Four Decades of Global Large Debt Reduction: Anatomy, Determinants and Lessons

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Abstract

This paper examines global large debt reduction over four decades using a panel data of 160 countries. It estimates the probability that a large debt reduction would occur in a given five year period using the conditional fixed effect logit methodology. The result shows that global large debt reduction is associated with robust economic growth, decisive and lasting fiscal consolidation, and a favorable external environment characterized by strong global growth. Fiscal rules are found to be positively associated with a higher probability of debt reduction because they increase fiscal discipline and credibility of fiscal policy and help secure the gains of fiscal consolidation. The results are robust to alternative estimation methodologies and alternative thresholds for identifying large debt reduction episodes. The paper concludes that future large debt reduction programs in the Caribbean needs to be based credible fiscal plans to increase primary balances, fiscal rules to enhance fiscal credibility, and structural reforms to promote growth.

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I. INTRODUCTION

The global financial crisis has led to renewed interest in the issue of debt reduction for many governments. Low economic growth, low budgetary revenues, and stimulus spending to prop up economic activity have resulted in a sizable accumulation of debt, especially by the developed world. For instance, the ratio of general government debt to GDP in advanced countries increased from 50 percent in 2007 to 90 during the crisis. Rising debt not only raises the risk of a fiscal crisis but also imposes costs on the economy by keeping borrowing costs high, discouraging private investment, and constraining fiscal flexibility. Empirical evidence points to a nonlinear relationship between public debt and growth, suggesting that public debt beyond certain levels can have negative effects on economic activity.

This paper investigates the determinants of global large debt reduction using a dataset that spans more than four decades for a large sample of developed and developing economies. The analysis uses a panel data set of about 160 countries to estimate the probability that a large debt reduction will be initiated using the logit regression approach. More specifically, the paper attempts to answer the following questions: How have large debt reductions occurred in practice? What factors determine the probability of a large debt reduction? And, what lessons can we draw for future large debt reduction?

Most studies in the literature have examined debt reduction within the context of fiscal consolidation (Giavazzi and Pagano, 1990; and Alesina and Perotti, 1995). According to this approach, only public debt reductions resulting from sizeable improvements in either the primary balance or the cyclically adjusted primary balance were considered. This approach ignores other potential determinants of public debt reductions, such as business cycle developments and the magnitude of debt servicing costs. Using a sample of 15 European Union countries for the period 1985-2009, Nickel, Rother, and Zimmermann (2010) analyze the determinants of large debt reductions. Their main findings were that major debt reductions are primarily driven by strong GDP growth and decisive and lasting fiscal consolidation efforts focused on reducing government expenditure, particularly by cuts in social benefits and public wages. This paper extends the work of Nickel, Rother, and Zimmermann by analyzing the factors determining large debt reductions using a large dataset of 160 countries for the period 1970-2009.

Our result shows that global large debt reduction is associated with robust economic growth, decisive and lasting fiscal consolidation, and a favorable external environment characterized by strong global growth. In addition, fiscal rules are found to be positively associated with a higher probability of debt reduction because they increase fiscal discipline and the credibility of fiscal policy and help secure the gains of fiscal consolidation. The initial level of debt and debt servicing cost appears to play a disciplinary role by enhancing the incentives of governments to consolidate aggressively. The results are robust to alternative estimation methodologies and alternative thresholds for identifying large debt

reduction episodes. We conclude that future large debt reduction programs in the Caribbean need to be based on credible fiscal plans to increase primary balances, fiscal rules to enhance fiscal credibility, and structural reforms to promote growth.

The rest of the paper is structured as follows. In Section II, we review the literature on debt reduction. The stylized facts and anatomy of global large debt reductions are analyzed in section III. The section also examines the experience of seven countries with large debt reduction. We discuss the empirical methodology and findings in section IV, while section V provides the summary and concluding messages.

II. LITERATURE REVIEW

Theoretically, countries have a number of options to reduce their debt levels, including economic growth, fiscal consolidation, inflation, debt restructuring and defaults, and privatization. Their pluses and minuses can be summed up this way (IMF, 2003):

- Reducing debt through economic growth would generally be the preferred option of policymakers, but growth is virtually nonexistent in the Caribbean at present.
- Reducing debt through explicit defaults entails reputation costs that could influence future borrowing and constrain fiscal policy.
- High inflation has enormous growth and welfare costs, while privatization, though debt reducing, does not change the net worth of the government.
- Reducing debt through fiscal consolidation maintains the credibility of the government, but it is often politically difficult, and the gains need to be maintained over a long period of time.

There is no standard definition of what constitutes a large reduction in the public debt-to-GDP ratio. Existing literature explaining the dynamics of these reductions has analyzed episodes in terms of the magnitude of debt reduction over a specific period of time. Nickel, Rother and Zimmermann (2010) define an episode as one in which the debt-to-GDP ratio declines by more than 10 percentage points in 5 consecutive years. In their analysis, Finger and Sadikov (2010) consider cases associated with debt-to-GDP ratio reduction of more than 20 percentage points. The IMF (2003) identifies cases in which this debt ratio was reduced by at least 18 percentage points over a three-year period. In a more recent study, the IMF (2012) analyzes cases in which the ratio exceeded the 100 percent threshold and discusses the debt dynamics 15 years after. Bandiera (2008) considers debt reductions on the order of 30 to 190 percentage points of GDP measured in Net Present Value (NPV) terms. Baldacci, Gupta and Mulas-Granados (2012) examine a debt-to-GDP ratio decline from a high level to a

prudent threshold of 60 percent of GDP for advanced economies and 40 percent for emerging economies.

Several large debt reduction episodes of considerable durations have occurred around the world. Examining a sample of 15 European Union countries during 1985-2009, Nickel, Rother and Zimmermann (2010) find that the total debt reduction per country, on average, stood at about 37 percent of GDP over a relatively long period, ranging from 5 to14 years. In a large sample of countries covering 1980-2010, Baldacci, Gupta and Mulas-Granados (2012) identify 104 episodes of public debt reduction, excluding debt relief cases lasting 2 to 13 years. Half of these episodes achieved a debt-to-GDP reduction of at least 20 percentage points, while in more than a third debt reduction was higher than 40 percentage points of GDP. The IMF (2012) identifies 26 episodes in advanced countries spanning almost 100 years; it finds that more than half of the 22 countries studied had at least one high-debt reduction episode between 1857 and 1997. In its earlier study, the IMF (2003) identifies about 26 episodes of public debt reduction in emerging market economies during 1970–2002, of which 19 were associated with a default or restructuring. Excluding the restructuring cases, the IMF further finds that the median decline in the public debt ratio was 34 percent of GDP over three years. According to Baldacci, Gupta and Mulas-Granados, (2012), it took about 6 years, on average, during which public debt was reduced by about 29 percent of GDP.

Experiences suggest that significant debt reduction takes time. It is even more difficult, and sometimes impossible for countries emerging from a crisis. Reflecting higher uncertainty and the difficulty of fiscal adjustment in a post-crisis environment, Baldacci, Gupta and Mulas-Granados (2010) find that lowering public debt takes about 10 years, on average, for a successful episode.

Empirical evidence indicates that large debt reductions are associated with a combination of factors. Findings to the following factors: real GDP growth, fiscal adjustment, inflation (or the hyper case), changes in interest and exchange rates, debt restructuring or default, debt relief, and sale of government assets. On top of these, some studies have argued for an appropriate policy mix and deep–rooted structural reforms to boost competitiveness and growth. In general, findings give prominence to robust real growth and fiscal consolidation.

Growth is fundamental as it allows countries to easily "grow their way" out of debt. GDP growth was the main factor in all large debt reduction episodes in seven low-income countries examined by Badiera (2008). However, the growth factor is often missing, especially in many advanced economies today, and in such cases, countries have relied on others factors to reduce public debt significantly. In emerging market economies, Baldacci, Gupta and Mulas-Granados (2012) find that in addition to higher growth, the bulk of debt reduction in the period 1980-2010 was driven by lower interest rates. Over the period 1970-

2002, strong growth performance averaging 8.5 percent of GDP and fiscal consolidation largely through expenditure restraint contributed to debt reduction in these economies (IMF, 2003). In advanced countries, the correlation between growth and debt reduction is less clear (IMF, 2012). However, excluding hyperinflation cases, a relatively stronger growth performance is associated with debt reduction. Finger and Sadikov (2010) note that while favorable debt dynamics played a lesser role in reducing public debt in advanced economies, countries with already high debt levels tended to rely more on favorable macroeconomic conditions than on fiscal adjustment, and the episodes were less sustained.

A number of studies have attributed large debt reductions to fiscal consolidation, implying that any serious plan for a major debt reduction must include a credible fiscal consolidation strategy. Indeed, evidence suggests that fiscal adjustments have been needed to reduce debt levels to prudent levels and that these past episodes serve as a lesson for countries facing high debt levels today. Nickel, Rother and Zimmermann (2010) and Amo-Yartey and others (2012) find that fiscal consolidation efforts must be decisive and call for reductions in government expenditure, in particular in wages and transfers. IMF (2012) lends support to this, arguing that successful debt reduction requires fiscal consolidation and a policy mix that supports growth. Evidence from Baldacci, Gupta and Mulas-Granados, (2012) indicates that about half of the decline in public debt emanated from stronger primary balances, especially in Africa. In oil exporting countries, the primary-balance contribution to debt reduction was greater than the contribution from favorable debt dynamics, reflecting revenue booms following improvements in terms of trade (Finger and Sadikov, 2010). In their analysis of major episodes of large debt changes in a sample of 19 advanced countries over 1880–2009, Abbas and others (2011) finds that debt reduction was accounted for by the primary balance and the growth-interest differential components in roughly equal proportions

Fiscal consolidation appears unavoidable in the absence of growth although evidence points to some exceptions. Bandiera (2008) notes that it was not a key factor for the seven cases he studied. No country was able to run fiscal surpluses consistently over time. Similarly, most countries covered in Finger and Sadikov (2010) were noted to have run primary deficits of about 2 percent of GDP on average over the debt reduction episode. In these cases, the countries involved benefitted from debt restructuring and relief that contributed substantially to debt reduction. For the low-income cases, the debt relief option appeared unsustainable in the absence of fiscal and structural reforms and a good debt management policy, as the countries soon found themselves back in rapidly increasing debt, which reinforces the earlier finding by the IMF (2003) that unless accompanied with sound macroeconomic policies, default is not a long-term solution for a large debt problem.

Other factors such as inflation and exchange rate appreciation are important determinants. Research on the relationship between inflation and debt reduction is inconclusive. One view is that generally, inflation is not associated with debt reduction, apart from exceptional cases of hyperinflation (IMF, 2012). Citing the experience of the United

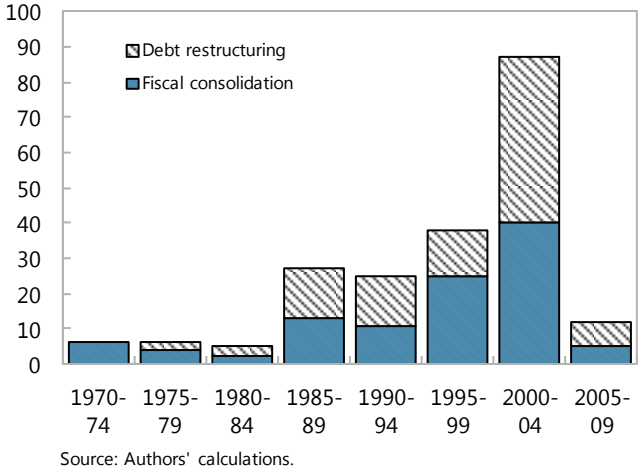
States after World War II, the IMF finds that high rates of surprise inflation combined with low nominal interest rates, largely reflecting financial repression, helped the United States to reduce debt significantly. Similarly, Finger and Sadikov (2010) finds no evidence of systemically higher inflation for countries with a lower share of foreign-currency debt. However, the IMF (2003) finds that in some emerging market cases, moderate inflation and exchange rate appreciation were helpful in reducing debt levels. For the serial debt defaulters, two-thirds of the cases involved real exchange rate appreciation (Reinhart, Rogoff and Savastano, 2003).

The appropriateness of the policy mix has been emphasized. It includes sound macroeconomic policies, pro-growth structural reforms, and the need to have the right environment for a sustained debt reduction, such as supportive monetary conditions and a friendly external environment. An inappropriate policy mix –severe fiscal austerity and tight monetary policy¬–hurts growth and raises debt, as the IMF (2012) observes in the case of the United Kingdom after World War I. The view is that debt reductions are larger when fiscal measures are permanent or structural rather than temporary and when they are anchored in fiscal frameworks, including fiscal rules. The findings of Baldacci, Gupta and Mulas-Granados (2012) also reflect the importance of combining supply-side structural reforms with policies to ameliorate debt dynamics.

III. Global Large Debt Reductions: Stylized Facts and Anatomy

In this paper, we define a large debt reduction episode as occurring if the debt-to-GDP ratio declines by at least 15 percent of GDP in 5 consecutive years. Using this definition, we recorded about 206 episodes of large debt reductions around the world between 1970 and 2009. These are among the key findings:

Figure 1. Number of Global Debt Reduction Episodes by Year and Nature



Source: Authors' calculations.

- Around 100 (48 percent) of the debt reduction episodes were achieved through debt restructuring or default.

- Around 106 (52 percent) of the debt reduction episodes were achieved through higher GDP growth, higher inflation, or fiscal consolidation.

- Of the debt reduction episodes achieved through fiscal consolidation, about 25 percent were preceded or accompanied by the existence of fiscal rules.

- Most of the large debt reduction episodes lasted over a relatively long period of time, ranging from 4 years in Panama to 18 years in Australia. The average duration of large debt reduction episodes not achieved through debt restructuring was about 7 years.

- The average decline in the debt-to-GDP ratio was 35 percent of GDP.

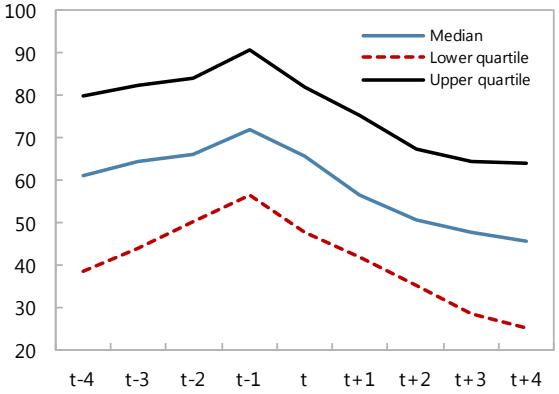
A. Factors Behind the Decline in the Public-Debt-to-GDP Ratio

How have large public sector debt reductions occurred in practice? To answer this question, we used data for advanced, emerging market, and developing countries for the period 1970–2010. We identify cases where public debt was reduced over a five-year period by 15 percentage points, dropping cases in which the debt stock at the end of the period was still above the level three years prior to the event.

This section illustrates the potential drivers of large debt reduction. In particular, we examine the behavior of macroeconomic factors, as depicted in Figures 4.2 to 4.7, such as primary balance, GDP growth, government spending, government revenue, inflation, and the composition of public spending before and after the onset of a large debt reduction. Among our key findings are the following:

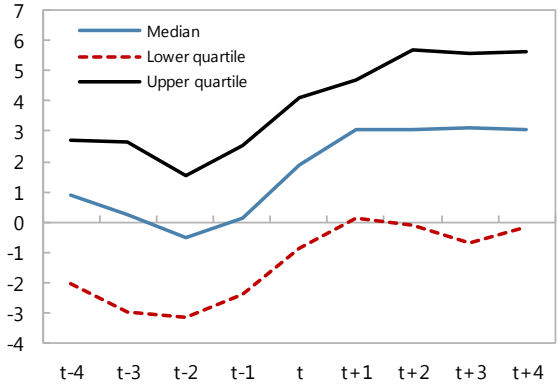
- In the 106 cases in which large debt reduction was not due to a restructuring, the median decline in the debt-to-GDP ratio was 26.4 percent over a five-year period. (Figure 2)

Figure 2. Public Debt, 106 Global Study Cases a/
(percent of GDP)



Source: Authors' calculations.
a/ Consist of cases where public debt was reduced over a five-year period by 15 percentage points or more without restructuring.

Figure 3. Primary Balance, 106 Global Study Cases
(percent of GDP)

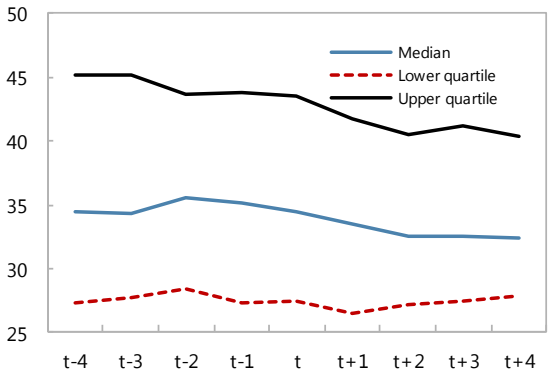


Source: Authors' calculations.

- A strong economic performance seems to have contributed significantly to the reduction in the debt-to-GDP ratio. Real GDP growth starts to pick up one year before the event and averaged about 5 percent per year during the first five years of the debt reduction episode.

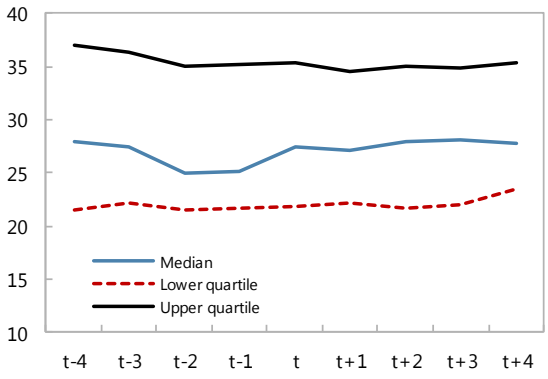
- A strong fiscal effort appears to have played an important role in the debt reduction. The primary balance starts to improve significantly at least two years before the large debt reduction episode, and the improvement continues to be sustained during the first five years of the episode (Figure 3).

Figure 4. Government Spending, 106 Global Study Cases
(percent of GDP)



Source: Authors' calculations.

Figure 5. Government Revenues, 106 Global Study Cases
(percent of GDP)

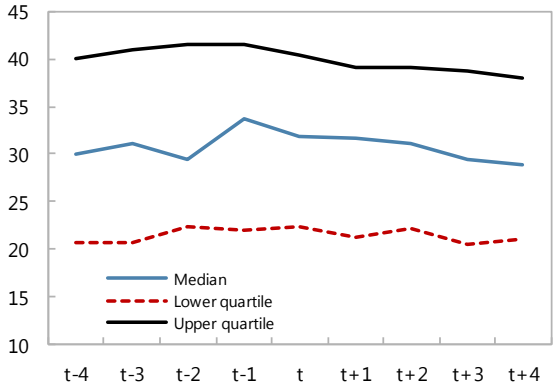


Source: Authors' calculations.

- The fiscal improvements were due to a combination of revenue enhancing measures and expenditure restraints. The median decline in the ratio of government spending to GDP was 3 percentage points of GDP over the five year period. (Figure 4)

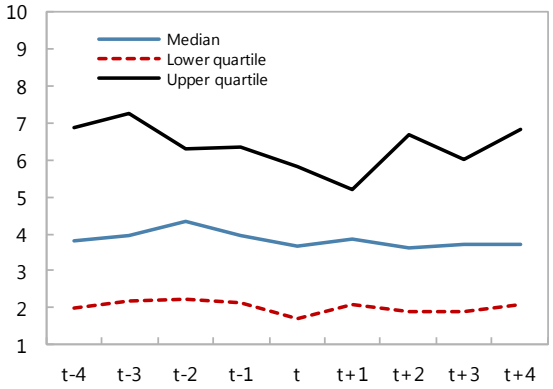
- The reduction in total spending came mainly from cuts in current spending, with capital spending remaining broadly flat over the five year period (Figures 6 and 7).

Figure 6. Current Spending, 106 Global Study Cases
(percent of GDP)



Source: Authors' calculations.

Figure 7. Capital Spending, 106 Global Study Cases
(percent of GDP)



Source: Authors' calculations.

- Moderate inflation also contributed to the decline in the debt-to-GDP ratio, with inflation averaging 5 percent over the five year period.

B. Public Debt Reduction: Tales from Seven Countries[1]

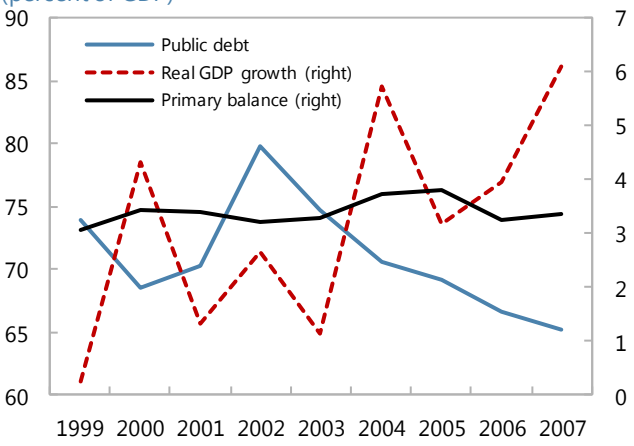
We analyze the experience of seven countries that have succeeded in reducing their debt levels substantially during different periods of time. These include: Brazil, Canada, Denmark, Lebanon, New Zealand, South Africa, and Vanuatu. The aim is to further examine the factors that promote debt reduction, covering the specific measures implemented by these countries over the course of their debt reduction episodes. As with the analyses for the full sample, we analyze for these country cases, the behavior of public debt, growth, primary balance, government revenue, government spending and the composition of public spending before and during the debt reduction episodes.

Brazil, 2002–08

In five years, covering 2002–07, the public-debt-to-GDP ratio fell by 15 percentage points from its peak of 80 percent in 2002. Over the debt reduction episode, real GDP expanded by 4 percent on average, while the primary-balance-to- GDP ratio was consistently above 3 percent of GDP. Brazil's story reflects the country's adherence to a well-established macroeconomic policy framework based on a high primary surplus objective, skillful debt management, inflation targeting, and a flexible exchange rate regime.

[1] The section draws from IMF staff reports on the respective countries.

Figure 8. Brazil: Public Debt, Real GDP Growth, and Primary Balance, 1999-2007
(percent of GDP)



Sources: National authorities; and authors' calculations.

Debt reduction was also boosted by a favorable external environment–improved commodity prices and enhanced access to foreign financing. The country successfully implemented the 2002-05 IMF-supported programs that helped restore confidence and improve market conditions following its 1998-99 currency crisis.

Fiscal adjustment was essentially revenue-based. The record high primary surpluses reflect strong revenue performances mainly through higher tax revenue at both the federal and sub-national government levels. Expenditure measures included efforts to strengthen the social safety net and pension reform to reduce generous benefits. Current spending came down in 2002 following the start of consolidation but started rising in 2005, partly reflecting entitlement spending, while capital spending became flat. Fiscal adjustment appeared to have been achieved at the expense of a high tax burden and limited public investment.

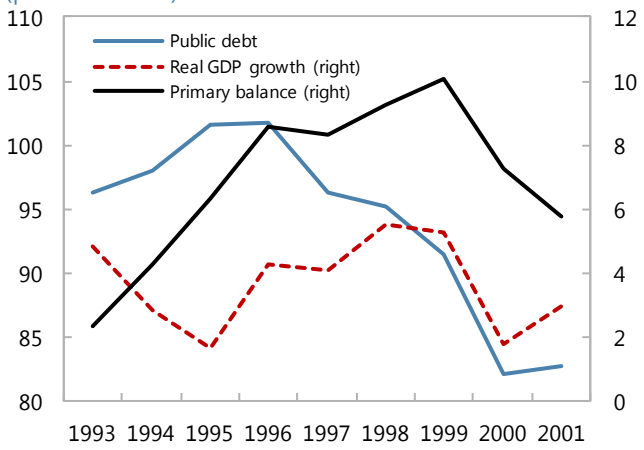
A budget guideline law introduced in 2007 maintained the primary surplus target, eliminated ceilings on government revenues and expenditure set a year earlier, and outlined targets for reducing current expenditure. There was a debt restructuring agreement between the federal and the sub-national governments and legislation limiting personnel expenditures and debt levels at all levels of government, paving the way for a comprehensive fiscal responsibility law.

Canada, 1997–2007

On the back of robust growth and fiscal consolidation, the public-debt-to-GDP ratio in Canada came down by 35 percentage points over an episode that lasted for 10 years starting from 1997. Macroeconomic policy measures implemented since the early 1990s put the economy on a strong footing and underpinned the buoyancy of economic activities. The

country has a fiscal framework, which targets a balance of budgets over a rolling two-year period based on conservative fiscal assumptions.

Figure 9. Canada: Public Debt, Real GDP Growth, and Primary Balance, 1993-2001
(percent of GDP)



Sources: National authorities; and authors' calculations.

The idea is to build sufficient savings to stem future pressures on public finances associated with an aging population. This approach proved quite successful as it appeared to have provided the authorities with the flexibility to respond to changing circumstances while delivering exceptionally high fiscal surpluses and sustaining the social consensus to reduce the debt level.

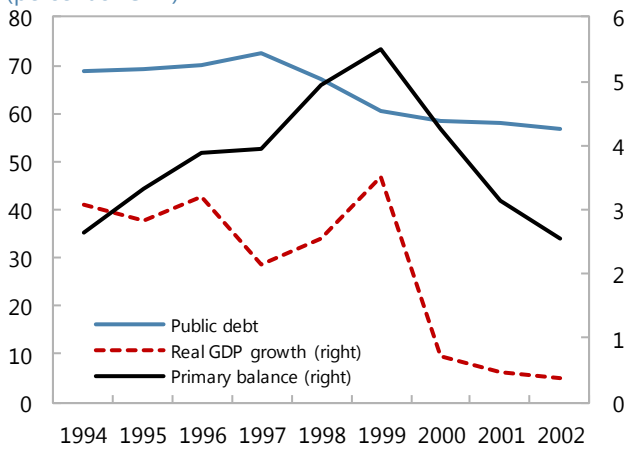
Decisive fiscal consolidation, which started in the mid-1990s, was sustained. It saw government expenditure declining substantially, largely on account of lower public consumption, reduced unemployment benefits, less capital spending, and lower wage bill and transfers to provinces. Thus, with tax rates already high, fiscal adjustment had an expenditure focus, complemented by some revenue measures including higher excises and a broadening of both the personal income tax and corporate income tax bases. There were structural reforms in many key areas, including employment insurance, a public old-age pension scheme, education, and trade.

Fiscal consolidation was extended to lower–level governments. Within the period, provinces raised education and health fees and excises and broadened the corporate income-tax base. With the return to fiscal surpluses, however, the government launched a five-year tax reduction plan in 2000, which significantly lowered statutory tax rates on personal income and corporate income, and it took steps to increase the contribution limits for tax-deferred retirement savings plans and cut capital gains taxes. Some provinces also lowered marginal income tax rates as well for both households and businesses.

Denmark, 1998–2007

Denmark cut the public-debt-to-GDP ratio by almost 40 percentage points over a period of nine years starting from 1998, reflecting buoyant economic activity and fiscal consolidation. Real GDP growth averaged 2 percent during 1994-2002, while primary surpluses averaged 4 percent of GDP. Prior to the debt reduction episode, the economic fundamentals seemed strong. The memory of bad times and the gains from earlier consolidation in the 1990s helped build a nationwide consensus about the importance of prudent fiscal policies. Fiscal adjustment consisted of a mix of revenue and expenditure measures, with emphasis on expenditure control, especially on transfers given the very high expenditure-to-GDP ratio. Caps on expenditure growth in real terms led to a gradual reduction in the expenditure-to-GDP ratio. To contain spending overruns, the counties were legally required to comply with budget targets beginning in 2003. At the same time, capital spending virtually disappeared.

Figure 10. Denmark: Public Debt, Real GDP Growth, and Primary Balance, 1994-2002
(percent of GDP)



Sources: National authorities; and authors' calculations.

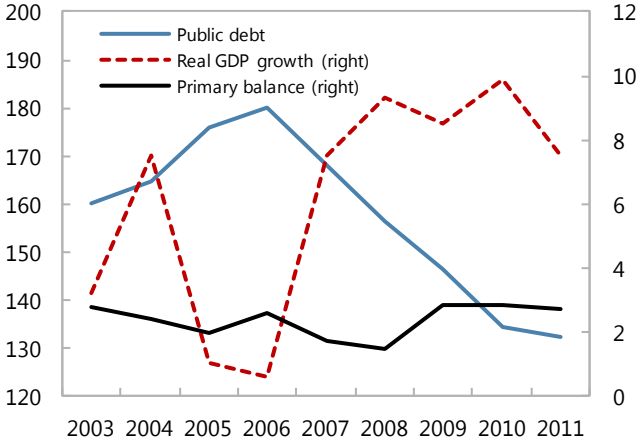
As in the case of Canada, the government was committed to a strategy of running fiscal surpluses and lowering public debt to avert future spending pressures owing to changing demographics. To this end, fiscal policy has been explicitly guided by a medium-term fiscal framework since the early 1990s, initially motivated by the need to meet the European Union's deficit targets, debt ceilings, and convergence programs.

There were also labor market reforms, including reductions in labor taxes and flexibility of hiring and dismissal, which resulted in significant increases in employment while maintaining high standards of social security for the unemployed. In 2006, the political parties reached a welfare agreement and included various measures aimed at later retirement and increasing labor supply in the short term.

Lebanon, 2006–10

Economic activity has been adversely affected by civil conflicts since 1990. However, real GDP growth rebounded in 2007 and registered 8½ percent during 2006-11. This was facilitated by a new and ambitious fiscal reform and financial support from donors for reconstruction, permitting the government to raise primary surpluses in the range of 1½ to 3 percent, thereby reducing the public-debt-to-GDP ratio by 45 percentage points in four years from a very high level in 2006. The country benefitted from Emergency Post-Conflict Assistance (EPCA) from the IMF in 2007 and 2008, which helped in improving macroeconomic stability and public finances.

Figure 11. Lebanon: Public Debt, Real GDP Growth, and Primary Balance, 2003-11
(percent of GDP)



Sources: National authorities; and authors' calculations.

A medium-term fiscal adjustment program was adopted in 2007. Referred to as the Paris III Agenda, it contained a number of measures, which were planned for implementation in phases. The VAT rate was increased from 10 to 12 percent in 2008, and then to 15 percent in 2010 bringing it in line with the regional average. A global income tax was planned for introduced in 2008, in addition to raising gasoline excises to their pre-capping levels of 2004. Tax on interest income was also raised, from 5 to 7 percent, in January 2008.

Other revenue measures included improvement in revenue from government properties and reforms in property tax administration. Revenue administration reforms included the introduction of a medium-sized taxpayer office and new audit procedures, and changes to the property tax evaluation system. On the expenditure side, measures included reforms that aimed at a nominal freeze in the wage bill and structural reforms in the energy and social sectors to curb fiscal leakages. Efforts to strengthen public financial management involved

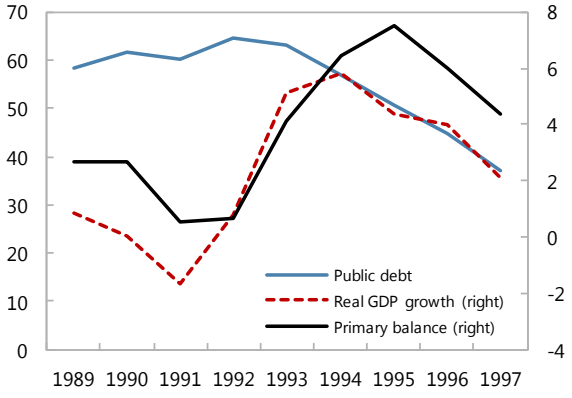
introducing medium-term planning. In 2008, a public debt directorate was created and a single treasury account was proposed.

However, some of the planned fiscal consolidation and structural reforms have been delayed repeatedly due to the difficult security situation and political tensions between the government and the party opposition, especially since 2010. Notably, however, the cabinet has approved the reform of the energy sector. Legislation has been passed for investments in the electricity sector, and reforms in tax administration and public financing management have been making progress. However, progress in introducing a global income tax, increasing the VAT rate, and implementing a single treasury account has been slow. Despite the challenging circumstances, the government appears committed to pursuing fiscal consolidation and reducing debt further, including by implementing the key measures of the Paris III Agenda.

New Zealand, 1992–2007

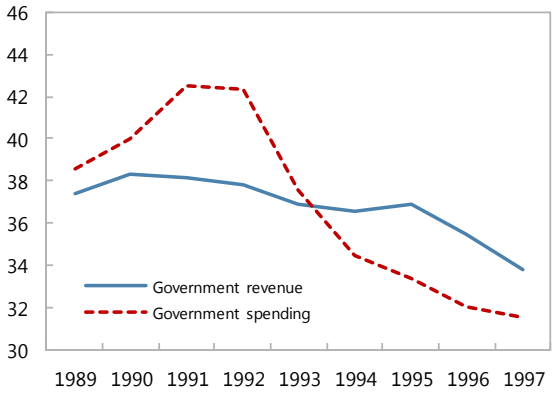
Public debt fell from about 65 percent of GDP in 1992 to 17 percent in 2007. During 1992-97, real GDP grew by about 4 percent on average while the primary balance averaged 5 percent. The economic expansion can be traced to radical structural reforms that commenced in 1985 – institutional reforms that effected a strong medium-term orientation to monetary and fiscal policies to achieve macroeconomic stability; privatization and labor market deregulation to enhance competition and efficiency; and efforts to raise the productivity of core government services.

Figure 12. New Zealand: Public Debt, Real GDP Growth, and Primary Balance, 1989-1997
(percent of GDP)



Sources: National authorities; and authors' calculations.

Figure 13. New Zealand: Government Revenue and Spending, 1989-1997
(percent of GDP)



Sources: National authorities; and authors' calculations.

Fiscal consolidation focused on limiting expenditures. For example, expenditure reduction accounted for approximately 40 percent of the improvement in the primary balance of about 1.4 percent of GDP in 2003. Caps on current expenditure led to a gradual reduction in the expenditure-to-GDP ratio. During the period, the government reiterated its commitment to

the principles of medium-term budgeting and emphasized the need for higher savings in the light of future pension and healthcare obligations. Lower interest rates significantly reduced the cost of debt servicing, and a debt management office established in 1998 helped manage the public debt portfolio. As a result, the share of foreign-currency-denominated debt fell from 58 percent in 1992 to 22 percent in 2001. Moreover, a new monetary policy framework brought inflation down from an average of 8.3 percent during 1986-91 to 1.9 percent during 1992-97.

The productivity of the public sector was substantially enhanced by reforms that placed department heads on performance contracts in return for flexibility to manage financial and human resource inputs. Building on the comprehensive public sector reforms, a Fiscal Responsibility Act was introduced in 1994, emphasizing the accountability and transparency of government fiscal operations. The tax system was also overhauled to broaden the tax base, lower marginal rates, and shift tax incidence from income to consumption. Most tax exemptions were abolished. The personal income tax bracket was reduced from five to two brackets with the top rate of 33 percent the same as the company income tax rate. A VAT of 12½ percent replaced a range of indirect taxes.

The social welfare system was streamlined, while targeting was improved. Eligibility requirements were tightened and the level of benefits was lowered for a broad range of programs. The national pension scheme was made partly income-dependent, and its eligibility age was set to increase gradually from age 60 to age 65 over a 10-year period ending in 2001. A major labor market reform introduced a legal framework for a highly decentralized wage-bargaining system, so that individual contracts became prevalent in many sectors. This enhanced labor flexibility and remuneration, and moderated the spillover of wage pressure across firms and sectors.

In 2005, the incumbent party was re-elected with a mandate for continued fiscal consolidation. Continuing with the medium-term budget framework that it had introduced in 1994, for example, after the elections in 2005, government set out explicitly its long term fiscal objectives, including reducing net public debt on a sustained basis to remain between 20 and 30 percent of GDP, restoring government net worth to positive levels, and reducing expenditure to below 30 percent of GDP.

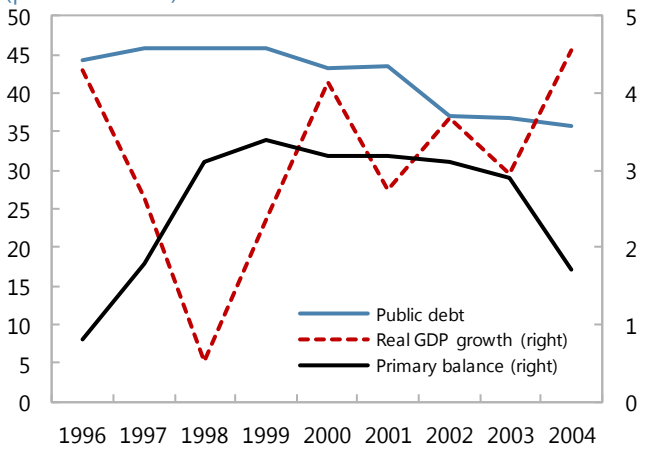
South Africa, 1999–2008

The public-debt-to-GDP ratio came down by 19 percentage points over an episode that lasted for nine years commencing in 1999. Real GDP growth averaged 3 percent from 1996 to 2004.Over the same period, primary balance averaged 2.6 percent of GDP. South Africa undertook a wide range of structural reforms beginning in the early 1990s, which laid the basis for improvement in macroeconomic performance and in public finances many years later, including the period of debt reduction. Key structural reforms adopted at various times

included trade liberalization, tax base broadening and lower rates for income taxes, revenue administration reforms, a medium-term budget framework, and expenditure planning and financial management. Income tax rates and import duties were cut as incentives for investment and job creation.

A Revenue Authority was created in 1997. This was accompanied by a reorganization of revenue administration, modernization of the information system, and strengthening of audit and collection capacity. Public finance management legislation introduced in 2000 boosted financial accountability and improved internal controls at the national and provincial levels. On top of these reforms, there was a strengthening of finances, an improvement in treasury control, and a centralization of personnel spending at the provincial level.

Figure 14. South Africa: Public Debt, Real GDP Growth, and Primary Balance, 1996-2004
(percent of GDP)



Sources: National authorities; and authors' calculations.

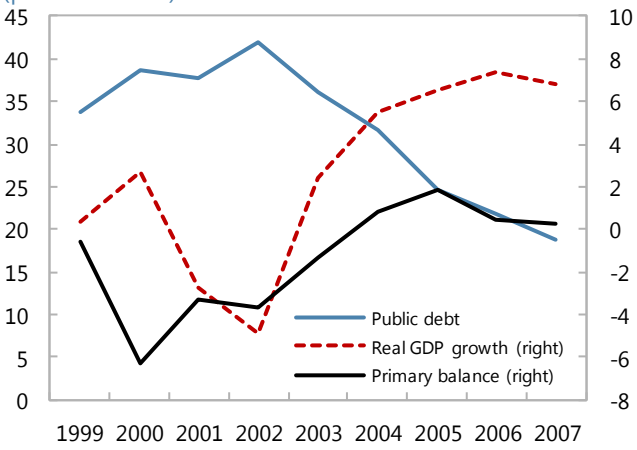
Fiscal consolidation focused on expenditure with deliberate efforts to reduce the overall fiscal deficit. Expenditure measures targeted cuts in the wage bill and in subsidies and transfers and allowed a marginal increase in capital expenditures. Following fiscal adjustment, current and total expenditure were reduced while revenue improved, although the initial gains from expenditure reduction were later reversed.

The reduction of budget deficits was accompanied by a reorientation of spending toward poverty reduction and social projects. In addition, the public financial management framework helped strengthened national and provincial capacity through provisions for multiyear budgeting and strategic planning. Beginning in 2000, restructured state-owned enterprises, especially the four largest which accounted for about 91 percent of assets of the top 30, to increase their efficiency through improved governance and competition.

Vanuatu, 2002–07

After years of sub-par economic performance, Vanuatu's economy is currently one of the fastest growing among all the small islands in the Pacific. Real GDP growth averaged 6 percent over the period 2003-2007. The strong growth performance can be explained by a booming tourism sector combined with foreign direct investment in real estate. At the same time, the country lowered its public debt by 23 percentage points of GDP in the five years following 2002. Political stability, largely absent since the early 1990s, boosted confidence and has enabled the government to undertake structural and fiscal reforms. Macroeconomic management has improved and has created the right environment for economic activity to thrive.

Figure 15. Vanuatu: Public Debt, Real GDP Growth, and Primary Balance, 1999-2007
(percent of GDP)



Sources: National authorities; and authors' calculations.

The strong fiscal position in recent years is credited to buoyant economic activity and important reforms, including a widening of the tax base, improvement in tax compliance, and strengthened expenditure control. Other reforms have included the introduction of a VAT, capacity strengthening at the tax office, strengthened regulation of the state-owned utility company, and fiscal transparency through more frequent financial reporting. In addition, the government liberalized the telecommunication sector in 2006 by offering a second telecommunication license. Furthermore, technical assistance to the central bank, especially from the Pacific Financial Assistance Centre, has helped build capacity and enhanced the transparency of the country's monetary policy operations.

IV. Estimating the Probability of a Large Debt Reduction

A. Methodology

The model. To examine the determinants of a large debt reduction, we use a dataset spanning four decades for a large sample of developed and developing economies. The analysis uses a panel data set of about 160 countries to estimate the probability that a large debt reduction will be initiated using the logit regression approach.

$$Y_{it} = \alpha_i + \beta X_{it} + \partial G_t + \upsilon_{it,} \qquad (1)$$

where Y is the log of the odds ratio, or more specifically the log odds of large debt reduction. The variable i stands for the i th country and t for the t th time period, α_i is an idiosyncratic fixed effect which accounts for inter-country differences as long as these differences are constant over time. The explanatory variables X_{it} and G_t – representing macroeconomic variables and measures of fiscal rule, respectively– are measured either at the beginning of the previous five-year period or during the previous five-year period.

Estimation method. The analysis uses a panel data set of 160 countries for eight five- year periods (1970-74, 1975-79…,2005-2009) to estimate the probability that a large debt reduction would be initiated in each five-year period using the logit regression approach. The logit is interpreted as follows: the slope coefficient measures the change in Y for a unit change in any of the explanatory variables, demonstrating how the log odds change as the explanatory variables change by a unit.[2]

The predicted probability of a large debt reduction can be computed using the estimated coefficient of the above regression:

$$\hat{Y}_{it} = \alpha_i + \beta \hat{X}_{it} + \partial \hat{G}_t + \upsilon_{it,} \qquad (2)$$

The probabilities for hypothetical observations can be calculated by first finding the average values for all explanatory variables for a subset of countries and taking this to represent a typical country within the subset and then using the following formula:

$$\rho_{it} = \frac{e^y}{(1+e^y)} = \frac{1}{(1+e^{-y})}, \qquad (3)$$

[2] The odds in favor of a large debt reduction initiation are the ratio of the probability of a large debt reduction to the probability of a "no debt reduction" in any given five-year period. The odds ratio is written mathematically as $\rho/(1-\rho)$.

However, when the dependent variable is observed as a qualitative variable and there are few time series observations per cross-section units and no autoregressions, fixed-effect models gives inconsistent estimates of the slope parameter. Andersen (1973) and Chamberlain (1980) argue that for large *N* and a small number of observations, the maximum likelihood estimation of the fixed- effects model gives inconsistent estimates of the parameters. They recommend the use of the conditional maximum likelihood (conditioning on the fixed effects). The main principle is to consider the likelihood function to be conditional on sufficient statistics for the incidental parameter α_i (Maddala, 1987). In our logit model in equation (1), these sufficient statistics are $\sum_t y_{it}$ for α_i. Maddala (1987) argues that for the logit model the conditional likelihood approach results in a computationally convenient estimator. The conditional maximum likelihood estimator of β is consistent, provided that the conditional likelihood function satisfies regularity conditions, which impose mild restrictions on the α_i.

Chamberlain (1980) demonstrates that the standard errors obtained by the usual conditional logit programs can be used as the asymptotic standard errors for the conditional maximum likelihood estimator of β. In the conditional fixe-effect logit approach, alternative sets for which $\sum_t y_{it} = 0$ or $\sum_t y_{it} = T$ are discarded because they do not contribute to the likelihood function. In order to test for a fixed individual effect, one can perform a Hausman-type test based on the difference between the conditional maximum likelihood estimator and the standard logit maximum likelihood, ignoring country differences:

$$H = (\beta_{CFE} - \beta_{SL})'(V_{CFE} - V_{SL})^{-1}(\beta_{CFE} - \beta_{SL}) \qquad (4)$$

The test statistics are asymptotically X^2 distributed with k degrees of freedom.

B. The Data

Dependent variable. The dependent variable is the probability of a large debt reduction (*Debtred*). The variable takes the value of 1 if a large debt reduction occurs and a value of zero otherwise. If a large debt reduction occurs in period *t* and continues in *t+1*, the value of *Debtred* is recorded as missing.

Explanatory variables. The explanatory variables are measures of fiscal consolidation, macroeconomic variables, political and institutional variables, and fiscal rules.

Fiscal consolidation: Fiscal consolidation is measured by the ratio of cyclically adjusted primary balance to potential GDP.

GDP growth: Real GDP growth is expected to be important in raising government revenues.

Inflation: Higher inflation could inflate the debt away, but it also has a significant negative effective on economic growth and welfare. Lucas (2003) estimates that the gains from completely removing the inflation rate of 200 percent are in excess of 5 percent of GDP in the long run.

Global economic conditions: We use global real GDP growth as a measure of global economic conditions. Many analysts believe that global economic conditions could influence the success of fiscal consolidation and debt reduction efforts.

Interest cost: This cost is measured as interest payments as a ratio to GDP. This measure is used to determine whether interest cost has a disciplinary effect on debt. High debt servicing cost could negatively affect growth and investment.

Fiscal rules: A dummy variable is used to capture fiscal rules. The dummy takes the value of 1 if a fiscal rule exists when the episode starts or during the episode and a value of zero otherwise. The literature suggests that fiscal rules are estimated to have affected several dimensions of fiscal consolidation and that the size of fiscal consolidation was significantly larger when fiscal rules were present. We also investigate whether the type of fiscal rules matters for a large debt reduction. To this end, we examine the impact of expenditure rules, debt rules, revenue rules, and a balanced budget rule in explaining the probability of a large debt reduction.

C. Estimation Results

Comparative Statistics. First, it is important to examine some comparative statistics. Table 1 presents comparative statistics for large debt reduction countries and no large debt reduction countries during the sample period. The data shows that as compared with countries that did not experience a large debt reduction during the period, those countries that did experience a large debt reduction--

- had a much higher debt
- had much higher growth on average
- had much better fiscal performance
- had much lower inflation
- had a much higher interest cost, and, finally
- were more likely to have fiscal rules (in whichever form).

Table 1. Comparative Statistics: Determinants of Global Large Debt Reduction

	Large debt reduction		No large debt reduction	
	Mean	Standard deviation	Mean	Standard deviation
Debt reduction	1	0	0	0
Debt	68.5	34.1	60.9	60.69
GDP growth	4.9	4.11	3.72	3.6
Primary balance	1.62	5.3	-0.004	6
Interest cost	3.8	3.1	2.77	2.2
Inflation	6.9	9.4	10.94	14.69
Political risk	65	12.5	66.5	13.6
Fiscal rules	0.26	0.44	0.15	0.36
Expenditure rule	0.11	0.32	0.05	0.21
Balance budget rule	0.25	0.43	0.13	0.33
Debt rule	0.19	0.4	0.11	0.31
Revenue rule	0.04	0.2	0.016	0.13

Source: Authors' calculations.

It is not surprising that the main finding from these comparative statistics is that countries that experienced a large debt reduction were on average able to achieve a higher GDP growth and larger primary surpluses and were more likely to have fiscal rules than countries that did not experience a large debt reduction.

Regression results. Table 2 provides the logit estimates for nine different models. Model 1 is the standard logit regression for the data that are pooled over time, and model 2 is the conditional fixed-effects logit model. When looking at the regression results, it is important to note that the fixed-effect estimator does not use information provided by inter-country comparisons of debt reduction. Consequently, the probability of a large debt reduction is identified by countries that change debt reduction status during the period. In fact, in the conditional fixed- effect model, all countries with unchanged outcomes drop out of the conditional likelihood function.

In our sample, we observed 217 countries that changed their debt reduction status at least once during the period 1970-2009. It is evident therefore that the number of informative observations is substantially lower than the total sample size, since the superior properties of the fixed-effects estimators in terms of bias need to be traded for less precise estimates in terms of higher standard errors. A comparison between the standard logit model and the conditional fixed-effect logit shows that the fixed- effect model performs better. A Hausman test statistic of 23.50 with a *p* value of 0.0014 leads to a rejection of the model without fixed effects.

Table 2. Regression Results: Determinants of Global Large Debt Reduction
(Dependent variable: the probability of a large debt reduction)

	(1) GLS	(2) Random effects	(3) Fixed effects	(4) Fixed effects	(5) Fixed effects	(6) Fixed effects	(8) Fixed effects	(9) Fixed effects
Interest cost	0.1810	0.1672***	0.1810	0.4803**	0.2284	0.5500**	0.6233**	0.2510
	(0.1671)	(0.0561)	(0.1671)	(0.2328)	(0.1793)	(0.2546)	(0.2673)	(0.1845)
Inflation	-0.0692**	-0.0226	-0.0692**	-0.0436	-0.0659*	-0.0442	-0.0326	-0.0661*
	(0.0333)	(0.0202)	(0.0333)	(0.0361)	(0.0342)	(0.0350)	(0.0364)	(0.0338)
Global growth	0.9006*	0.6304	0.9006*	1.2181**	0.9749*	1.3896**	1.4011**	1.0819**
	(0.4996)	(0.4187)	(0.4996)	(0.6039)	(0.5149)	(0.6303)	(0.6428)	(0.5326)
Primary balance	0.1418**	0.0561**	0.1418**	0.1535**	0.1411**	0.1600**	0.1476**	0.1394**
	(0.0624)	(0.0260)	(0.0624)	(0.0623)	(0.0620)	(0.0689)	(0.0667)	(0.0626)
Debt-to-GDP ratio	0.0572***	-0.0000	0.0572***	0.0483***	0.0558***	0.0519***	0.0455***	0.0560***
	(0.0171)	(0.0029)	(0.0171)	(0.0179)	(0.0175)	(0.0178)	(0.0173)	(0.0174)
GDP growth	0.1131**	0.0477	0.1131**	0.1271**	0.1144**	0.1396***	0.1382***	0.1166**
	(0.0481)	(0.0297)	(0.0481)	(0.0494)	(0.0483)	(0.0519)	(0.0521)	(0.0483)
Fiscal rules				3.0087***				
				(1.0787)				
Expenditure rule					1.0147			
					(0.8789)			
Debt rule						5.3949**		
						(2.0981)		
Balanced budget rule							5.4797***	
							(1.9784)	
Revenue rule								1.7689
								(1.3734)
N	217	469	217	217	217	217	217	217
Log likelihood	-52.6156	-153.5913	-52.6156	-45.9339	-51.8868	-44.0946	-42.6553	-51.6386

Source: Authors' calculations.

Notes: Standard errors in parentheses. Asteriks ***, **, * denote signficant at 1, 5, and 10 percent level, respectively.

The main results are as follow:

- Global large debt reductions are positively associated with strong economic growth**,** with a favorable external environment, with lasting fiscal consolidation, and with weaker initial conditions.

- The probability of a large reduction tends to increase when initial debt levels are high, since high debt levels tend to make fiscal consolidation needs more pressing in our sample of countries.

- Strong economic growth also increases the probability of a large debt reduction, as the implementation of sound polices helps countries grow themselves out of debt. The

results also show that global large debt reductions are driven by decisive and lasting fiscal consolidation.

- As expected, inflation does not contribute to major debt reductions and is actually negative and significant in the conditional fixed-effects logit specification.

- Debt servicing costs also play a disciplinary role, as high debt servicing costs are positively associated with the probability of a large debt reduction.

- Fiscal rules tend to increase the probability of a large debt reduction because they help strengthen the fiscal framework and improve fiscal transparency.

- Which types of fiscal rules are more successful in debt reduction? We found that debt rules and balanced budget rules are important in explaining the probability of such debt reductions. Fiscal rules based on revenue and expenditure do not appear to have any significant impact on the probability of a large debt reduction.

Robustness Tests

How robust are these results? The robustness of our results is tested by the following measures. First, we use a variety of estimation techniques. Second, we restrict the sample period to the period 1990-2009. Third, we exclude oil exporters from the full sample. And fourth, we use an alternative definition of a "large debt reduction" episode. Some of the results of our robustness analysis are presented in Table 4.3.

We examine whether our benchmark regression results are robust to changes in the definition of large debt reduction. We then define a large debt reduction as occurring when the debt-to-GDP ratio declines by at least 10 percentage points over a five-year period. Using this definition, we can identify 12 more episodes of global large debt reduction. We then estimate our benchmark model using the new definition of large debt reduction as the dependent variable.

The results show that the estimated coefficients are largely unchanged, even though the standard errors, as expected, are larger in the model that uses fewer observations. Higher primary surpluses, strong global growth, robust real GDP growth, and fiscal rules are all positive and significant factors explaining the probability of global large debt reduction. We also exclude oil exporters from our baseline regression, and find that the results are statistically similar to our baseline regression results.

Table 3. Robustness Tests: Determinants of Global Large Debt Reduction

(Dependent variable: the probability of a large debt reduction)

	Alternative definition of debt reduction			Excluding oil exporters		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Interest cost	0.50430	0.53438	0.56349	0.29272	0.31031	0.29679
	(0.22121)**	(0.22830)**	(0.23435)**	-0.25080	(0.25730)**	(0.25682)
Inflation	-0.03796	-0.03832	-0.03991	-0.08113	-0.07962	-0.08292
	(0.03483)	(0.03327)	(0.03260)	(0.04930)*	(0.04945)*	(0.04892)
Worldgrowth	1.58845	1.67717	1.57595	2.15448	2.18990	2.23625
	(0.59345)***	(0.60020)***	(0.62130)***	(0.84615)***	(0.83808)***	(0.85083)***
Primary balance	0.14228	0.13833	0.15033	0.34035	0.34080	0.33940
	(0.05988)**	(0.06170)**	(0.06471)**	(0.13085)***	(0.13139)***	(0.13295)**
Initial debt	0.04598	0.04555	0.04832	0.09870	0.09911	0.10102
	(0.01743)***	(0.01746)***	(0.01749)***	(0.02995)***	(0.02994)***	(0.02986)***
GDP growth	0.12465	0.12506	0.13226	0.33741	0.33195	0.34562
	(0.04861)***	(0.04870)***	(0.04938)***	(0.15349)**	(0.15219)**	(0.15358)**
Fiscal rules	2.24256			2.33547		
	(0.78523)***			(0.9494492)**		
Budget balance rule		2.64213			2.52412	
		(0.97406)***			(1.06235)**	
Debt rule			3.53640			2.48407
			(0.12566)***			(1.06354)**
Loglikelihood	-51.23484	-51.1829	-51.23484	-33.83596	-33.90281	-34.11112
No. of observations	231	231	231	189	189	189

Source: Authors' calculations.

Note: Standard errors in parentheses. Asteriks***, **, * show significant at 1, 5, and 10 percent levels of significance, respectively.

V. SUMMARY AND CONCLUSION

Highly indebted countries should generally aim to lower their debt levels in order to create a better platform for growth. The results of this chapter show that major debt reductions are mainly driven by decisive and lasting fiscal consolidation efforts focused on reducing government expenditure. Our analyses also show that robust real GDP growth increases the likelihood of a major debt reduction, because it helps countries grow their way out of indebtedness. Since growth in the current environment is virtually nonexistent, significant fiscal consolidation is inevitable.

Fiscal consolidation needs to be credible in order to anchor market expectations about fiscal sustainability. It is essential to strengthen the fiscal framework by adopting fiscal rules and independent fiscal agencies to guide budget processes and improve fiscal transparency. The literature on fiscal rules shows that when such rules are present, the size of fiscal consolidation is significantly larger and the consolidation efforts are sustained longer. The adoption of a spending rule on top of a budget balance rule helps in the achievement and maintenance of a primary balance that is sufficient to stabilize the debt-to-GDP ratio.

Countries could create a stable general fiscal rule to strengthen the current fiscal framework. This can be done by defining the rule in terms of primary deficit for general government, which could take the form of expenditure ceilings and revenue floors. It is also essential to support the fiscal rule by creating an independent fiscal council to assess macroeconomic projections underlying the budgeting process and assess the compatibility of the fiscal framework with fiscal rules and general government policies.

Fiscal consolidation needs to be completed by a comprehensive policy to reduce public debt, including reforming tax policy, improving the efficiency of government spending, containing contingent liabilities, rationalizing the public sector, actively managing debt, restructuring debt, and making growth-enhancing structural reforms. Key areas for reforms include increasing labor market flexibility, achieving greater regional cooperation, and creating an enabling environment for private sector development.

REFERENCES

Abbas, Ali S. M., Nazim Belhocine, Asmaa El Ganainy, and Mark Horton, 2011, "Historical Patterns of Public Debt–Evidence from a New Database" (Washington: International Monetary Fund).

Alesina Alberto, and Roberto Perotti, 1995, "Fiscal Expansions and Fiscal Adjustments in OECD Countries," NBER Working Paper No. 5214 (Cambridge, Massachusetts: National Bureau of Economic Research).

Amo-Yartey, Charles, Machiko Narita, Garth Peron Nicholls, Joel Chiedu Okwuokei, Alexandra Peter, and Therese Turner-Jones, 2012, "The Challenges of Fiscal Consolidation and Debt Reduction in the Caribbean," IMF Working Paper No. 12/276 (Washington: International Monetary Fund).

Andersen, Erling, 1973, "Conditional Inference and Models for Measuring," (Copenhagen: Mentalhygiejnisk Forsknings Institut)

Bandiera, Luca, 2008, "Public Debt and its Determinants in Low-Income Countries–Results From Seven Country Case Studies," (Washington: World Bank). Available at SSRN: http://ssrn.com/abstract=1143511 or http://dx.doi.org/10.2139/ssrn.1143511

Baldacci, Emmanuele, Sanjeev Gupta, and Carlos Mulas-Granados, 2010, "Getting Debt Under Control," *Finance and Development*, Vol. 47, No. 4, pp. 18– 21, December (Washington: International Monetary Fund).

Chamberlain, Gary, 1980, "Analysis of covariance with qualitative data," *Review of Economic Studies, 47*, pp. 225–38. Finger, Harald, and Azim Sadikov, 2010, "Lowering Public Debt," *Finance and Development*, Vol. 47, No 2, pp. 36–38, June (Washington, DC: International Monetary Fund).

Giavazzi, Francesco, and Marco Pagano, 1990, "Can Severe Fiscal Contractions Be Expansionary? Tales of Two Small European Countries," NBER Macroeconomics Annual, Vol. 5, pp. 75–111 (Cambridge, Massachusetts: National Bureau of Economic Research).

Greenidge, Kelvin, Roland Craigwell, Chrystol Thomas, and Lisa Drakes, 2012, "Threshold Effects of Sovereign Debt: Evidence from the Caribbean," IMF Working Paper No. 12/157 (Washington: International Monetary Fund).

IMF, 2003, "Public Debt in Emerging Markets: Is it too High?" in *World Economic Outlook* (September).

_____, 2012, "The Good, the Bad and the Ugly: 100 Years of Dealing With Public Debt Overhangs," in *World Economic Outlook* (October).

Iwulska, Aleksandra, 2011a, "Reducing Public Debt: Turkey," Country benchmarks prepared for *Golden Growth: Restoring the Lustre of the European Economic Model*, Indermit S. Gill and Martin Raiser, (Eds.), 2012 (Washington: World Bank).

_____, 2011b, "Reducing Public Debt: New Zealand," country benchmarks prepared for *Golden Growth: Restoring the Lustre of the European Economic Model*. , Indermit S. Gill and Martin Raiser (Eds.), 2012 (Washington: World Bank).

Lucas, E. Robert, 2003, "Macroeconomic Priorities," *The American Economic Review*, Vol. 93, No. 1 pp. 1-14 Maddala, G. S., 1987, "Limited Dependent Variable Models Using Panel Data," *The Journal of Human Resources*, Vol. 22, No. 3, pp. 307-38.

Mulas-Granados, Carlos, Sanjeev Gupta, and Emmanuele Baldacci, 2012, "Reassessing the Fiscal Mix for Successful Debt Reduction," *Economic Policy,* Vol. 27, Issue 71, pp. 365–406.

Nickel, Christiane, Philipp Rother, and Lilli Zimmermann, 2010, "Major Public Debt Reductions: Lesson from the Past, Lessons for the Future," Working Paper No. 1241 (Frankfurt: European Central Bank, September).

Reinhart, M. Carmen, and Kenneth S. Rogoff, 2008, "This Time is Different: A Panoramic View of Eight Centuries of Financial Crises," NBER Working Paper No. 13882 (Cambridge, Massachusetts: National Bureau of Economic Research).

_____, 2010, "This Time Is Different Chart book: Country Histories on Debt, Default, and Financial Crises," NBER Working Paper No. 15815 (Cambridge, MA: National Bureau of Economic Research).

_____, 2011, "A Decade of Debt," NBER Working Paper No. 16827 (Cambridge, Massachusett: National Bureau of Economic Research).

Reinhart, M. Carmen, Kenneth S. Rogoff, and Miguel Savastano, 2003, "Debt Intolerance," *Brookings Papers on Economic Activity,* Vol. 2003, No.1, pp. 1–62.

Winkelmann, Liliana, and Rainer Winkelmann, 1998, "Why Are the Unemployed So Unhappy? Evidence from Panel Data," *Economica*, Vol. 65, pp. 1–15.

World Bank, 2005, *Public Debt and its Determinants in Market Access Countries: Results from 15 Country Case Studies* (Washington).

Appendix Table 1. Episodes of Large Debt Reduction without Debt Restructuring

Country	Period	Duration (Years)	Public Debt (percent of GDP)		Change in debt ratio	Fiscal rules?
			Peak	Trough		
Angola	1999-2007	8	89.9	22.7	-67.2	Yes
Antigua	2002-2008	8	124.9	62.1	-62.8	Yes
Armenia	1999-2007	8	38.4	16.1	-22.3	No
Austrialia	1994-2007	18	31.5	9.6	-21.8	Yes
Bahrain	1987-1994	9	26.8	6.8	-20.1	No
Bahrain	2003-2008	5	36.9	14.6	-22.3	No
Belgium	1994-2007	13	132.1	84.2	-47.9	Yes
Belize	1985-1990	5	68.8	39.8	-29.0	No
Bhutan	2004-2008	4	81.8	63.0	-18.8	No
Botswana	1976-1980	4	45.7	13.3	-32.3	No
Botswana	1985-1990	5	39.8	17.1	-22.7	No
Brazil	2002-2008	6	79.8	65.2	-14.6	Yes
Bulgaria	2001-2008	7	68.6	15.5	-53.1	Yes
Canada	1997-2007	10	101.7	66.5	-35.2	Yes
Chile	1993-2000	7	47.4	13.7	-33.7	Yes
Colombia	2003-2008	5	45.6	30.8	-14.8	No
Comoros	1985-1993	8	115.9	69.9	-45.9	No
Croatia	2002-2008	6	48.7	28.5	-20.2	No
Cyprus	2004-2008	4	70.2	48.3	-21.9	Yes
Denmark	1998-2007	9	72.4	34.1	-38.3	Yes
Egypt	2003-2008	5	114.8	74.7	-40.1	No
Equatorial Guinea	2000-2008	8	34.4	0.7	33.7	Yes
Fiji	1997-1999	12	56.6	36.0	-20.6	No
Finland	1994-2002	8	56.6	41.5	-15.1	Yes
Gabon	1978-1984	6	80.1	23.9	-56.2	No
Ghana	1972-1978	6	28.7	9.4	-19.2	No
Grenada	1970-1979	9	136.4	26.2	-110.2	No
Hungary	1995-2001	6	82.4	52.0	-30.4	No
Iceland	1995-2000	5	58.9	41.0	-17.9	No
India	2004-2010	6	83.9	68.1	-15.8	Yes
Iran	1988-1993	5	59.7	24.1	-35.6	No
Iran	1994-1997	3	45.7	23.0	-22.7	No
Iran	2003-2010	7	26.5	11.1	-15.4	No
Ireland	1993-2006	13	94.1	24.8	-69.3	Yes
Israel	1989-1997	8	147.4	99.4	-48.0	Yes
Israel	2003-2008	5	100.2	76.8	-23.4	Yes
Jamaica	2002-2007	5	106.8	82.8	-24.0	No
Kazakhstan	1993-1996	3	38.9	12.7	-26.2	No
Kazakhstan	1999-2007	8	27.2	5.9	-21.2	No
Korea	1985-1996	11	21.5	6.8	-14.6	No
Kuwait	1994-2008	14	114.5	10.0	-104.5	No
Lao PDR	1990-1995	5	202.6	118.5	-84.2	No
Lao PDR	1998-2001	3	187.6	140.2	-47.4	No
Lao PDR	2002-2008	6	144.9	58.0	-86.9	No
Lebanon	1990-1993	3	98.5	50.8	-47.7	No
Lebanon	2006-2010	4	179.9	134.1	-45.8	No
Lesotho	2001-2007	6	126.1	44.9	-81.2	No
Libya	1994-2003	9	78.5	44.9	-33.7	No
Malaysia	1991-1997	6	72.2	31.8	-40.4	No
Maldives	1981-1990	9	88.1	45.5	-42.6	No
Mali	1970-1973	3	79.3	52.4	-26.9	No
Malta	1971-1978	6	38.2	18.2	-20.0	No
Mauritius	1985-1989	4	71.8	48.5	-23.3	No

Appendix Table 1. Episodes of Large Debt Reduction without Debt Restructuring (continued)

Country	Period	Duration (Years)	Public Debt (percent of GDP)		Change in debt ratio	Fiscal rules?
			Peak	Trough		
Mongolia	2003-2007	4	95.8	40.7	-55.1	No
Morocco	2000-2009	9	73.7	47.7	-26.0	No
Myanmar	2000-2008	8	140.9	42.4	-98.5	No
Nepal	2002-2010	8	64.3	35.9	-28.4	No
Netherlands	1995-2002	7	76.1	50.5	-25.6	Yes
New Zealand	1992-2007	5	64.6	17.4	-47.2	Yes
Norway	1993-1999	6	61.3	31.0	-30.4	Yes
Oman	1998-2008	10	38.6	5.1	-33.5	No
Panama	2004-2008	4	62.3	39.2	-23.1	Yes
Papua New Guinea	1987-1988	11	62.1	42.1	-20.0	No
Papua New Guinea	2002-2007	5	62.6	32.9	-29.7	No
Paraguay	2002-2009	7	72.6	18.0	-54.6	No
Peru	2003-2008	5	41.3	25.0	-16.2	Yes
Phillipines	2003-2007	4	67.7	46.1	-21.6	No
Qatar	2001-2008	7	58.2	8.6	-49.6	No
Samoa	1985-1990	5	77.5	63.0	-14.5	No
Samoa	1994-1998	4	121.7	72.8	-48.9	No
Samoa	2003-2005	2	67.2	44.8	-22.4	No
Saudi Arabia	2002-2008	6	96.9	13.2	-83.7	No
Seychelles	1987-1990	3	90.6	72.9	-17.8	No
Seychelles	2003-2006	3	160.6	132.7	-27.8	No
Singapore	1979-81	2	89.0	59.7	-29.3	No
Singapore	1987-1990	3	89.0	73.1	-15.9	No
Slovak Republic	2003-2008	5	42.4	27.8	-14.6	Yes
Solomon Islands	1991-1997	6	67.4	41.2	-26.2	No
Solomon Islands	2002-2010	8	87.0	25.7	-61.3	No
South Africa	1977-1984	7	45.3	23.2	-22.1	No
South Africa	1999-2008	9	45.9	27.3	-18.7	No
Spain	1996-2007	11	67.4	36.1	-31.3	Yes
St Kitts and Nevis	2005-2008	3	168.1	138.0	-30.1	Yes
St Vincent	1994-1997	3	57.0	41.3	-15.7	No
Suriname	2000-2008	8	69.4	18.0	-51.4	No
Sweden	1984-1990	6	70.9	46.3	-24.6	No
Sweden	1996-2008	12	84.4	38.8	-45.6	Yes
Switzerland	1977-1989	12	46.9	31.0	-15.9	No
Switzerland	2004-2008	4	71.9	54.8	-17.1	Yes
Syria	1998-2002	4	150.4	131.2	-19.2	No
Syria	2003-2008	5	133.5	37.4	-96.1	No
Tajikistan	2002-2008	6	79.1	30.2	-48.8	No
Thailand	1986-1996	10	53.0	10.7	-42.2	No
Thailand	2001-2007	6	57.2	37.3	-19.8	No
Trinidad and Tobago	2002-2008	6	58.7	24.1	-34.6	No
Tunisia	2001-2010	9	62.5	40.4	-22.0	No
Turkey	1970-1974	4	39.8	19.0	-20.8	No
Turkey	2001-2007	6	77.6	39.4	-38.1	No
Turkmenistan	1998-2008	10	64.4	2.4	-62.0	No
United Kingdom	1970-1975	5	73.2	46.7	-26.6	No
United Kingdom	1997-2005	8	57.9	42.1	-15.8	Yes
United States	1993-2001	8	72.4	54.7	-17.7	Yes
Uzbekistan	2001-2010	9	59.4	9.8	-49.6	No
Vanuatu	2002-2007	5	41.9	18.7	-23.3	No
Vietnam	1998-2001	3	79.3	39.9	-39.4	No
Zimbabawe	1998-2002	4	88.0	20.1	-67.8	No
Average		**6.6**	**77.9**	**41.8**	**-35.5**	
Median		**6.0**	**70.9**	**38.8**	**-27.8**	

Source: Authors' calculations.