real wages paid by the government if they are not indexed to the price level. Second, if the tax system is progressive (i.e. people with higher incomes are subject to higher tax rates), then higher inflation automatically moves people into higher tax brackets. If the tax brackets are not changed in response, higher inflation results in an improvement in the ratio of the primary balance to GDP.

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[53] Loyo (1999) argues that debt indexed to the domestic price level can be inflated away because of lags in publishing the data used for the indexation, although inflation rates would need to be higher to achieve a given debt reduction than with nominal debt.

[54] Radelet and Sachs (1998), Corsetti et al. (1999) and Aghion et al. (2000) discuss related issues.

[55] This is the special case studied in a famous article by Tom Sargent and Neil Wallace (1981).

Conversely, inflation can also worsen the fiscal position because of tax collection lags. Taxes are normally paid after the income used to calculate the tax liability is earned. When prices are rising rapidly, this reduces the ratio of tax payments to GDP because the taxes were calculated on the basis of income earned when prices were significantly lower. This is known as the Olivera-Tanzi effect (Olivera, 1967; Tanzi, 1977).

**The costs of inflation**

Central banks can, and have, used monetary policy to reduce the government debt burden. This strategy has costs and, as Keynes suggested, does not tend to be a first resort. Economists have suggested a number of reasons why inflation is costly (Table 2). Many of these costs are associated with lower GDP, which acts as a brake on any boost that inflation gives to the fiscal position.

**Table 2: Costs of Inflation**

| Cost of inflation | Assumption | Anticipated inflation | Surprise inflation |
|---|---|---|---|
| Distorted prices | Time-dependent price stickiness | Yes | Yes |
| | Time-dependent information stickiness | No | Yes |
| | State-dependent price/information stickiness | Minimal | Minimal |
| Money holding too low | Money pays interest | No | No |
| | Money pays no interest | Yes | No |
| Lending too low / in other currencies | | No | Yes |

Inflation can lead to distorted prices in the economy, impeding the efficient allocation of resources, although the importance of this effect is disputed. Some economists believe that many prices are “sticky” in absolute terms, so that when inflation is higher, the relative price of these goods falls rapidly, even when not merited by changes to underlying supply and demand conditions (Schmitt-Grohé and Uribe, 2004). Another view is that all prices are flexible, but people are slow to learn about inflation; if inflation proceeds as expected, even

high inflation does not distort relative prices, but surprise inflation is costly (Ball et al., 2005). A third view is that companies change prices more frequently when the benefits of doing so are higher, for instance because inflation is elevated (Burstein and Hellwig, 2008). Recent evidence is consistent with, but does not unambiguously support, the third view, suggesting that this particular cost of inflation is not very high, at least at moderate levels of inflation (e.g. less than 50 per cent per annum).[56]

A second cost stems from the fact that a higher seigniorage tax reduces the real value of money in the economy. Because people *choose* to hold money, we can infer that they value holding it. A higher tax on money holding therefore has real costs.[57] However, temporary *surprise* increases in inflation should have a much smaller impact on people's decision to hold money and therefore should be far less costly.[58] Furthermore, a way to eliminate this cost of higher inflation – albeit at the cost of eliminating the seigniorage benefit – is to pay interest on money, so that holders are compensated for changes in inflation.[59]

The third cost arises from the impact of surprise inflation on financial markets. Investors who are uncertain about future inflation are less inclined to purchase financial assets denominated in domestic currency.[60] Governments and companies in these countries are forced either to borrow in foreign currency or to abstain from borrowing altogether. Countries with a history of high and volatile inflation are also more likely to index wages to prices, which makes it costlier for monetary policy to bring inflation back down (Dornbusch and Fischer, 1993).

[56] See e.g. Gagnon (2009) and Nakamura et al. (2018) for evidence based on movements in individual prices and Dornbusch et al. (1990) who present indirect evidence for a range of high inflation economies.

[57] E.g. Lucas (2000) and Burstein and Hellwig (2008) find that a permanent 10 percentage point increase in inflation has costs equivalent to reducing consumer spending by 1-2 per cent forever.

[58] E.g. Chari et al. (1991).

[59] Bank reserves already earn interest at some central banks, while proposals for electronic money could have the same implication for the general public.

[60] The data show that countries with histories of high and more volatile inflation have poorly developed domestic currency bond markets (Jeanne, 2005, and Burger and Warnock, 2006).

Although there is no consensus about the costs of moderate inflation, episodes of very high inflation *do* appear to have large costs. It is hard to demonstrate convincingly that very high inflation depresses output, but with this caveat in mind, researchers have found correlations consistent with the claim: economic performance tends to be weak during periods of very high inflation and to improve during large reductions in inflation (Fischer et al., 2002).

Just like sovereign default, inflation has political costs as well. While tighter fiscal policy tends to be unpopular, at least it tends to be agreed through a democratic process. Sovereign default and inflation lack this legitimacy because they rely on the authorities fooling the people.[61] In a fascinating survey, Robert Shiller (1997) found that one reason inflation is disliked is that people feel it is an attempt to trick them. Consistent with this, political leaders are twice as likely to lose their jobs following a rapid loss of value of the currency, which is almost always accompanied with high inflation (Frankel (2005).

## V. Financial Repression

Financial repression, typically in combination with inflation, has been an effective means through which governments have reduced debt in the past. As with the previous discussion on monetary policy, this mechanism is most relevant when debt is denominated in local currency. However, a critical difference is that financial repression can reduce debt even when inflation is fully anticipated.

This section starts by defining financial repression,[62] a term that carries negative connotations but that is part of the history (and present) of both emerging and advanced economies. We then present a conceptual framework that clarifies the mechanisms through which financial repression can reduce debt. The second part of this section discusses the post-World War II period, in which financial repression was particularly prevalent. Finally, we discuss

[61] Surprise inflation may also lead to arbitrary distributions of wealth between creditors and debtors within the private sector.

[62] This section draws largely on Reinhart and Sbrancia (2015), Kirkegaard, Reinhart and Sbrancia (2011), and Sbrancia (2012).

regulatory changes since the recent crisis, which arguably bear some of the hallmarks of financial repression.

**What is financial repression?**

The term financial repression was coined by Edward Shaw (1973) and Ronald McKinnon (1973). While it has traditionally been applied to emerging economies, similar policies also have an extensive history in advanced economies (Reinhart and Sbrancia, 2015). One way to better understand the concept is to think of financial regulation as a continuum where at one extreme lies a fully financially liberalized regime and at the other a fully financially regulated/repressed regime. In between there are degrees. Perhaps unsurprisingly there is an optimal degree of financial regulation that will depend on country characteristics and that, for most countries, lies somewhere in between the extremes.[63]

The reader may be wondering, what type of policies can be considered financial repression? To narrow the discussion, we focus on policies and regulations which create frictions in financial markets, or introduce significant participation by nonmarket players. Importantly, while some of these policies are directly motivated by a desire to reduce government borrowing costs, in other cases the impact on government debt markets is a side-effect of policies introduced for other reasons.

The list of potential financially repressive policies is large. Most relevant are policies which create captive audiences for government debt which, when there are limits to arbitrage, allow the government to issue debt at a rate below what the market would charge absent restrictions. Restrictions on banks are a particularly common form of financial repression, including through ceilings on interest rates, direct lending, and reserve requirements[64] (see below for some historical examples). Importantly, restrictions which affect banks' (or other financial intermediaries) assets may need to be complemented by restrictions on their liabilities, for example to prevent deposits moving to institutions not subject to reserve

[63] See for example, Bai et al (2001), Chari et al. (2018).

[64] When required reserves are not remunerated, reserve requirements are similar to a forced interest-free loan from banks to the government.

requirements. Capital controls are a form of financial repression in their own right, but can also increase the scope for other repressive policies to reduce borrowing costs by restricting the ability of investors to arbitrage across countries. In some cases governments have also used moral suasion to persuade investors to act in a certain way without imposing explicit restrictions.

There are two main channels through which inflation can reduce debt: unanticipated inflation, and financial repression combined with inflation.[65] The conceptual framework developed by Reinhart and Sbrancia[66] distinguishes between these effects by focusing on the contribution to debt dynamics of three distinct real interest rates. Two of these rates have already been discussed: the ex-post real interest rate $\left(r_t^P = \frac{i_t - \pi_t}{1+\pi_t}\right)$; and the ex-ante real-interest rate anticipated by investors $\left(r_t^A = \frac{i_t - \pi_t^e}{1+\pi_t^e}\right)$. The direct effect of financial repression is identified by a third rate, the free market interest rate ($i_t^F$). This is the nominal interest rate that would be observed in the absence of financial regulations or official interventions. In turn this can be expressed as a free-market *real* interest rate based on investors' inflation expectations: $r_t^F = \frac{i_t^F - \pi_t^e}{1+\pi_t^e}$.

These terms can be incorporated into the government budget constraint, which after some manipulations yields the following equation:[67]

$$\Delta d_t = \underbrace{\frac{1}{1+g_t}(r_t^F - g_t)d_{t-1} - pb_t + sfa_t}_{\text{Conventional debt dynamics}} \underbrace{- \frac{1}{1+g_t}(1+r_t^A)\frac{\pi_t - \pi_t^e}{1+\pi_t} d_{t-1}}_{\text{Unanticipated Inflation Effect}} \underbrace{- \frac{1}{1+g_t}\frac{i_t^F - i_t}{1+\pi_t^e} d_{t-1}}_{\text{Financial Repression Effect}} \quad (3)$$

[65] The conceptual framework can be extended to incorporate as an additional channel changes in the market value of debt (see Sbrancia (2012) for details).

[66] The version here is highly stylized. For more details see Reinhart and Sbrancia (2015)

[67] For simplicity, we assume here that there is no foreign currency debt. See appendix A for a derivation of this equation.

The first items in equation (3) are the same as those in the conventional debt-dynamics identity (1) and show how debt would evolve if the ex-post real interest rate was equal to the (ex-ante) free-market real interest rate. However, there are also two additional terms, capturing the impact of unanticipated inflation, and financial repression, respectively.

The "unanticipated inflation effect" is the difference between realized and expected inflation multiplied by the real cost of the previous period's stock of debt, while the "financial repression effect" is the difference between the free market and actual nominal interest rate multiplied by the stock of debt from the previous period. In the absence of regulatory restrictions and official interventions that would cause $i_t$ to be different from $i_t^F$, and if actual inflation was equal to expected inflation, then the last two terms on the left side would be equal to zero. In this case, $r_t^F = r_t^A = r_t^P$, and there would be no savings in interest payments for the government from either source.

Whenever the actual inflation rate is above the expected inflation rate, the unanticipated inflation effect will be positive, and public debt will be reduced.[68] The opposite is true when expected inflation is higher than the actual inflation rate.

The financial repression effect will be positive and represent savings for the government whenever the actual nominal interest rate is below the free market interest rate, regardless of the level of inflation. When the real interest rate is not only below the free market rate but is negative, then the real value of government debt is actually reduced: these are what Reinhart and Sbrancia label "liquidation years".

**Financial Repression after WWII**

At the end of World War II, public debt in advanced economies was at historically high levels, although in contrast to the post-2008 period, private debt remained low. Historically it had been thought that governments had been able to bring down those high debt levels by

[68] When the only friction is the difference between actual and expected inflation, $r_t^F = r_t^A$

growing out of them, but Reinhart and Sbrancia (2015) showed that negative real interest rates also played a critical role.

Before discussing the policies imposed during this period, it is important to understand the context. Financial liberalization has not evolved monotonically over time: historical indices of capital mobility peaked in 1914 when World War I began (Obstfeld and Taylor, 2004; Reinhart and Rogoff, 2009), after which a period of low capital mobility persisted until the 1980s, interrupted only briefly during the interwar period.

During the post-WWII Bretton Woods era, there was a political and economic consensus in favor of accepting restrictions on the flow of capital. Capital controls were viewed as a way to avoid speculation and maintain the stability of the international financial system. Policymakers wanted to avoid a repeat of the financial instability experienced during the interwar period, when competitive devaluations and lack of coordination across countries were common (Bordo, 2003; Eichengreen and Sachs, 1986).

The types of financial repression during this period were diverse (Table 3). In some cases policymakers imposed direct restrictions in the market for government securities, whereas other policies had a more indirect impact; for example, capital controls were common.

**Table 3: Examples of financial repression during 1945-1980**

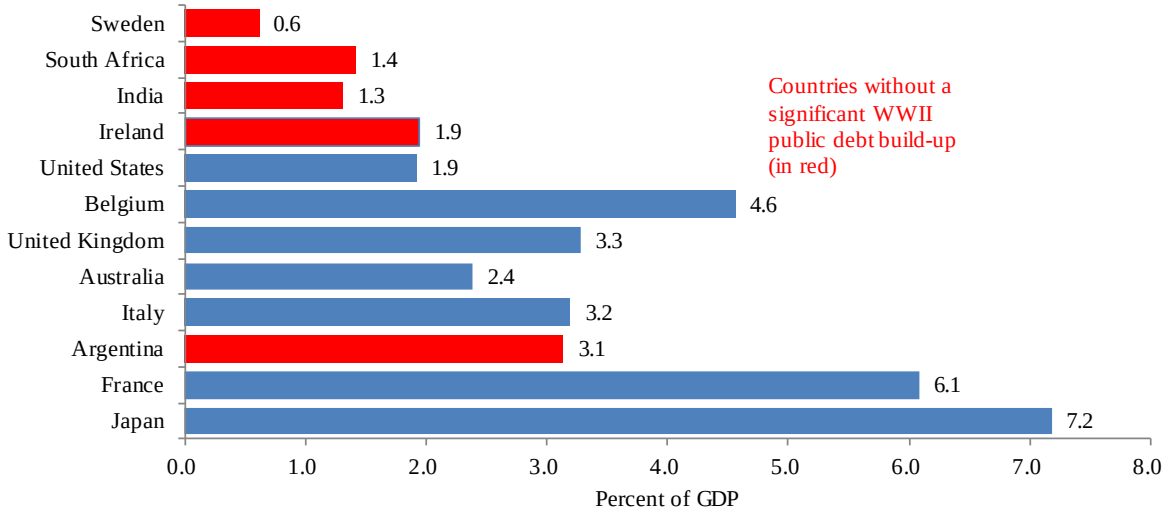
| |
|---|
| **United States: price support for government securities** |
| During World War II there was an agreement between the Fed and the Treasury to support the price of government securities in the market. The Treasury had set a structure of return for securities of different maturities, which the Fed supported by buying and selling securities at par. Once the War was over, there was a consensus between the Treasury and the Fed that the policy of low interest rates should be continued, which lasted until 1951. |
| **United Kingdom: Cheap Money Policy and Minimum Prices for Government Securities** |
| Domestic financial policy during the War and in its immediate aftermath was designed to obtain cheap money for the government, including though Treasury Deposit Receipts (90-day nonmarketable paper sold to banks), tap loans, and arrangements for insurance companies to invest in government securities. Minimum prices on government securities were imposed at the beginning of the war, while interest rates were cut after its conclusion (according to Fforde (1992), this was presented as a "technical adjustment"), and the maturing stock of lower-yielding Exchequer Bonds was converted. Several Local Loans at 3% were exchanged for irredeemable 2.5% bonds. |

| |
|---|
| There were restrictions on issues by British companies and a "virtual prohibition on the issue or purchase of foreign securities." Michie (1999). Government agencies and banks, such as the Postal and Trustee Saving Banks, substantially increased their government debt holdings in this period. |
| **Japan:**<br>"Following World War II and until 1970-1, the Japanese financial system and its economy in general, were characterized by strict government control" (Kanovsky, 1990).<br>Interest rates on government bonds were regulated, with the mechanism differing by type of bond (See Suzuki, 1987, for a detailed description). For instance, for long-term bonds, "the issue terms are decided by the long-term Government bond facilitation committee *sewanin kai*, which consists of the Ministry of Finance, the Bank of Japan, and representatives of the underwriting syndicate." *De facto* most issuance was regulated, even in the absence of a legal requirement.<br>Regulations on deposit rates were common, having been introduced in 1901 by the Osaka Bankers Association. For example, in 1947, the Temporary Interest Rate Law was passed, controlling maximum interest rates for bank deposits. These policies were motivated both by fears that competition among banks to capture deposits could lead to a financial crisis, and the argument that they could contribute to price stability by holding down interest costs. |
| **France:**<br>Following World War II, policymakers decided that the government should take an active role in directing credit to the sectors in the economy that needed it the most, including ensuring that the government would obtain adequate financing, by establishing what was called "*the circuit"*. This was achieved through policies such as portfolio requirements on banks' restrictions on purchases of assets besides government securities; tax benefits on government securities, and isolation of *the circuit* from foreign markets through capital controls. |

Reinhart and Sbrancia (2015) document the overall impact of negative real interest rates in reducing government debt during this period (Figure 8). Most real interest rates were significantly lower during 1945-1980 than in the freer capital markets before the depression and World War II, and after financial liberalization in the 1980s. For the advanced economies, ex-post real interest rates were negative in about half of the years of the financial repression era, compared to less than 10 percent of the time since the early 1980s. Average annual savings in their sample range from about 1 to 5 percent of GDP for the full 1945-1980 period.[69] The most significant savings materialized in the decade immediately after WWII, when debt levels were highest, and in the 1970s, when inflation accelerated.

[69] Inflation was not particularly high. In fact, in the US the average inflation rate was 4.6 percent and the median inflation rate was 3.2 percent, while in the UK the average inflation was 6.3 percent and median inflation 4.2 percent.

**Figure 8: "Liquidation effect" revenues per liquidation year as percentage of GDP**




Sources: Renihart and Sbrancia (2015) and sources theirin.
Notes: Notes: 1945–80 for Australia, France, UK, United States, South Africa; 1945–80 for Argentina; 1945–74 for Belgium; 1949–80 for India; 1960–83 for Ireland; 1946–80 for Italy; 1945–2008 for Japan and 1945–90 for Sweden.

Dissecting the precise role of financial repression in this period is challenging, because key elements of equation (3) are unobserved. For example, the equilibrium "free market" real interest rate is unknown, and as discussed earlier in this chapter, may fluctuate for reasons unrelated to financial repression. Furthermore, there are few direct estimates of investors inflation expectations during this period, making it difficult to precisely estimate the contribution of unexpected inflation. Nonetheless, the combination of increased regulatory restrictions, and the increased prevalence of low or negative real interest rates, is suggestive of an important role for financial repression.

Strikingly, this period was also the "golden age" of economic growth. Real per Capita GDP grew at an average of 4.1 percent in Western Europe from 1950-73, and by 3.7 percent in advanced economies, almost 2 percent higher than in the subsequent period (Crafts and O'Rourke, 2014). While there were probably many factors (including post-war reconstruction, favorable demographics, and conditions conducive to catch-up) behind this growth acceleration, it is notable that these forces were not dramatically impeded by the widespread presence of financial repression during this period.

**Financial repression in the XXI century**

The financial crisis of 2008 led to both a surge in public debt across advanced economies and an increase in "macroprudential" regulation. Many of these policies have been at least partly motivated by either macroeconomic or financial stability concerns, rather than the desire to reduce government financing costs, but in many cases they bear similarities to those in the post-war period, and that have traditionally been thought as financial repression. While other factors may also have driven a decline in ("free market") equilibrium real interest rates since the crisis, it is nonetheless notable that the incidence of negative real interest has increased by a similar magnitude to the Bretton Woods era.

Perhaps the most striking development is the increased importance of non-market players in government debt markets. In the US, not only has the Fed increased its government debt holdings through quantitative easing, but foreign central banks (mostly of emerging economies) have accumulated large stocks of US debt. In Europe, the ECB launched its expanded asset purchase programme (APP) in 2015, through which it has been buying both government bonds and corporate paper and other assets. As of August 2018, it holds more than €3 trillion in government bonds. In December 2017, the Basel Committee decided after a two-year study to keep the status quo of zero risk weights for national sovereign bonds. Onega, Popov and Van Horen (2016) also present evidence that euro-area periphery banks' holdings of their own sovereign's debts during the crisis were influenced by "moral suasion".

Other recent policies which could be interpreted as financial repression include the requirement in 2009 for UK banks to hold a larger share of UK government bonds in their portfolio; Spain's imposition of interest rate ceiling on deposits in 2010 and Ireland's use of funds from the national pension reserve to capitalize banks (see Kirkegaard and Reinhart 2012, and Reinhart, Kirkegaard, and Sbrancia 2012 for details).

## V. Conclusion

This chapter has discussed four distinct areas of government policy which can potentially be used to achieve debt reduction. Each has its own features and potential costs, and as discussed in the introductory section, countries have historically relied on a combination of

these policies to reduce debt, with the mix varying in different countries and eras. In this concluding section, we briefly summarize the considerations for a policymaker attempting to determine the relative importance of these policies in their own debt reduction strategy.

Fiscal consolidation is the government's most direct policy instrument to achieve debt reduction, and with the exception of a few hyperinflationary episodes, fiscal surpluses have almost always made at least some contribution to successful debt reductions. However, fiscal policy can raise sharp trade-offs between debt reduction and welfare, both because it changes resource allocation by adjusting expenditures and the burden of taxation, and because of its impacts on GDP and employment. As a result, the timing, composition and size of fiscal consolidations need to be carefully designed to minimize these trade-offs, and policymakers may prefer to make use of the other policy instruments discussed in this chapter, rather than relying on fiscal adjustment alone.

Growth-enhancing policies are an attractive option for governments, since even relatively modest improvements in GDP growth rates can substantially improve the prospects for debt reduction and reduce the need for adjustment via other policies. The list of potential policies is large, but for countries close to the global GDP per capita frontier, the scope for a boost to GDP per capita through structural reform may be modest, in part due to societal preferences and political barriers. For developing and emerging economies, there is potentially larger scope for growth accelerations, regardless of the level of debt, but it is not clear that the policies required are more likely when debt is already high.[70]

Monetary policy can almost always be used to reduce the government debt burden, through seigniorage and through inflating away for those countries with domestic currency debt. Inflating away a sizable proportion of debt requires rates of inflation which are high by recent standards in advanced economies, but hardly unprecedented. Governments without domestic currency debt must rely on seigniorage, which is associated with much higher rates of inflation. But there are limits to what monetary policy can achieve: it cannot generate large amounts of ongoing fiscal support without coercing the public to hold money or domestic

[70] Indeed, some have argued the opposite: that a debt overhang creates a disincentive to undertake difficult but growth-enhancing reforms, since more of the upside flows to creditors (Sachs, 1989).

currency debt. Inflation also has costs, particularly for the holders of government debt and money, but so do other options for reducing government debt. For this reason, a moderate and temporary increase in inflation may sometimes be appropriate as part of a package of measures to reduce the debt burden. Furthermore, a temporary *surprise* period of inflation is likely to be both more effective and less costly than other forms of inflation. One way to overcome the political drawbacks of a surprise inflation is to be explicit about why inflation deviates from its target (or why currency devaluations occur), ideally ahead of time.[71]

Financial repression to reduce the cost of servicing government debt has been stigmatized as a strategy but has historically been common in both advanced and emerging economies. It is a natural complement of inflationary monetary policies, with which it is frequently used, and like those policies acts as an implicit tax on holders of government debt and money. Some fear negative consequences for growth, particularly in an era of significant global financial integration, but the post-WWII experience casts some doubt on this supposition, at least at moderate levels of financial repression. While it is hard to anticipate how governments will manage to reduce the current debt overhang, it seems likely that policymakers will be concerned with debt management and interest cost of their debt for the foreseeable future. In this context, policies aimed at keeping interest rates low and assuring a demand for government paper (financial repression) are likely to remain and may even expand.

[71] Some economists have gone further than this argued that monetary policy should act forcefully to offset completely shocks which affect the fiscal position (Leeper and Leith (2016) contains an excellent review of the literature on optimal monetary, fiscal and debt management policy, including work by Chari et al.(1991) which makes this argument). A problem with this proposal is that the government might not be able to commit to an appropriate fiscal policy knowing that the central bank will provide it with insurance. A halfway house is for monetary policy to offset shocks to government debt dynamics over which the government has relatively little control such as productivity growth, as for example is implied by nominal GDP targeting.

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## Appendix A: Deriving the debt dynamics equations

***Debt dynamics with domestic currency debt only:***

To derive the debt dynamics identity, we start with the government's budget constraint in nominal terms:

$$(A) \qquad T_t + D_t = D_{t-1} + i_t D_{t-1} + G_t + SFA_t$$

Where $D_t$ represents nominal government debt, $i_t$is the nominal effective interest rate on government debt, $G_t$ is government non-interest expenditures, $T_t$ is government revenues (including seigniorage profits received from the central bank). [72]

The intuition underlying equation (A) is clearest when the government only issues one-year maturity debt. In this case, the items on the left of the equation represent the government's sources of financing, its revenues ($T_t$**)** and new debt issuance ($D_t$). The first three items on the right are the government's financing requirements: principal payments on maturing debt from the previous period ($D_{t-1}$), interest payments on this debt ($i_t D_{t-1}$), and government non-interest expenditure ($G_t$). As explained in the introduction, the final item ($SFA_t$) is a residual, which in practice captures transactions in other government assets and liabilities, and any revenues and expenditures that are not captured in the fiscal data.

If we subtract $T_t$ from both sides of (A), define the primary balance: $PB_t = T_t - G_t$, and divide through by nominal GDP ($P_t Y_t = P_{t-1}(1+\pi_t) Y_{t-1}(1+g_t)$, we can express these variables as percentages of GDP (denoted by lower case variables):

$$d_t = \frac{(1+i_t)}{(1+\pi_t)(1+g_t)} d_{t-1} - pb_t + sfa_t$$

Subtracting $d_{t-1}$ from both sides:

$$\text{(B)} \quad \Delta d_t = \frac{(1+i_t) - (1+g_t)(1+\pi_t)}{(1+\pi_t)(1+g_t)} d_{t-1} - pb_t + sfa_t$$

$$\Rightarrow \Delta d_t = \frac{1}{(1+g_t)} \frac{(1+i_t) - (1+\pi_t) - g_t(1+\pi_t)}{(1+\pi_t)} d_{t-1} - pb_t + sfa_t$$

Which can be simplified to equation (1):

$$\textbf{(1)} \quad \boldsymbol{\Delta d_t = \frac{1}{1+g_t}\left(\frac{i_t - \pi_t}{1+\pi_t} - g_t\right) d_{t-1} - pb_t + sfa_t}$$

[72] If the government is consolidated with the monetary authorities, then there would be an additional financing item: $H_t - H_{t-1}$, the change in the monetary base in nominal terms, but government revenues would not include seigniorage profits.

Defining the (ex-post) real interest rate: $1 + r_t^P = \frac{1+i_t}{1+\pi_t}$, and substituting into (B):

$$\Delta d_t = \frac{(1 + r_t^P) - (1 + g_t)}{1 + g_t} \; d_{t-1} - pb_t + sfa_t$$

Which can be expressed as:

$$\text{(C)} \qquad \Delta d_t = \frac{r_t^P - g_t}{1 + g_t} d_{t-1} - pb_t + sfa_t$$

Equations (B) and (1) in nominal terms, and (C) in real terms, are the standard debt dynamics identities.

***Debt dynamics with foreign currency debt:***

With foreign currency debt, the nominal budget constraint becomes:

$$(D) \quad D_t = \left(1 + i_t^d\right) D_{t-1}^{dc} + \left(1 + i_t^f\right) \frac{e_t}{e_{t-1}} D_{t-1}^{fc} + (G_t - T_t) + SFA_t$$

Where $e_t$ is the nominal exchange rate expressed as the foreign currency per unit of domestic currency (ie. a nominal depreciation is an *increase* in $e_t$).

We also introduce notation for the shares of domestic $\left(\alpha_t^{dc} = \frac{D_{t-1}^{dc}}{D_{t-1}}\right)$ and foreign currency debt $\left(\alpha_t^{fc} = \frac{D_{t-1}^{fc}}{D_{t-1}}\right)$, and as before, divide both sides by domestic nominal GDP ($P_t Y_t$):

$$(E) \;\; d_t = \frac{\left(1 + i_t^d\right)}{\left(1 + \pi_t^d\right)(1 + g_t)} \alpha_{t-1}^{dc} d_{t-1} + \frac{\left(1 + i_t^f\right)}{\left(1 + \pi_t^d\right)(1 + g_t)} \frac{e_t}{e_{t-1}} \alpha_{t-1}^{fc} d_{t-1} - pb_t + sfa_t$$

Now define the real exchange rate: $q_t = \frac{e_t P_t^d}{P_t^f} \Rightarrow \frac{q_t}{q_{t-1}} = \frac{e_t}{e_{t-1}} \frac{1+\pi_t^d}{1+\pi_t^f}$, and substitute into (E):

$$d_t = \frac{\left(1 + i_t^d\right)}{\left(1 + \pi_t^d\right)(1 + g_t)} \alpha_{t-1}^{dc} d_{t-1} + \frac{\left(1 + i_t^f\right)}{\left(1 + \pi_t^f\right)(1 + g_t)} \frac{q_t}{q_{t-1}} \alpha_{t-1}^{fc} d_{t-1} - pb_t + sfa_t$$

Then defining the foreign $\left(r_t^{f,P}\right)$ and domestic $\left(r_t^{d,P}\right)$ ex-post real interest rates as

$$1 + r_t^{j,P} = \frac{1 + i_t^j}{1 + \pi_t^j}$$

And substituting in:

$$d_t = \left( \frac{\left(1 + r_t^{d,P}\right)}{(1 + g_t)} \alpha_{t-1}^{dc} + \frac{\left(1 + r_t^{f,P}\right)}{(1 + g_t)} \frac{q_t}{q_{t-1}} \alpha_{t-1}^{fc} \right) d_{t-1} - pb_t + sfa_t$$

Subtracting $d_{t-1}$ from both sides:

$$\Delta d_t = \left(\frac{r_t^{d,P} - g_t}{(1+g_t)}\alpha_{t-1}^{dc} + \left(\frac{(1+r_t^{f,P})q_t - (1+g_t)q_{t-1}}{(1+g_t)\,q_{t-1}}\right)\alpha_{t-1}^{fc}\right)d_{t-1} - pb_t + sfa_t$$

$$\Rightarrow \Delta d_t = \left(\frac{r_t^{d,P} - g_t}{(1+g_t)}\alpha_{t-1}^{dc} + \frac{q_t + q_{t-1}r_t^{f,P} + \Delta q_t r_t^{f,P} - q_{t-1} - q_{t-1}g_t}{(1+g_t)\,q_{t-1}}\alpha_{t-1}^{fc}\right)d_{t-1} - pb_t + sfa_t$$

Which after further simplification yields the full debt-dynamics equation with foreign-currency debt (F):

$$(F)\quad \Delta d_t = \frac{1}{1+g_t}\left(r_t^{d,P}\alpha_{t-1}^{dc} + \left(r_t^{f,P} + \frac{\Delta q_t}{q_{t-1}}\left(1+r_t^{f,P}\right)\right)\alpha_{t-1}^{fc} - g_t\right)d_{t-1} - pb_t + sfa_t$$

If we again substitute for foreign and domestic real interest rates, and drop the cross term $\left(\frac{\Delta q_t}{q_{t-1}}\frac{r_t^{f,P}}{1+g_t}\right)\alpha_{t-1}^{fc}d_{t-1}$, which is typically small, from the RHS, we get equation (2):

$$\mathbf{(2)}\ \boldsymbol{\Delta d_t} = \frac{\mathbf{1}}{\mathbf{1+g_t}}\left(\frac{\boldsymbol{i_t^d - \pi_t^d}}{\mathbf{1+\pi_t^d}}\boldsymbol{\alpha_{t-1}^{dc}} + \left(\frac{\boldsymbol{i_t^f - \pi_t^f}}{\mathbf{1+\pi_t^f}} + \frac{\boldsymbol{\Delta q_t}}{\boldsymbol{q_{t-1}}}\right)\boldsymbol{\alpha_{t-1}^{fc}} - \boldsymbol{g_t}\right)\boldsymbol{d_{t-1}} - \boldsymbol{pb_t} + \boldsymbol{sfa_t}$$

***Debt dynamics with financial repression:***

To show the impact of financial repression and unexpected inflation, we first define expected inflation ($\pi_t^e$), and two additional (domestic) real interest rates: the ex-ante real interest rate ($r_t^A$), and the ex-ante free market real interest rate ($r_t^F$):

$$1 + r_t^A = \frac{1+i_t}{1+\pi_t^e}$$

$$1 + r_t^F = \frac{1+i_t^F}{1+\pi_t^e}$$

Adding and subtracting $\frac{1+i_t+(i_t^F - i_t)}{1+\pi_t^e}$ from the equation for the ex-post real interest rate*:*

$$1 + r_t^P = \frac{1+i_t}{1+\pi_t} + \frac{1+i_t^F + i_t - i_t}{1+\pi_t^e} - \frac{1+i_t+(i_t^F - i_t)}{1+\pi_t^e}$$

Which can be rearranged as follows:

$$\Rightarrow 1 + r_t^P = \frac{1+ir_t^F}{1+\pi_t^e} + \left(\frac{1+i_t}{1+\pi_t} - \frac{1+i_t}{1+\pi_t^e}\right) - \frac{i_t^F - i_t}{1+\pi_t^e}$$

$$\Rightarrow 1 + r_t^P = 1 + r_t^F + (1+i_t)\left(\frac{1+\pi_t^e - 1 - \pi_t}{(1+\pi_t)(1+\pi_t^e)}\right) - \frac{i_t^F - i_t}{1+\pi_t^e}$$

$$\Rightarrow \text{(G)}\ r_t^P = r_t^F - (1 + r_t^A)\left(\frac{\pi_t - \pi_t^e}{1 + \pi_t}\right) - \frac{i_t^F - i_t}{1 + \pi_t^e}$$

Substituting (G) into equation (C), the real debt-dynamics equation, leads to equation (3):

$$(\mathbf{3})\ \ \boldsymbol{\Delta d_t = \frac{1}{1+g_t}(r_t^F - g_t)d_{t-1}\ - \frac{1}{1+g_t}(1 + r_t^A)\frac{\pi_t - \pi_t^e}{1+\pi_t}d_{t-1}} \\ \boldsymbol{- \frac{1}{1+g_t}\frac{i_t^F - i_t}{1+\pi_t^e}d_{t-1} - pb_t + sfa_t}$$

## Appendix B: Inflation and Debt Reduction Simulation Details

| Simulation | Details |
|---|---|
| Baseline | See Krause and Moyen (2016). |
| More flexible prices | Theta changed from 0.75 to 0.25 (so prices change on average three times per year instead of once). |
| 15 year debt maturity | Alpha falls from 0.0472 (consistent with average debt maturity of just over 5 years) to 0.0167. |
| 1 year debt maturity | Alpha rises to 0.25. |
| Learning | Expectations are formed by least squares learning. |
| Low persistence | Rho falls from 0.99 to 0.95. |
| Low persistence and learning | Expectations are formed by least squares learning and rho falls from 0.99 to 0.95. |