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# Does Fiscal Consolidation Affect Non-Performing Loans? Global Evidence from Heavily Indebted Countries (HICs)

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**Abstract:** This study explores fiscal consolidations' impact on non-performing loans (NPLs) in highly indebted countries (HICs) following the global financial crisis (GFC) and subsequent sovereign debt crisis. A dynamic panel data estimator was applied to obtain the unbiased estimator due to NPLs' time persistence. The findings reveal that fiscal consolidation measures increase NPLs since they limit the household and business loan-serving capacity. Extended analysis categorises fiscal consolidation episodes into (1) the fiscal consolidation weak form (FCWE) and (2) the fiscal consolidation strong form (FCSE). The extended analysis results reveal that the FCWE and FCSE improve NPLs by 1.55% and 31.10%, respectively. The weak-to-strong form transition of the fiscal consolidation analysis resulted in improving NPLs by 28.55 percentage points. NPL definition challenges, the potential influence of loan restructuring and regulatory restrictions, and implications for policymakers and financial institutions in managing NPLs in highly indebted economies were explored. Investigating the potentially different effects of both forms of fiscal consolidation (FCWE and FCSE) on NPLs in countries with different definitions of NPLs, including a comparison study between different definitions, was identified as an implication for future research. Finally, future studies should examine how restrictions on IFRS 9 may affect the FCWE and NPL as well as FCSE and NPL associations.

**Keywords:** non-performing loans; fiscal consolidation; highly indebted countries; global financial crisis; sovereign debt crisis



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## 1. Introduction

The economic recessions that followed the global financial crisis (GFC) of 2007–2009 had varying impacts on credit quality worldwide. Initially, banks heavily exposed to United States residential mortgage-backed securities saw a decline in asset quality. Subsequently, the GFC evolved into a sovereign debt crisis in the Eurozone, further straining the debt-serving capacity of businesses and households, especially in highly indebted countries (HICs)<sup>1</sup> (Louzis et al. 2012; Siakoulis 2017). Notably, Ireland witnessed a significant 24.82 percentage point increase in NPLs from 2003 to 2013, while Ukraine experienced a surge of 51.54 percentage points in NPLs from 2007 to 2017, mirroring the trend seen in other highly indebted economies.

During the sovereign debt crisis, highly indebted economies had to adopt stringent fiscal measures to address their debt burdens. Many of these countries, including Ireland, Spain, Colombia, and Jordan, implemented such measures, increasing the fiscal burden on businesses and households. Businesses face weak demand for their products and services due to the lower disposable income available to households. In these economic conditions, lower free cash flows available to firms and less disposable income for households elevate credit risk for the banking sector. Along these lines, Konstantakis et al. (2016) also mentioned that this fiscal burden negatively affects the debt-servicing capacity, leading to a rise in NPLs. There is a wide range of research on the macroeconomic determinants of

NPLs (Alizadeh Jarvisloo and Muhammad (2013), Beck et al. (2013), Dimitrios et al. (2016), Fallanca et al. (2021), Fofack (2005), Makri et al. (2014), Messai and Jouini (2013), Roland et al. (2013), Zheng et al. (2019), Kartal et al. (2021), Konstantakis et al. (2016), Thornton and Di Tommaso (2020), Tanasković and Jandrić (2015), Vithessonthi (2016), Le et al. (2020), Boumparis et al. (2019), and Jiang et al. (2018)). While there is existing research on the macroeconomic determinants of NPLs, evidence is scarce regarding the fiscal determinants, with limited empirical studies, such as that of Siakoulis (2017), focusing solely on the Eurozone and using the cyclical adjusted primary balance as a measure of the fiscal stance. This study aims to fill this gap by providing empirical evidence on the impact of fiscal consolidation on NPLs in highly indebted countries, making significant contributions to the current literature.

NPLs refer to loans where borrowers cannot meet scheduled repayment obligations outlined in the loan agreement. The NPL ratio represents the proportion of defaulted loans to the total gross loans. Defaulted loans are defined as those with overdue interest and principal payments exceeding three months, while total gross loans encompass the entire loan portfolio's value. It is crucial to note that NPLs reflect the gross value of loans recorded on financial statements and not just the specifically overdue amount. However, caution must be exercised when comparing NPL data across countries due to variations in national accounting practices, standards, taxation policies, and supervision frameworks.

Furthermore, NPL data may not fully capture impaired loans resulting from bank-specific loan restructuring. Therefore, the interpretation of NPL data requires careful consideration, as reporting bodies employ different methodologies. Barisitz (2013) conducted a comprehensive study to shed light on the definition of NPLs across diverse economies, identifying two key criteria: loans overdue by more than 90 days or strong evidence indicating significant weaknesses in the loan or borrower's financial position<sup>2</sup>.

The discussion on loan restructuring is essential due to regulatory restrictions regarding the transfer of NPLs into performing loans. For example, restructured loans typically need to remain non-performing for a probationary period of one year, followed by an additional two years before their status can be changed. The treatment of restructured loans in historical non-performing loan data remains unclear<sup>3</sup>. Furthermore, a situation may arise where a borrower fulfils payment obligations for one loan but fails to do so for another. This raises concerns regarding the classification of loans as performing, considering the well-defined weakness highlighted in the second key element of Barisitz's (2013) comprehensive definition of NPLs. Such discussions indicate that the restructuring of NPLs can impact the health of a balance sheet. Consequently, global data on NPLs may present a slightly different picture of balance sheet health, while accounting and financial standards, such as the IFRS and GAAP, primarily focus on impaired loans rather than NPLs<sup>4</sup>.

NPLs arise from financial sector difficulties (Konstantakis et al. 2016), which are intertwined with macroeconomic conditions. During an economic expansionary phase, NPLs tend to decrease as the debt-servicing capacity of businesses and households improves. However, the financial sector may extend credit to less-creditworthy customers, increasing NPLs during an economic downturn. Recessional conditions diminish the income streams of consumers and firms, contributing to a rise in NPLs. Furthermore, the financial sector has been found to influence overall economic growth (Carlstrom and Fuerst (1997), De Bock and Demyanets (2012), Fisher (1933), and Kiyotaki and Moore (1997)). Increased levels of NPLs result in higher associated costs, reducing the owner's equity of banks, increasing the credit risk of commercial banks (Jiajia et al. (2023)), and potentially leading to insolvencies and systemic failures. Under such circumstances, the banking system faces challenges in effectively channelling savings into investments and transmitting monetary policy to the real economy.<sup>5</sup> This study primarily focuses on the transmission mechanism through which the economy affects the banking sector, specifically examining the impact of the debt-servicing capacity of individual and corporate borrowers on fiscal stance improvement (Perotti (1996)).

However, identifying the effect of a fiscal stance is complicated by potential endogeneity issues. The existing literature employs various measures to analyse fiscal policy effects. For instance, [Siakoulis \(2017\)](#) utilised the cyclical adjusted primary balance, which represents the budget balance under normal economic activity levels. A positive change in this indicator indicates an increased tax burden, adversely affecting the debt-servicing capacity of businesses and households. Another approach employed in the literature ([Alesina and Ardagna \(2010\)](#), [Barríos et al. \(2010\)](#), [Mirdala \(2013\)](#), [Perotti \(1996\)](#), and [Rahman \(2018\)](#)) is the use of strict fiscal measures to identify fiscal effects. This approach focuses on fiscal consolidation episodes aimed at reducing the burden of sovereign debt. Two measurement approaches are commonly used for fiscal consolidation episodes: the “cold shower” approach and gradual consolidation. The cold shower approach identifies a fiscal consolidation episode when the cyclical adjusted primary balance improves by more than 1.5% of the GDP per year. Gradual consolidation, on the other hand, refers to a situation where the cyclical adjusted primary balance does not deteriorate by more than 0.5% of the GDP per year. Building upon the work of [Rahman \(2018\)](#), a strong episode of fiscal consolidation is defined as a period in which the cyclical adjusted primary balance improves by 1.5% of the GDP per year or two consecutive years with an improvement of at least 1% of the GDP per year. To the best of our knowledge, this study represents the first attempt to analyse the impact of both weak and strong forms of fiscal consolidation on NPLs.

The existing literature ([Beck et al. \(2013\)](#), [Dimitrios et al. \(2016\)](#), [Fallanca et al. \(2021\)](#), [Kjosevski and Petkovski \(2021\)](#), [Louzis et al. \(2012\)](#), [Makri et al. \(2014\)](#), [Messai and Jouini \(2013\)](#), [Roland et al. \(2013\)](#), [Siakoulis \(2017\)](#), [Vogiazas and Nikolaidou \(2011\)](#), and [Zheng et al. \(2019\)](#)) has identified a wide range of determinants of the NPLs. Following this strand of research, this study uses economic growth and unemployment to capture the effect of the economic cycle. The existing empirical literature shows that the debt-servicing capacity of businesses and households has a negative relationship with economic growth and a positive relationship with unemployment. Inflation also affects the debt-serving capacity of businesses and households through different channels. The first channel increases the debt-servicing capacity of businesses and households. For instance, the higher level of inflation reduces the real value of an outstanding loan, making debt serving much easier. Conversely, the second channel deteriorates the debt-serving capacity of these agents. For instance, the higher level of inflation reduces the real income of borrowers, which deteriorates the borrowers’ capacity to repay the loans.

Furthermore, the monetary policy announcements affect the NPLs in a variable loan rate environment. In particular, the monetary policy actions to reduce the level of inflation are highly likely to reduce the debt-serving capacity of borrowers, since the lenders adjust their rates to maintain the real returns. In other words, they increase their interest rates in response to the increasing policy rates. These rate adjustments deteriorate the loan-paying capacity of borrowers. Therefore, the impact of inflation on the NPLs can be positive or negative. This study also uses private debt as a control variable, and it is expected that private credit is positively associated with NPLs, since the increase in private credit restricts the capacity of businesses and households to refinance their debt. To summarise, this study uses economic growth, unemployment, inflation, and domestic credit for the private sector as the control variables to separate the effect of fiscal measures from the general macroeconomic factors.

Our empirical investigation reveals that fiscal consolidation measures increase the NPLs in highly indebted countries since these measures limit the loan-serving capacity of households and businesses. The existing literature used the positive change in the CAPB to analyse its impact on NPLs. We called this positive change in the CAPB the weak form of fiscal consolidation. Our findings reveal that the weak form of fiscal consolidation improves NPLs by 1.55%. In other words, any positive change in the cyclical adjusted primary balance improves NPLs by one and a half percent. To the best of our knowledge, the impact of the strong form of fiscal consolidation on NPLs has yet to be analysed. Therefore, this study

contributes to the existing empirical literature by adding evidence on the strong form of fiscal consolidation. The strong form of fiscal consolidation is defined as a period where the cyclical adjusted primary balance improves by 1.5 percent of the GDP per year or a period of two consecutive years where the cyclical adjusted primary balance is improved by at least 1 percent of the GDP per year. Our extended analysis indicates that the strong form of fiscal consolidation improves the NPLs by 30.10%. The most striking observation to emerge from the comparison between the weak form and the strong form of fiscal consolidation is that moving from the weak form to the strong form improves the NPLs by 28.55 percentage points. The results of this study are consistent with the theoretical expectation.

The rest of this paper is organised as follows. Section 2 presents the relevant literature on the topic. Section 3 presents the data, empirical model, and estimation strategy, which is further categorised into (1) The Data Set and HICS Classification, (2) Empirical Model and Estimation Strategy, and (3) Methodological Notes on Fiscal Consolidation Episodes. Section 4 presents the results and discussion. This study is concluded in Section 5.

## 2. Literature Review

The empirical literature on the association between macroeconomic conditions and credit quality is extensive (Dimitrios et al. (2016), Fallanca et al. (2021), Kjosevski and Petkovski (2021), Tanasković and Jandrić (2015), and Zheng et al. (2019)) and focuses primarily on the loan-serving capacity of households and businesses. For instance, several studies have reported a positive relationship between unemployment and NPLs, since a higher level of unemployment lowers the loan-serving capacity of households and businesses. Most of the studies on NPLs are country-specific and conducted after the financial and debt crises. For instance, Vogiazas and Nikolaidou (2011) investigated the determinants of the NPLs in Romania's banking and financial system. Their empirical investigation revealed that unemployment, inflation, external debt, and M2 are the critical determinants of credit quality in the Romanian financial system.

Apart from the macroeconomic factors, bank-specific factors also affect the quality of loans in any banking sector. Furthermore, it might be relevant to note that these bank-specific and macroeconomic effects vary between different loan categories. Along these lines, Louzis et al. (2012) reported that the macroeconomic factors, including the GDP, unemployment, public debt, and interest rates, explain the NPLs of all categories. They further reported that management quality is also one of the key determinants of NPLs. The weighted average loan rate was also reported as a determinant (Greenidge and Grosvenor (2010)). One strand of research used the panel of banks to investigate the determinants of the NPLs (Alizadeh Janvisloo and Muhammad (2013), Messai and Jouini (2013), Quagliariello (2007), and Salas and Saurina (2002)).

Another strand of research used cross-country data to identify the specific determinants of credit quality. We follow this approach since cross-country analysis incorporates country-specific variations in the trends of NPLs. This country-specific variation has a couple of sources, including accounting standards. Econometrically, cross-country analysis provides more robust results than time series analysis. Using an unbalanced panel of 75 countries, Roland et al. (2013) reported that share prices, real GDP growth, lending interest rates, and exchange rates are critical determinants of NPLs. However, they reported some variation in the exchange rate and share price effects. The countries with pegged and managed exchange rates had a higher impact of exchange rates on the NPLs. Working in a similar vein, Makri et al. (2014) used the unbalanced panel data from 2002 to 2008 of 14 Eurozone economies and reported that the state of the economy is significantly linked with the loan quality. In particular, they reported that the NPLs of the previous year, GDP, unemployment, and public debt are the key determinants of NPLs. Similarly, Fofack (2005) used the unbalanced panel data of 16 sub-Saharan African countries from 1993 to 2003 and reported the strong causality between NPLs and (1) economic growth, (2) interest rates, and (3) real exchange rates. Comparatively recently, some panel studies were also published on the determinants of NPLs. For instance, Kjosevski and Petkovski (2021) investigated

the macroeconomic and bank-specific determinants of NPLs from the Baltic states using panel data from 21 commercial banks. By applying the fixed-effect Generalised Method of Moments difference and system, they reported that GDP growth, inflation, public debt, and unemployment are key determinants of NPLs. However, they also reported the bank-specific determinants, including return on assets, total assets ratio, return on equity, and the growth of gross loans.

To the best of our knowledge, we could not find any paper on the linkage between fiscal policy and NPLs other than that of Siakoulis (2017). Using a global dataset from 31 countries, Siakoulis reported that fiscal pressure, as measured by the changes in the cyclical adjusted primary balance, determines the NPLs.

### 3. Research Design

#### 3.1. The Data Set and HICS Classification

The data set used in this study is a balanced panel which consists of NPLs, fiscal consolidation episodes, and a set of control variables. The control variables consist of economic growth, unemployment, inflation, and domestic credit to the private sector. The complete definitions, acronyms, and indicator codes are given in Table 1. Fiscal consolidation and NPLs are the key variables of interest in this study. A separate section is included on the detailed calculation of the weak and strong episodes of the fiscal consolidation episodes.

**Table 1.** Definitions, acronyms, and indicator codes of the variables.

Names of the Variables	Acronyms	Indicator Codes
<i>Dependent Variable</i>		
Bank NPLs to gross loans (%)	BNPL	GFDD.SI.02
<i>Independent Variable</i>		
Weak episode of fiscal consolidation	FCWE	Author’s calculation
Strong episode of fiscal consolidation	FCSE	Author’s calculation
<i>Control Variables</i>		
GDP growth (annual %)	GDPG	NY.GDP.MKTP.KD.ZG
Unemployment, total (% of the total labour force) (national estimate)	UNEM	SL.UEM.TOTL.NE.ZS
Inflation, GDP deflator (annual %)	INFL	NY.GDP.DEFL.KD.ZG
Domestic credit to the private sector (% of GDP)	LCPD	FS.AST.PRVT.GD.ZS
<i>Variable to calculate HICS countries</i>		
Central government debt, total (% of GDP)	CGTD	GC.DOD.TOTL.GD.ZS

Note: See the section Methodological Notes on Fiscal Consolidation Episodes for the detailed calculation of the weak and strong episodes of the fiscal consolidation.

The highly indebted countries (HICs) were selected based on the entire stock of the direct long-term contractual obligations of the government to others. The central government debt (percent of the GDP) is the most suitable measure for this entire stock. These data calculate the average debt of all the countries available in the World Development Indicators (World Bank 2022). For this purpose, we used the latest data on the central government debt (percent of the GDP) for the last 10 years. Then, the countries were sorted in descending order, and the first 35 countries were selected as the HICs countries. These global data enabled us to investigate the common patterns in the NPLs.

#### 3.2. Empirical Model and Estimation Strategy

Following the recent literature (Louzis et al. (2012) and Rahman et al. (2020)), this study applied the dynamic panel data estimator to arrive at the unbiased estimator due to the time persistence in NPLs. Equation (1) presents the dynamic panel data specification to analyse the impact of fiscal consolidation on NPLs:

$$NPL_{i,t} = \beta NPL_{i,t-1} + \gamma(L)x_{i,t} + \delta_i + \varepsilon_{i,t}; |\beta| < 1, i = 1, \dots, N, t = 1, \dots, T. \quad (1)$$



The subscripts  $i$  and  $t$  represent the cross-sectional and time dimensional of the panel dataset, respectively.  $NPL_{i,t}$  represents the NPLs as the dependent variable, and  $\gamma(L)$  denotes a lag polynomial vector, while  $x_{i,t}$  is the  $k \times 1$  vector of independent variables other than  $y_{i,t-1}$ . Here,  $\delta_i$  and  $\varepsilon_{i,t}$  represent the unobserved individual effect and the error term, respectively.

The existing literature (see [Siakoulis \(2017\)](#)) provides evidence of time persistency in NPLs. Therefore, Equation (1) is consistently estimated using the Generalised Method of Moments in a framework proposed by [Arellano and Bond \(1991\)](#). Later, this approach was generalised by [Arellano and Bover \(1995\)](#) and [Bulundell and Bond \(1998\)](#). This estimation approach is based on the first difference transformation and the subsequent elimination of  $\delta_i$ . In this case, Equation (1) can be written as follows:

$$\Delta NPL_{i,t} = \beta \Delta NPL_{i,t-1} + \gamma(L) \Delta x_{i,t} + \Delta \varepsilon_{i,t} \tag{2}$$

In Equation (2),  $\Delta$  represents the first difference operator. As mentioned above,  $x_{i,t}$  represents the explanatory variables. The explanatory variable set includes the primary and control variables of interest. In particular, this set includes (1) weak episodes of fiscal consolidation (FCWE), (2) strong episodes of fiscal consolidation (FCSE), (3) the GDP growth (GDPG), (4) unemployment (UNEM), (5) inflation (INFL), and (6) domestic credit to the private sector (LCPD). We used the FCWE as the positive change in the cyclical adjusted primary balance. However, the FCSE is a dummy variable which takes a value of one for the case of strong episodes of fiscal consolidation and zero otherwise. Following [Rahman \(2018\)](#), a strong episode of fiscal consolidation is a period where the cyclical adjusted primary balance improves by 1.5 percent of the GDP per year or a period of two consecutive years where the cyclical adjusted primary balance is improved by at least 1 percent of the GDP per year. For further details on these variables, see [Table 1](#). However, detailed notes on the calculation of the fiscal consolidation episodes are provided in [Section 3.3](#) (Methodological Notes on Fiscal Consolidation Episodes). Based on this set of explanatory variables, Equation (2) can be rewritten as

$$\Delta NPL_{i,t} = \beta_1 \Delta NPL_{i,t-1} + \gamma_1 \Delta FCWE_{i,t} + \gamma_2 \Delta FCSE_{i,t} + \gamma_3 \Delta GDPG_{i,t} + \gamma_4 \Delta UNEM_{i,t} + \gamma_5 \Delta INFL_{i,t} + \gamma_6 \Delta LCPD_{i,t} + \Delta \varepsilon_{i,t} \tag{3}$$

It might be relevant to note that the error term  $[\Delta \varepsilon_{i,t}]$  in Equation (2) is, by definition, correlated with the lagged dependent variable  $\Delta NPL_{i,t-1}$ . This correlation imposes a bias in the estimation process of the model. One of the possible ways to arrive at the unbiased coefficient is using the higher-order lags of the dependent variables as instruments. For instance, it is expected in Equation (2) that the second lag of NPLs  $\Delta NPL_{i,t-2}$  is correlated with its first lag  $\Delta NPL_{i,t-1}$  and uncorrelated with the error term  $[\Delta \varepsilon_{i,t}]$  for the third period and above. Therefore,  $\Delta NPL_{i,t-2}$  can be used as an instrument in Equation (2). This discussion reveals that lags of orders of two and above satisfy the moment condition of  $E = 0$  for  $t = 3, \dots, T$  and  $s \geq 2$ . Another source of biasedness originates from (1) the possible endogeneity of the explanatory variables and (2) the correlation with the error term  $[\Delta \varepsilon_{i,t}]$ . The explanatory variables should be strictly exogenous. For the case of strictly exogenous variables, the historical and future values are uncorrelated with the error term  $[\Delta \varepsilon_{i,t}]$ . In other words, the strict exogenous variables satisfy the moment condition of  $E = 0$  for  $t = 3, \dots, T$  and all the values of  $s$ . However, the restrictive assumption of the strict exogenous is no longer valid in reverse causality. Following [Cameron and Trivedi \(2010\)](#), the current lagged values of the explanatory variables are the only valid instruments for the weak or predetermined explanatory variables implying the moment condition of  $E = 0$  for  $t = 3, \dots, T$  and  $s \geq 2$  (see [Gholami et al. \(2023\)](#), [Gholami et al. \(2022\)](#) and [Siakoulis \(2017\)](#)). Based on these orthogonality restrictions, the estimates of the GMM are consistent. Furthermore, we apply the Sargan specification test for the null hypothesis, and therefore the instruments must be valid for that moment's conditions. This test is asymptotically distributed as a chi-square. The reported J-statistics are simply the Sargan

statistics. Furthermore, we apply the Arellano–Bond test for zero autocorrelation in the first-difference error. Consequently, the null hypothesis of no autocorrelation is expected to be rejected at order one and not at the higher orders.

### 3.3. Methodological Notes on Fiscal Consolidation Episodes

Identification of the fiscal effect on banks' NPLs is difficult due to potential endogeneity (Siakoulis 2017). Therefore, the budgetary impact should be recorded when the economy is at a normal activity level. Along these lines, Siakoulis (2017) used the cyclical adjusted primary balance to analyse the effect of fiscal policy on NPLs. Theoretically, the cyclical adjusted primary balance removes the endogenous components of spending and revenues. In particular, the cyclical adjusted primary balance reveals the fiscal position after removing the cyclical and automatic movements. Considering these theoretical aspects, the positive change in the cyclical adjusted primary balance is considered a weak fiscal consolidation episode. However, this study extends the empirical literature by incorporating the second type of fiscal consolidation episode. Following the existing empirical literature (Alesina and Ardagna (2010), Alesina and Perotti (1995), Mirdala (2013), and Rahman (2018)), we incorporate the strong episodes of fiscal consolidation in Equation (3).

Fiscal consolidation is the improved fiscal stance to reduce the burden of sovereign debt. Following Mirdala (2013), this is accomplished through a set of fiscal arrangements on the side of the government budget's revenue and expenditures. The existing literature has provided several approaches to measure the episodes of fiscal consolidation (Alesina and Ardagna (2010), Barrios et al. (2010), and Mirdala (2013)). The most common approach to measuring fiscal consolidation episodes was given by Mirdala (2013), which is a revised version of the approach proposed by Barrios et al. (2010). Mirdala (2013) used two approaches, including (1) the cold shower approach and (2) gradual consolidation. According to the cold shower approach, the episode of fiscal consolidation is when the cyclical adjusted primary balance improves by more than 1.5 percent of the GDP per year. However, gradual consolidation is when the cyclical adjusted primary balance will not deteriorate by more than half a percent of the GDP per year. Following Rahman (2018), a strong episode of fiscal consolidation is a period where the cyclical adjusted primary balance improves by 1.5 percent of the GDP per year or a period of two consecutive years where the cyclical adjusted primary balance is improved by at least 1 percent of the GDP per year.

#### Cyclical Adjusted Primary Balance

There are different approaches to calculating the cyclical adjusted primary balance. However, Mirdala (2013) revealed that the main algorithm follows the same procedures"

1. The first step is to estimate the potential GDP.
2. The second step is to determine the responses of the key revenues and expenditures to a fluctuation in the cyclical GDP.
3. The third step is to adjust these cyclical components calculated in the second step from the revenue and expenditures.

The existing literature has different approaches to estimating the cyclical components, as mentioned in the second step above. One approach is to estimate the income elasticities of the main budgetary variables, including revenue and expenditures (Altar et al. (2010) and Bouthevillain et al. (2001)). However, most empirical studies apply the Hodrick and Prescott (HP) filter (Hodrick and Prescott (1997)) to calculate the cyclical components. Following this strand of research, we apply the HP filter to calculate the cyclical components for the fiscal variables. Mirdala (2013) revealed that the cyclical adjusted primary balance is calculated by subtracting the cyclical components from the primary government balance. This can be written as follows:

$$CAPB_t = PB_t - B_t^c = PB_t - \sum_{i=1}^n B_{t,i}^c \quad (4)$$

where  $CAPB$ ,  $PB$ , and  $B^c$  represent the cyclical adjusted primary balance, primary balance, and cyclical components, respectively. Here, the primary balance is calculated by subtracting the interest payable from the actual government budget balance. This can be represented as follows:

$$PB_t = B_t - E^I \tag{5}$$

$B_{t,i}^c$  in Equation (4) represents a cyclical component of each budget category, including revenue and expenditure. As mentioned above, we apply the HP filter to calculate the cyclical components. Being a two-sided linear filter, the HP filter minimises the variance in  $y$  around  $s$  and computes the smoothed series  $s$  of  $y$  (Hodrick and Prescott (1997)). This computation is subject to a penalty that constrains the second difference of  $s$ . And the HP filter selects  $s$  to minimise. This can be represented as follows:

$$\sum_{t=1}^T (y_t - s_t)^2 + \lambda \sum_{t=2}^{T-1} ((s_{t+1} - s_t) - (s_t - s_{t-1}))^2 \tag{6}$$

In Equation (6), the smoothness of variance is controlled by  $\lambda$ . And as  $\lambda = \infty$ ,  $s$  approaches a linear trend. EViews 12 is used to apply this HP filter and estimate the cyclical components.

#### 4. Results and Discussion

Table 2 presents the descriptive statistics of the variables selected for this study. Critical analysis of Table 2 reveals that 6.03% of the total bank loans were NPLs. The highest level of NPLs was observed in Ukraine, Indonesia, and Uruguay. It might be relevant to note that the highest level of NPLs was observed in Ukraine from 2017 to 2019.<sup>6</sup> What is interesting about the data in this table is that it reveals useful insights about fiscal consolidation. The descriptive statistics of the weak episodes of fiscal consolidation reveal that the cyclical adjusted primary balance was reduced by 0.41% of the GDP in the top 35 HICs from 2000 to 2020. The main source of variation in the cyclical adjusted primary balance was within the economies. The construction of strong episodes of fiscal consolidation is complex. However, 12.93 percent of the budgetary efforts could be considered strong commitment of the government to improving the fiscal stance.

**Table 2.** Descriptive statistics.

Variable		Mean	Std. Dev.	Min	Max	Observations
BNPL	Overall	6.0354	6.9033	0.2000	54.5413	N = 624
	Between		4.7869	0.9927	22.8881	n = 34
	Within		5.1332	-13.8527	37.6886	T = 18.3529
FCWE	Overall	-0.4096	2.9920	-16.1102	15.0072	N = 686
	Between		1.6505	-4.9682	2.0327	n = 35
	Within		2.5048	-17.0294	14.0880	T-bar = 19.6
FCSE	Overall	0.1293	0.3357	0.0000	1.0000	N = 735
	Between		0.0935	0.0000	0.3333	n = 35
	Within		0.3228	-0.2041	1.0816	T = 21
GDPG	Overall	3.0991	3.6954	-18.9795	25.1763	N = 735
	Between		1.3947	-0.2410	5.8194	n = 35
	Within		3.4299	-15.6395	23.2489	T = 21
UNEM	Overall	7.8553	6.1962	0.0000	33.2900	N = 734
	Between		5.4026	1.1276	27.2562	n = 35
	Within		3.1570	-9.7195	21.3905	T = 20.9714
INFL	Overall	5.6538	10.0784	-5.9922	185.2908	N = 735
	Between		6.1587	-0.4652	33.1890	n = 35
	Within		8.0422	-19.1933	157.7556	T = 21
LCPD	Overall	4.2207	0.6416	2.8236	5.7189	N = 643
	Between		0.6005	3.3519	5.2135	n = 35
	Within		0.2348	3.2692	5.1246	T-bar = 18.3714

Note: BNPL, FCWE, FCSE, GDPG, UMEN, INFL, and LCDP indicate the bank NPLs to gross loans, weak episodes of fiscal consolidation, strong episodes of fiscal consolidation, gross domestic product growth, unemployment, inflation, and the natural log of domestic credit to the private sector, respectively.



The correlation analysis results in Table 3 revealed that there was no evidence of multicollinearity since the independent variables were not correlated. Following the empirical strategy, the models were estimated using the GMM after testing the appropriateness of the estimation techniques.<sup>7</sup> Along these lines, the existing empirical literature reveals that stationarity of the panel data should be ensured for appropriate estimation of the dynamic panel model (Buck et al. (2008) and Chang et al. (2011)).

**Table 3.** Correlation analysis.

		FCSE	FCWE	GDPG	UNEM	INFL	LCPD
FCSE	Correlation	1.0000					
	t-Statistics	----					
	Probability	----					
FCWE	Correlation	0.0901 **	1.0000				
	t-Statistics	2.2569	----				
	Probability	0.0244	----				
GDPG	Correlation	-0.1234 **	0.3286 ***	1.0000			
	t-Statistics	-3.1044	8.6831	----			
	Probability	0.0020	0.0000	----			
UNEM	Correlation	0.1325 ***	0.0236	-0.1511 ***	1.0000		
	t-Statistics	3.3364	0.5882	-3.8141	----		
	Probability	0.0009	0.5566	0.0002	----		
INFL	Correlation	0.1234 ***	0.1193 ***	0.0753 **	0.0287	1.0000	
	t-Statistics	3.1030	2.9980	1.8837	0.7157	----	
	Probability	0.0020	0.0028	0.0601	0.4745	----	
LCPD	Correlation	0.0358	-0.2521 ***	-0.2146 ***	0.0323	-0.3703 ***	1.0000
	t-Statistics	0.8932	-6.5033	-5.4832	0.8076	-9.9501	----
	Probability	0.3721	0.0000	0.0000	0.4196	0.0000	----

Note: BNPL, FCWE, FCSE, GDPG, UMEN, INFL, and LCDP indicate the bank NPLs to gross loans, weak episodes of fiscal consolidation, strong episodes of fiscal consolidation, gross domestic product growth, unemployment, inflation, and the natural log of domestic credit to the private sector, respectively. \*\* < 0.05, \*\*\* < 0.01.

Stationarity testing is particularly important when T is less than N, as demonstrated in our dataset.<sup>8</sup> There was another reason to test the stationarity before applying the GMM, as the first-difference GMM only takes care of the first order of integration. Therefore, stationarity testing should be applied to ensure that none of the series is integrated into an order of two. For this purpose, this study applied three cross-sectionally independent panel unit root tests, including (1) Levin, Lin, and Chu, (2) the ADF-Fisher Chi-square, and (3) the PP-Fisher Chi-square.

Table 4 presents the results of these tests at the level and the first difference. A critical analysis of this table reveals that all the series were stationary, at least at the first difference. These results ensure that it is econometrically appropriate to estimate Equation (3). Table 5 presents the results of the impact of fiscal consolidation on the NPLs of the HICs. Columns 1 and 2 present the coefficients of the test statistics of Equation (2), which were estimated using the panel GMM with the first difference transformations. This model is named Model 1. Columns 3–8 present the coefficients of the test statistics of Equation (2) estimated using pooled (Model 2), random (Model 3), and fixed effects (Model 4). The estimates of Models 2–4 were part of the robustness analysis. This study aims to analyse the impact of fiscal consolidation on NPLs in highly indebted economies. The NPLs are the ratio of defaulting loans to total gross loans<sup>9</sup>. The dataset from the wide scope of economics enabled us to investigate the common patterns in the NPLs.

**Table 4.** Panel unit root tests.

	At Level			At First Difference		
	LLC	ADF-F	PP-F	LLC	ADF-F	PP-F
BNPL	−18.0683 0.0000	610.5140 0.0000	463.3610 0.0000	−5.8995 0.0000	202.3380 0.0000	542.7890 0.0000
FCWE	−7.4605 0.0000	164.7540 0.0000	169.5170 0.0000	−19.7814 0.0000	450.2270 0.0000	451.2990 0.0000
FCSE	−8.7310 0.0000	117.9560 0.0000	120.9550 0.0000	−30.7682 0.0000	400.6090 0.0000	296.5490 0.0000
GDPG	−8.5565 0.0000	195.2070 0.0000	190.8560 0.0000	−28.4972 0.0000	621.2740 0.0000	615.6850 0.0000
UNEM	−4.1440 0.0000	154.6120 0.0000	149.4780 0.0000	−17.6138 0.0000	363.9070 0.0000	694.3550 0.0000
INFL	−10.2159 0.0000	243.4020 0.0000	225.0290 0.0000	−36.5655 0.0000	726.6920 0.0000	710.1670 0.0000
LCPD	−1.5656 0.0587	84.8266 0.1094	85.9664 0.0944	−2.9989 0.0014	135.6620 0.0000	225.6220 0.0000

Note: BNPL, FCWE, FCSE, GDPG, UMEN, INFL, and LCPD indicate the bank NPLs to gross loans, weak episodes of fiscal consolidation, strong episodes of fiscal consolidation, gross domestic product growth, unemployment, inflation, and the natural log of domestic credit to the private sector, respectively.

**Table 5.** Impact of fiscal consolidation on the NPLs of the HICs.

	Model 1 (GMM)		Model 2 (Pooled)		Model 3 (Random)		Model 4 (Fixed)	
	Coefficient (1)	t-Stat (2)	Coefficient (3)	t-Stat (4)	Coefficient (5)	t-Stat (6)	Coefficient (7)	t-Stat (8)
BNPL (-1)	0.8386 ***	173.0265						
FCWE	0.0155 **	1.8658	0.0220 ***	0.2291	0.1097 **	1.1784	0.1213 **	1.2527
FCSE	0.3010 ***	4.5585	3.4370	4.2808	1.7588	2.7890	1.4868	2.3277
GDPG	−0.3097 ***	−41.4851	−0.2696 ***	−2.9762	−0.2155 **	−2.7372	−0.1856 **	−2.2930
UNEM	0.1464 ***	29.9918	0.1673 ***	4.2974	0.3856 ***	5.7880	0.4944 ***	6.1327
INFL	0.0547 ***	23.6857	0.0016	0.0331	0.0163	0.4649	0.0175	0.4964
LCPD	−0.1006 **	−2.8072	−2.3737 ***	−5.8425	−2.5276 ***	−3.5083	−2.4397 **	−2.7017
C			14.3889 ***	7.8559	13.6066 ***	4.1882	12.0663 ***	3.0342
J-statistic		29.4914						
Prob. (J-statistic)		0.3375						
Instrument rank		34.0000						
<i>Arellano–Bond Serial Correlation Test</i>								
AR (1)								
M-Statistic	−0.4684 ***							
Prob.		0.0000						
AR (2)								
M-Statistic	−0.1908							
Prob.		0.8487						
<i>Lagrange Multiplier Tests for Random Effects</i>								
Breusch–Pagan			486.5730 ***					
Prob.				0.0000				
<i>Correlated Random Effects—Hausman Test</i>								
Chi-Sq. Statistic					11.8314 **			
Prob.						0.0658		

Note: BNPL, FCWE, FCSE, GDPG, UMEN, INFL, and LCPD indicate the bank NPLs to gross loans, weak episodes of fiscal consolidation, strong episodes of fiscal consolidation, gross domestic product growth, unemployment, inflation, and the natural log of domestic credit to the private sector, respectively. For further details on these variables, see Table 1. \*\* < 0.05; \*\*\* < 0.01.

The first row of Table 5 reveals that the coefficient of the lagged dependent variable was positive and statistically significant at a five percent significance level. These results indicate that the NPLs increase in the current period if these loans increased in the previous period.<sup>10</sup> It is highly likely that the fiscal consolidation measures increased the NPLs since

these measures limit the loan-serving capacity of households and businesses. The results of this study are consistent with the theoretical expectation. The first two columns of Table 5 show that fiscal consolidation improved the NPLs in highly indebted countries. These results are consistent with those of Siakoulis (2017). It might be relevant to note that Siakoulis (2017) used the cyclical adjusted primary balance to measure the fiscal policy effects. He specifically used the positive change in the cyclical adjusted primary balance to measure the effect of austere fiscal policy. Conceptually, the first measure of fiscal consolidation is similar to the approach used by Siakoulis (2017). This study called it the weak form of fiscal consolidation, and the results of Table 5 reveal that the weak form of fiscal consolidation improved the NPLs by 1.55%. In other words, any positive change in the cyclical adjusted primary balance improved the NPLs by one and a half percent. To the best of our knowledge, no one has analysed the impact of the strength of fiscal consolidation on NPLs. Therefore, this study contributes to the existing empirical literature by adding evidence on the strong form of fiscal consolidation.

The coefficient of FCSE (the strong form of fiscal consolidation) was positive and statistically significant, revealing that the period of fiscal consolidation improved the NPLs by 30.10%. The most striking observation to emerge from the comparison between the weak form and the strong form of fiscal consolidation is that moving from the weak to the strong form improved the NPLs by 28.55 percentage points.<sup>11</sup> However, these results should be interpreted carefully since there are significant differences in the definitions of the NPLs across jurisdictions, despite some recent efforts in the form of IFRS 9.

The next row of Table 5 presents the results of the economic growth. The coefficient of economic growth was negative and statistically significant. These results reveal the strong dependence of the debt-serving capacity of businesses and households on economic growth. These results are consistent with those of Louzis et al. (2012) and Siakoulis (2017). Similar results were observed for the case of domestic credit to the private sector. The next control variable of this study was unemployment, and its coefficients were positive and significant. This finding broadly supports the work of other studies in this area (Louzis et al. (2012) and Siakoulis (2017)). A possible explanation might be that businesses can predict their debt-serving capacity and take steps to cut their costs. One of the possible methods of cost-cutting is reducing the labour force. However, reducing the labour force cannot always avoid debt-serving problems. Another possible explanation is that the higher level of unemployment deteriorates the debt-serving capacity of business and households.

Table 5 further reveals that the coefficient of inflation was also positive and statistically significant. These results indicate that the higher level of inflation affected the borrower's debt-serving capacity through various channels. Along these lines, Siakoulis (2017) further revealed that the impact of inflation can be positive or negative on NPLs. For instance, the higher level of inflation reduces the real value of an outstanding loan, making debt serving much easier. Conversely, the higher level of inflation reduces the real income of borrowers, which deteriorates the borrowers' capacity to repay the loans.

Furthermore, the monetary policy announcements affect NPLs in a variable loan rate environment. In particular, the monetary policy actions to reduce the level of inflation are highly likely to reduce the debt-serving capacity of borrowers, since the lenders adjust their rates to maintain real returns. In other words, they increase their interest rates in response to the increasing policy rates. These rate adjustments deteriorate the loan-paying capacity of borrowers. The inflation coefficients (see Table 5) were positive and statistically significant. The data of NPLs were not strictly comparable across countries due to a couple of differences in the national accounting, accounting standards, taxation, and supervision regimes.

## 5. Robustness Tests

We tested the robustness of our findings using the alternative models as elaborated in Section 4 above. In particular, we used three alternative models, including (1) the pooled model (see Model 2 in Table 5), (2) the random model (see Model 3 in Table 5), and (3) the

fixed effects model (see Model 4 in Table 5). A comparison of the coefficients of the GMM model with the coefficients of our three alternative models revealed that our estimated coefficients maintained their orders of magnitude and statistical significance in most of the cases. In particular, our main findings were robust to different models.

## 6. Conclusions

This study investigated the impact of fiscal consolidation on NPLs in highly indebted countries. Identification of the fiscal effect on banks' NPLs is difficult due to potential endogeneity. Consequently, the budgetary impact should be recorded when the economy is at a normal activity level. Along these lines, the existing literature applied the cyclical adjusted primary balance to measure the impact of fiscal consolidation on NPLs. We extended this literature by measuring the episodes of fiscal consolidation. For this purpose, we categorised the fiscal consolidation episodes into two types, including (1) the weak form of fiscal consolidation and (2) the strong form of fiscal consolidation (see Section 3.3 (Methodological Notes on Fiscal Consolidation Episodes)). Considering the theoretical aspects, the positive change in the cyclical adjusted primary balance was considered a weak fiscal consolidation episode. A strong episode of fiscal consolidation was when the cyclical adjusted primary balance improved by 1.5 percent of the GDP per year or two consecutive years where the cyclical adjusted primary balance was improved by at least 1 percent of the GDP per year. We used the World Development Indicators (World Bank 2022) to arrive at 35 highly indebted countries to analyse the impact of fiscal consolidation on NPLs.

We applied the dynamic panel data estimator to arrive at the unbiased estimator due to the time persistence in the NPLs. We applied the GMM and some alternative estimation techniques for empirical investigation, including the pooled, random, and fixed-effect models. These empirical investigations revealed that fiscal consolidation improved the NPLs in highly indebted countries. Our results suggest that both forms of fiscal consolidation (FCWE and FCSE) improved the NPLs by 1.55% and 31.10%, respectively. Our analysis also revealed that the weak-to-strong form transition of fiscal consolidation improved the NPLs by 28.55 percentage points. Policymakers should consider that the weak form of fiscal consolidation has a very low impact on NPLs, and such fiscal steps are safe for the banking sector.

Conversely, the strong forms of fiscal consolidation had strong detrimental effects on the banking sector's balance sheets. However, these results should be interpreted carefully, since the definitions of NPLs vary across countries. A comparatively recent addition to the international financial reporting standard (IFRS 9 available at IFRS-IFRS 9 Financial Instruments) puts some restrictions on financial institutions and banks to assess the credit losses on loans and recognise these loans based on the forward-looking approach. Despite these guidelines, there is a need for a universally accepted criterion on the classification of loans, since loans are the most sizeable assets of the statement of financial position of banks.

Future research should investigate the impact of both forms of fiscal consolidation (FCWE and FCSE) on NPLs in countries with similar or different definitions of NPLs or include a comparison study between different definitions. Additionally, the effect of the restriction of IFRS 9 on the FCWE and FCSE association with NPLs is another future research implication that recent reporting impositions may influence. Furthermore, some threshold of the central government debt (percent of the GDP) can be used to extend the panel of HICs. Later, a comparative study can be conducted by including the less-indebted countries.

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**Data Availability Statement:** Data Links: Table 1. Definitions, acronyms, and indicator codes of the variables provide the complete details of these indicator codes. However, the links to the indicators are given here. For further details, see Table 1. GFDD.SI.02 (global financial development | DataBank (worldbank.org)). NY.GDP.MKTP.KD.ZG (GDP growth (annual percent) | data (worldbank.org)). SL.UEM.TOTL.NE.ZS (unemployment, total (percent of total labour force) (national estimate) | data (worldbank.org)). NY.GDP.DEFL.KD.ZG (inflation, GDP deflator (annual percent) | data (worldbank.org)). FS.AST.PRVT.GD.ZS (domestic credit to private sector (percent of GDP) | data (worldbank.org)). GC.DOD.TOTL.GD.ZS (central government debt, total (percent of GDP) | data (worldbank.org)).

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## Notes

- 1 See Section 3.1 (The Data Set and HICS Classification) for detailed notes on the classification of HICS.
- 2 For detailed discussion on the secondary elements, see Barisitz (2013).
- 3 For further discussion, see ITS 227/2015, as discussed in Siakoulis (2017). Also, see Chang (2006).
- 4 For the relevant discussion, see IFRS 9.
- 5 Interested readers can see Kankpang et al. (2023) for further discussion on the impact of NPLs on profitability of banks. Also, see Muchiri and Omwenga (2023) for further discussion on the impact of provision of NPLs on the financial performance of commercial banks in Kenya.
- 6 The descriptive statistics do not cover the latest crises since the latest available data values are from 2020. However, the descriptive analysis revealed some insights from 2017's data.
- 7 For further discussion, see Nelson and Plosser (1982) and Rahman and Ali (2022).
- 8 For further discussion, see Buck et al. (2008) and Chang et al. (2011).
- 9 The loans are considered defaulting loans if the payments of interest and principles are overdue by more than three months, and the total gross loans are the total value of the loan portfolio. Furthermore, it might be relevant to note that the NPLs are the gross value of the loans recorded on the statement of financial position instead of the amount that is overdue.
- 10 For further discussion on the economic interpretation of a lagged dependent variable, see Louzis et al. (2012) and Sorge and Virolainen (2006).
- 11 For the relevant discussion, also see Gavin and Hausmann (1996).

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