European Bank
for Reconstruction and Development

# The economic impact of reducing non-performing loans

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**Summary**

Using newly collected data on non-performing loan (NPL) reduction episodes and policies, this paper analyses the problem of NPLs and the burden they impose on the economy. Using matching analysis, we compare three different scenarios following a rise in NPLs: active measures to reduce the stock of NPLs; a decline in NPL ratio primarily due to fast growth of new credit; and periods when high NPLs persist. We find that reducing NPLs has an unambiguously positive medium-term impact on the economy. While countries that experience an influx of fresh credit grow the fastest, the economies that actively seek to resolve NPLs do comparably well. On the other hand, when the NPL problem is ignored, economic performance suffers: the foregone growth due to an overhang of NPLs can be in excess of 2 percentage points annually until the problem is resolved.

Keywords: non-performing loans, economic growth

JEL Classification Number: G21, G33, O40

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The authors are grateful to Jose Damijan, Ralph de Haas and Alexander Lehmann for excellent comments and suggestions.



**Working Paper No. 193** **Prepared in October 2016**

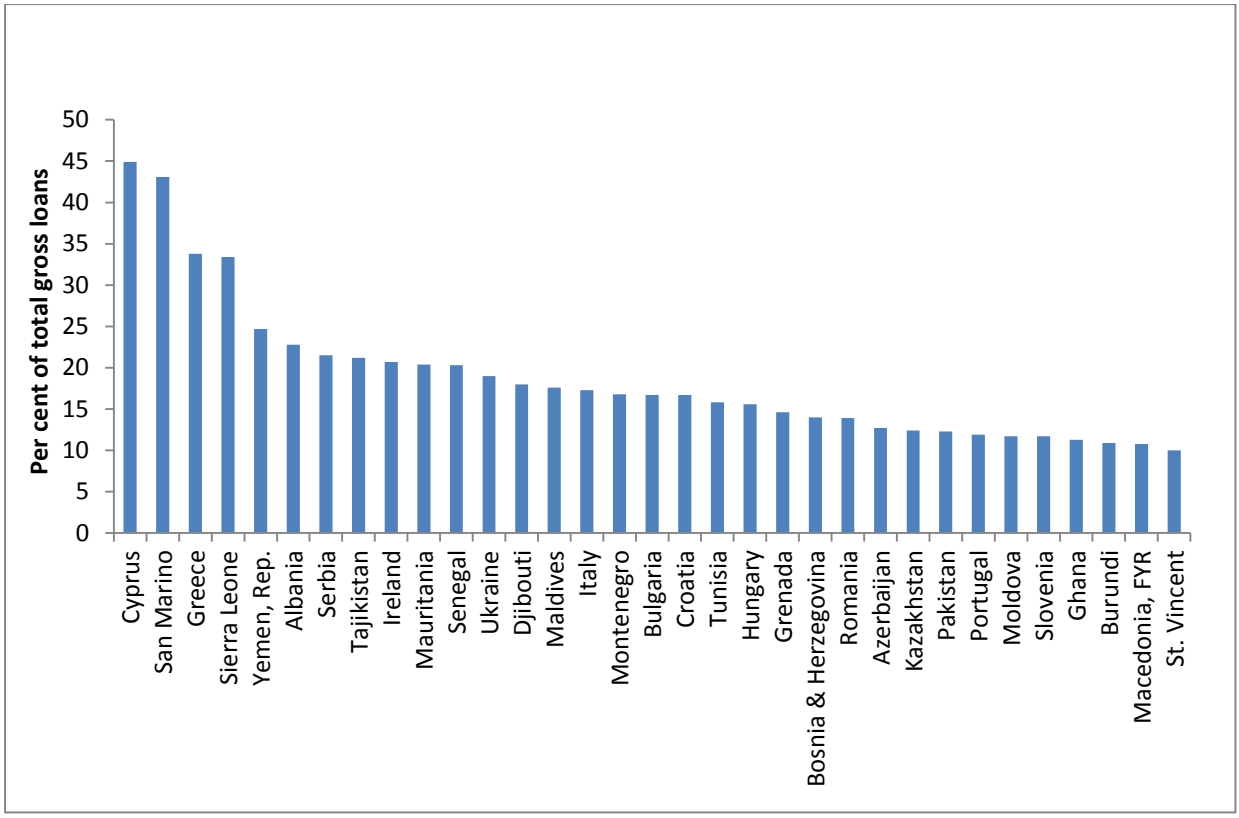
# 1. Introduction

A non-performing loan (NPL) is a loan that is several months overdue or in default. It may be the result of economic misfortune, but it is more than just an indicator of a debtor's inability (or unwillingness) to pay: a non-performing loan is a burden for both the lender and the borrower.

For a debtor, an NPL traps valuable collateral and the unresolved debt makes it more difficult to obtain new funding and make investment (see, for instance, Bernanke et al., 1999). At the same time, the lender has to meet the costs of the NPL, including the wind-down costs. Until the NPL case is resolved, capital requirements limit the creation of new credit. High NPL ratios weigh on banks' balance sheets and are a drag on banks' profitability. They contract credit supply, distort allocation of credit, worsen market confidence and slow economic growth (for instance, Kwan and Eisenbeis, 1995; Cucinelli, 2015; Jorda, Schularick and Taylor, 2013; Peek and Rosengren, 2000, 2005).

The global financial crisis made the problem of NPLs once again relevant. In 2014 there were 32 countries where more than 10 per cent of total credit was not being repaid on schedule; the NPL ratio was above 15 per cent for 20 of them (see Chart 1, based on World Bank data). What is even more striking is that some of the worst cases of NPLs are in advanced economies: 34 per cent of all Greek loans and 17 per cent of all Italian loans were non-performing. Across the European Union, the stock of NPLs relative to GDP more than doubled between 2009 and the end of 2014. European economies outside the European Union are also among the afflicted, with the NPL ratio rising to almost 22 per cent for Albania and Serbia, 19 per cent for Ukraine and around 16 per cent for Montenegro (see de Haas and Knobloch, 2010, for an early discussion).

**Chart 1: Countries with NPL ratio above 10 per cent, 2014**
NPLs to total gross loans




Source: World Bank World Development Indicators (WDI) and International Monetary Fund (IMF).

Given the rise in NPLs in many economies (Chart 1), it is natural to ask what the impact of addressing the issue of NPLs could be and how policy-makers should respond. These questions become particularly pressing as countries emerge from the 2008-09 financial crisis and the subsequent recession, with fragile financial systems and often facing sluggish economic recovery.

The aim of this paper is to compare three scenarios corresponding to different ways of reacting to the NPL problem. A country with a large NPL ratio can tackle the problem in two ways: it can actively reduce the outstanding stock of NPLs (by encouraging NPLs to be written off or moved to special purpose vehicles), or it can wait until fast growth of new loans makes the NPL problem obsolete. In other words, the NPL ratio can fall either when its numerator (NPL volume) contracts or when its denominator (total credit) expands. In this paper we refer to an increase in credit as the "passive" NPL ratio reduction, while the "active" method is one where the stock of NPLs falls. The third scenario is one in which no active action is taken and credit fails to expand, often because economic activity does not pick up. This "procrastination" scenario, in which the NPL problem persists, serves as a useful control group.

Analysis of the economic impact of reduction in NPLs is complicated by the fact that NPLs themselves are often a reflection of an economic downturn, while fast economic growth can lead to a faster drop in the NPL ratio. Isolating the impact of NPL reduction on economic performance is thus a challenge. Our paper tackles this issue in two steps. First, we present descriptive statistics associated with "active" and "passive" reductions in NPLs, thus separating the cases where NPL reductions were driven primarily by rapid growth of fresh

credit from episodes where policy actions and the associated reductions in the stock of bad loans played a major role. Second, we use matching to account for the fact that the selection into NPL reduction episodes and, specifically, NPL reduction episodes with and without major "efforts" to reduce NPLs, is not random. The estimated effects of "active" NPL reduction episodes are of primary interest here.

The findings of the paper can be summarised as follows. First, the data unambiguously show that a fall in NPL ratio is good for the economy. The countries that reduced their NPL ratio experienced faster GDP growth, invested more and enjoyed better labour market outcomes (higher rates of labour participation and lower rates of unemployment). Credit growth was also faster in this group of countries.

Second, the outcomes were stronger in cases of "passive" reductions in NPL ratios. Countries that enjoy, or engineer, a positive credit shock experience better economic outcomes than those that reduce their NPL ratio primarily by resolving the outstanding NPLs. However, this difference between the economic performance in the "active"versus the "passive" NPL reduction scenarios is relatively small, and disappears completely once we control for the determinants of active policy. Moreover, we demonstrate that the "active" group of countries does significantly better than those countries that "procrastinate" over their NPL problem, even though these countries face similar (adverse) credit conditions. This is our third finding.

The fourth finding concerns exports. Unlike with other economic indicators, our results for export growth are not clear cut and, in general, exports do not appear to react to changes in the NPL ratio. We hypothesise that exporters are more immune to the NPL problem because they enjoy better access to cross-border credit (typically denominated in foreign currency). This also serves as a falsification exercise for our paper, suggesting that it is primarily the functioning of the credit channel rather than the general macroeconomic conditions (faster growth) that drive the different outcomes for different treatment groups.

We contribute to the literature on the relationship between NPLs and economic performance in several ways. While the negative impact of NPLs and lending to "zombie firms" on credit structure and growth and consequently on economic activity is well documented (see, for instance, Peek and Rosengren, 2005 and Caballero et al., 2008), we primarily focus on episodes of NPL reduction rather than growth; the impact of a rise in NPLs on economic activity need not be the same as the impact of a drop in NPLs, and while a rise in NPLs is a function of a deteriorating economic environment, a reduction in NPLs may stem as much from explicit policy actions as from favourable external conditions. The main contribution of our paper is in analysing these two different scenarios and comparing the economic outcomes with cases where the NPL problem remained unaddressed over a prolonged period. To our knowledge, such an analysis, although of value to policy-makers and regulators, has not yet been conducted.

Reinhart and Trebesch (2016) look at the episodes of reduction in sovereign debt and find very significant medium-term effects of sovereign debt relief, of up to 5 percentage points per annum in terms of extra growth. We focus on resolution of NPLs. Compared with sovereign debt write-offs, drops in NPL ratios are typically a result of restructuring of a large number of smaller (and typically private sector) liabilities. We show that NPL reductions can also have large real effects of similar (albeit slightly smaller) magnitude.

Methodology-wise, our paper also draws on the episodes-based approach used in literature on the impact of fiscal consolidation. Beetsma et al. (2014), Guajardo et al. (2014) and Alesina et al. (2015) employ narrative evidence to identify cases of fiscal consolidation. Looking at

relative tax increasing and spending cuts, they distinguish between expenditure-based and tax-based events, and analyse the differential impact of these policies on consumer confidence, output growth, and other macroeconomic indicators.

In a similar vein, our paper uses a newly constructed dataset on NPL reduction episodes as well as policies associated with various episodes around the world. This information enables us to sort various episodes into distinct groups and analyse their economic impact separately. Unlike most country-level studies of the impact of NPLs on growth, we use matching instead of vector autoregressions (VAR) to control for selection biases. It is encouraging that while matching analysis required a different set of assumptions to the various VAR specifications, our baseline results are in line with the rest of the literature.

This paper is organised as follows. Section 2 reviews related literature, explores the complex relationship between NPLs and the economy, and briefly outlines various components of active resolution of NPLs. Section 3 describes the identification and classification of various country episodes in our data. In section 4 we present the stylised facts about the various types of NPL ratio reduction episodes and make first observations. The matching analysis itself is described in section 5, along with our results. Section 6 concludes.

# 2. NPLs and the economy

Drawing on the existing literature, this section outlines the interlinkages between NPLs and economic performance. On the one hand, macroeconomic environment and bank-specific factors affect loan performance. On the other hand, a high concentration of NPLs has a negative impact on the economy, slowing down the creation of new credit and worsening market expectations. This section addresses both of these channels in turn and reviews measures that can be deployed to actively reduce the stock of NPLs.

## 2.1. Determinants of NPLs

In general, the factors driving NPLs fall into two groups: macroeconomic conditions (such as inflation, interest rate and real GDP growth), or bank-specific factors (capital ratios, quality of risk management). There is a wealth of papers documenting both.

Overall, the growth rate of GDP stands out as the most important driver of NPLs. Beck, Jakubik and Piloiu (2013) use dynamic panel estimation to show that while the interest rate and share prices influence the NPL ratio, the growth rate of GDP has the greatest explanatory power. In a similar vein, a study by Espinoza and Prasad (2010) that focuses on banks in the Gulf states also documents how lower economic growth and higher interest rates trigger an increase in NPLs. Other studies have found significant relationships between asset quality and macroeconomic environment in countries such as Greece (Louzis, Vouldis and Metaxas, 2012), Spain (Salas and Saurina, 2002), Italy (Quagliariello, 2009) and Mexico (Blavy and Souto, 2009). Nkusu (2011) arrives at similar conclusions in a panel of 26 advanced economies. Klein (2013) extends these results for the region of central, eastern and south-eastern Europe, pointing out that bank-specific factors play a crucial role alongside the wider macroeconomic situation.

## 2.2. NPLs and new lending

A high ratio of NPLs to total loans affects banks' lending activities in several ways. A bank plagued with a high stock of NPLs is likely to focus on internal consolidation and improving asset quality rather than providing new credit. A high NPL ratio requires greater loan loss provisions, reducing capital resources available for lending and denting bank profitability.

Several papers (Gonzales-Hermosillo et al., 1997; Lu and Whidbee, 2013; Barr et al., 1994) cite high NPL stock as a significant predictor of bank failure. Where banks avoid failure, NPLs impact negatively on a bank's cost structure and efficiency (Maggi and Guida, 2009) and their willingness to lend (Cucinelli, 2015). Leon and Tracey (2011) further specify a model where banks lend less when the NPL ratio rises above a certain threshold. Looking at data for two Caribbean countries, the authors find that as the NPL ratio increases, banks become more risk-averse in their lending, and conclude that "the efficiency of the banking sector can be severely compromised by NPLs". An earlier paper by Hou and Dickinson (2007) looks at a sample of mostly developed countries and reaches similar conclusions.

Bank lending is in turn crucial for a well-functioning economy for several reasons. Credit is not only needed for business expansion, but also for day-to-day operational expenditures (working capital). A credit crunch may trigger second-round business failures that push the NPL ratio further up, making banks even more reluctant to lend. Krueger and Tornell (1999) document such a vicious liquidity spiral after the 1995 crisis in Mexico, and point to a large NPL burden as one of its primary causes. Agung et al. (2001) reach similar conclusions for

Indonesia. More generally, credit growth is known to lead real GDP growth at major turning points of the business cycle (for example Jorda, Schularick and Taylor, 2013). Lending standards are often relaxed during economic booms and tightened once the cycle turns, amplifying the impact of an economic downturn on credit volumes and quality (Rajan, 1994; Ruckes, 2004). Beatty and Liao (2011) argue that delays in the recognition of loan losses serve to exacerbate this pro-cyclicality of lending.

### 2.3. The impact of NPLs on the economy

As a higher-than-normal NPL ratio (where "normal" varies by country and regulatory regime) makes banks more cautious in their lending, economic performance suffers. Sluggish credit growth, or a full-blown credit crunch, serves as a transmission mechanism from greater creditor risk-aversion to weaker demand, which in turn can lead to business failures, weaker growth and a further increase in NPLs.

An overhang of NPLs can also result in a misallocation of resources in an economy with strong bank-business interlinkages. When banks channel most new credit into the existing troubled sectors and companies ("zombie lending"), they help to prevent second-round business failures, but this also diverts funds away from new, more productive parts of the economy. This way, the lending disruption created by high NPLs compromises the country's long-run growth prospects (see Peek and Rosengren, 2005; Caballero et al., 2008). Large capital injections in banks are required to break this vicious circle (Giannetti and Smirnov, 2013).

Macroeconomic conditions, in turn, have a non-negligible impact on the severity of the NPL problem, and so to estimate the causal relationship between NPLs and economic performance cross-country studies must circumvent the problem of simultaneous causation. The most common approach in the literature is to turn to vector autoregressive (VAR) models. Identification of the causal impact of NPLs then relies on assumptions about the ordering of the variables within the VAR system. Although studies use different samples and dependent variables, they typically find a negative and significant impact of rising NPL ratios on GDP growth and employment.

Nkusu (2011) estimates the reaction of an economy to a sudden increase in the NPL ratio in a sample of 26 developed countries and finds that a 2.4 percentage point increase in the NPL ratio is associated with a fall in private borrowing and a 0.6 percentage point reduction in GDP growth within the first year and the strong negative impact persists for four years after the initial shock. Espinoza and Prasad (2010) also estimate a VAR system that includes a measure of NPLs and conclude that losses on banks' balance sheets lead to a strong, negative – but temporary – impact on the economy. Kaminsky and Reinhart (1999) further find that a large increase in the NPL ratio serves as a reliable predictor of financial crises. Klein (2013) uses SVAR estimation and reports a negative impact of increases in NPL ratios on credit, growth and employment in emerging Europe in the aftermath of the 2008-09 financial crisis.

### 2.4. Active resolution of NPLs

This section outlines the various ways to actively resolve the NPL problem.

Identifying the problem is the first step. Banks need to transparently and credibly asses the quality of the assets on their balance sheets and then build up necessary provisions to cover

the expected losses. As one of the by-products of the NPL problem is damaged market confidence, providing credible guidance to market agents is an important part of the process.

Relying on banks' voluntary efforts to resolve NPLs may not be sufficient, especially when the NPL burden grows (see, for instance, Cabinet Office, 2001). The government may choose to "prod" banks into disposing of NPLs, for example by setting deadlines. The regulator may want to guide banks as to the optimal use of their capital buffers and determine target loan loss provisions. Banks are likely to need to develop special capacity to deal with NPLs, which is another area where the regulator may step in.

Creating a good legal framework for corporate restructuring and timely disposal of NPLs is crucial, in particular when judicial capacity to deal with NPLs case by case is lacking (see Laeven and Laryea, 2009). For example, the Consensual Financial Restructuring (CFR) framework launched in 2012 in Serbia helps small and medium-sized enterprises reach an agreement on the restructuring of their debt with their banking creditors by means of providing out-of-court mediation. Significant tax and financial incentives make CFR attractive for both debtors and lenders. Woo (2000) documents the centralised out-of-court debt workout programme used by governments of Korea, Thailand, Indonesia and Malaysia in the 1990s. These governments took a central and formal role in arranging rehabilitation or liquidation of non-performing debt in order to deal with the consequences of the Asian financial crisis.

Authorities can also encourage a liquid secondary market for NPLs. One possibility is for the government to create a "bad assets bank" that allows commercial banks to transfer the NPLs on their balance sheets to a specialised entity. This route was followed, for example, in Sweden in the early 1990s and by the government of Mexico in the aftermath of the 1995 banking crisis (Macey, 1999; Krueger and Tornell, 1999).

Similarly, public or private asset management companies were employed successfully in the countries most affected in the 1990s Asian financial crisis. By the end of the decade, these companies had taken on assets valued at up to 20 per cent of GDP (Woo, 2000) and managed to achieve a significant degree of asset value recovery (Fung et al., 2004).

More recently, in January 2016, the Italian government reached a deal with the European Union allowing it to attach a government guarantee to a subset of the €350m of NPLs clogging up the balance sheets of Italian banks. Such government guarantees help to price NPLs higher and thus bridge the difference between the asking price and the price that potential buyers would be willing to pay.

Generally, active policies to resolve NPLs are associated with short-term costs. They rely on sufficient capitalisation of banks allowing for full provisioning of non-performing exposures and their write-off or sale at discounted prices. Centralised solutions involving well-capitalised state-backed bad banks, asset management companies or significant tax incentives for NPL resolution also carry a fiscal cost. Active policies also require strong administrative capacity and legal regimes supportive of NPL resolution. For these reasons, in many cases authorities lack capacity (administrative or fiscal) or willingness to deploy active policies to address NPLs.

# 3. Identifying active and passive episodes of NPL ratio reduction

In this section we describe the process of identifying and classifying NPL reduction episodes and the episodes that will serve as counterfactuals.

## 3.1. Data

An NPL is a loan where the full repayment of the principal and interest may no longer be expected. Typically, the principal or interest would be at least 90 days in arrears, although the precise definition of an NPL varies across jurisdictions. This complicates international comparisons in our data. In the absence of a universally applied definition of NPL, however, there is little a researcher can do to remedy the situation.

However, because this paper primarily focuses on changes in NPLs within each country, different definitions should not bias the results as long as country-specific approaches to classifying NPLs do not change over time.

For our analysis we use a global sample of 100 countries during the period 1997-2014. For data on NPL ratios and credit we primarily use the World Bank's World Development Indicators (WDI). We use question 9 from the World Bank's Bank Regulation and Supervision Survey (2012) that provides information on asset classification, provisioning and write-offs. All other variables are from WDI and the World Economic Outlook of the International Monetary Fund.

For some parts of our analysis it is useful to strip total credit of NPLs. For this purpose we define "performing loans" as the difference between total loans and NPLs.

## 3.2. Classification

To compare the three scenarios of evolution of NPLs (reduction in non-performing assets; rapid credit growth resulting in reduced NPL ratio; and no reduction in NPL ratio), we first need to identify the corresponding periods in the data. We follow a two-pronged approach: narrative evidence and mechanical, data-based coding. We first classify NPL episodes looking at changes in the actual NPL ratio. We then complement this classification by collecting narrative evidence (newspaper articles, reports from governments and international organisations) on the approaches used to address high levels of NPLs. This serves as a check on the outcomes of the mechanical coding, and sometimes leads to alternative classifications of certain episodes to reflect more accurately a particular policy that was put into practice. As a robustness check, we also present results obtained relying separately on mechanical coding and narrative evidence.

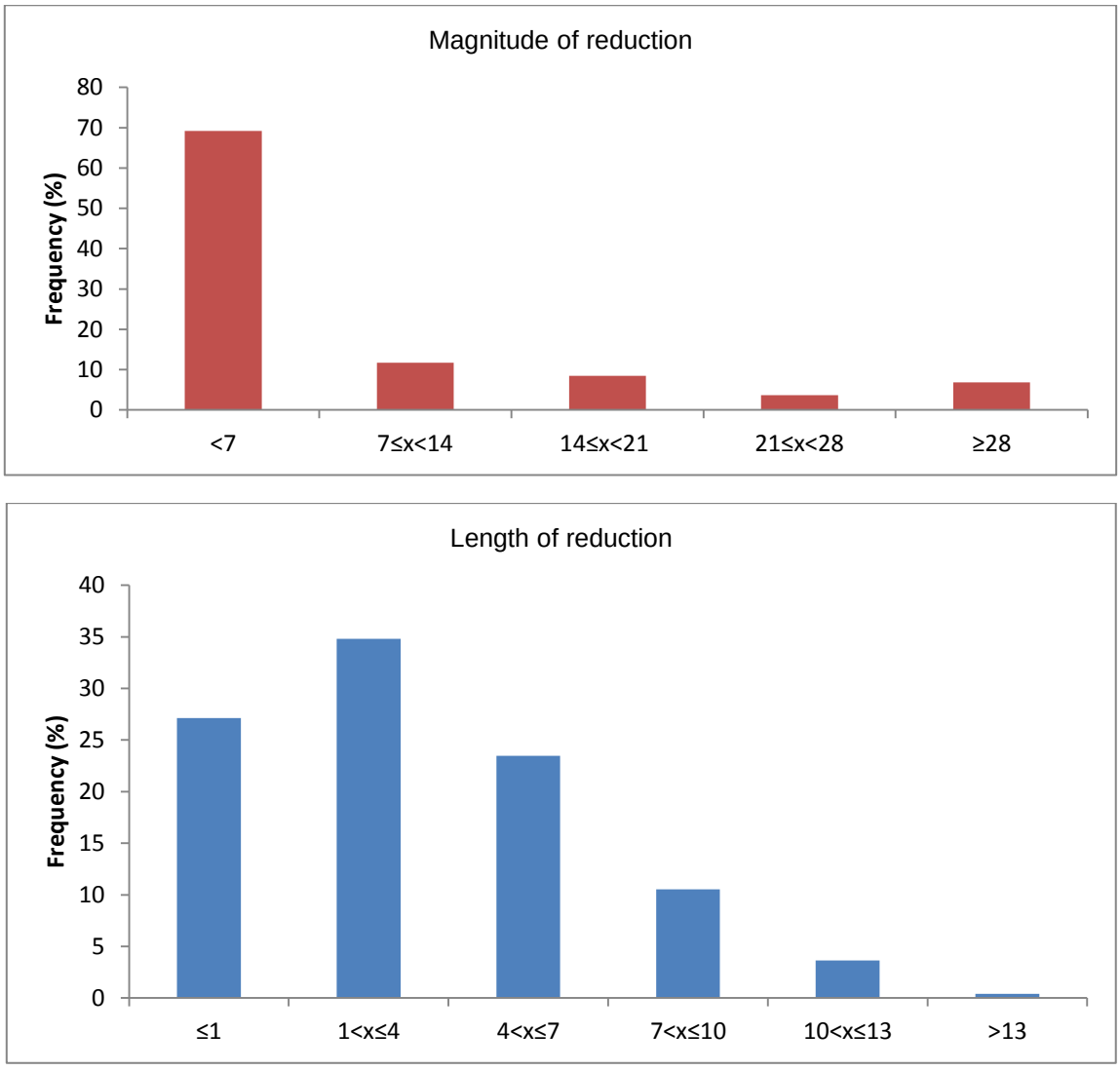
To begin, we define the start of an NPL ratio reduction episode as the first year in which the NPL ratio is smaller than in the preceding year. We define the end of the period as the last year in which the ratio is smaller or equal to that in the preceding year. Occasionally, the NPL ratio increases briefly before falling again. We code such events as a part of the NPL ratio reduction period as long as they are limited to a single year and involve a relatively small increase in NPLs in that year.[1] We further use the detailed narrative evidence to determine the precise timing of the episodes.

[1] Not exceeding 1.6 percentage points – the smallest value which preserves a sufficiently large sample size.

Countries that suffer from recurrent NPL problems may enter our set of NPL reduction periods more than once. We do not treat such recurring periods differently; that is, all are assumed to be independent draws from the same data-generating process.

Coding the data this way yields a total of 247 NPL ratio reduction periods. The largest fall in the NPL ratio is 44 percentage points, but the most frequent group – one that captures roughly 70 per cent of the dataset – are reductions of less than 7 percentage points (Chart 2). Shorter NPL reduction periods are more common than longer ones: more than 60 per cent of all episodes end within 4 years (Chart 2), while 10 cases last for more than 10 years.

**Chart 2: Magnitude and length of reduction episodes**




Sources: CEIC, WDI, authors' calculations.

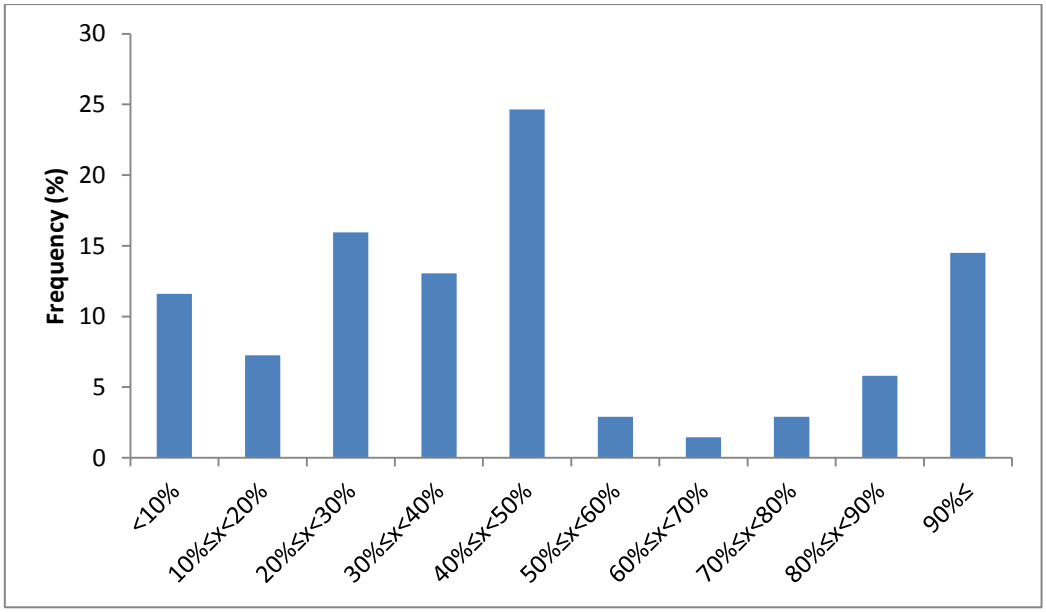
Fluctuations in NPL ratios happen constantly and indeed every country in the dataset experienced a period of NPL ratio reduction, however small. For this reason we further restrict our analysis to cases when the initial NPL ratio presented a significant problem for the economy while the reduction in NPLs was sizeable. The base cut-off point that we adopt is 7 percentage points. That is, the NPL ratio has to fall by at least 7 percentage points during the reduction episode and, by implication, the NPL ratio must exceed 7 per cent at the start. This leaves 73 periods which constitute our treatment group.

The next step is to distinguish between different types of treatment. An NPL ratio can either fall because total loans are rising (the denominator effect) or because NPL stock is falling (the numerator effect), or both. An *active* reduction of the NPL ratio is one where the stock of NPLs is falling. A *passive* approach is one when the NPL stock stays the same or increases, while the growth in "performing" credit resolves the problem of a high NPL ratio.

However, a closer look at the data reveals that this simple classification is too blunt. Most reduction periods combine both a fall in the NPL stock and an increase in new lending. In China, for example, the NPL ratio fell from 26 per cent in 2002 to less than 1 per cent in 2012. This was achieved by a mixture of credit growth and active NPL policies: the loan book increased every single year, while NPL stock fell in all years but one. Underpinning these trends was the establishment of several specialised asset management companies, starting in 1999, which aimed to transfer non-performing assets in excess of US$ 170 billion from the balance sheets of the four largest banks. Argentina, on the other hand, experienced years of poor or negative credit growth in the early 2000s in the aftermath of the peso crisis. A 16 percentage point reduction in the NPL ratio by 2011, achieved despite the 2008-09 global financial crisis, was mostly due to a decline in the stock of NPLs. Yet in a different scenario, a 17 percentage point reduction in the NPL ratio in Bangladesh in the first half of the 2000s was underpinned by a strong credit boom while NPL stock continued rising during much of the period (see Annex 3).

Overall, in only 1 out of the 73 episodes in our treatment group NPL stock rises. In almost two thirds of episodes, reduction in the NPL stock accounted for more than 30 per cent of the decline in the NPL ratio (see Chart 3), and in 10 cases, this active reduction was in fact sufficient to offset a decline in total credit.

**Chart 3: Proportion of the fall in NPL ratio accounted for by a reduction in the NPL stock**




Source: Authors' calculations.

As a typical episode of NPL reduction combines both credit growth and a drop in nominal stock of NPLs, we adopt a more nuanced approach. For each episode we calculate the total change in the stock of NPLs and credit over the NPL reduction period, and compute the corresponding contributions of these two trends to the overall reduction in NPLs:

$$NPL\ contribution = \frac{overall\ NPL\ growth}{overall\ NPL\ growth - overall\ loans\ growth} * change\ in\ the\ NPL\ ratio$$

$$loans\ contribution = \frac{-\ overall\ loans\ growth}{overall\ NPL\ growth - overall\ loans\ growth} * change\ in\ the\ NPL\ ratio$$

For example, consider an economy with an NPL ratio of 25 per cent at the start of the period (corresponding to a stock of NPLs of 250 monetary units and total credit of 1,000). At the end of the period, the NPL ratio has dropped by 20 percentage points to 5 per cent, as the stock of NPLs has fallen to 75, while credit has expanded to 1,500. Using the formulas above, 12 percentage points of the NPL ratio reduction is down to the decline in the stock of NPLs, while 8 percentage points can be attributed to credit growth; the relative contributions of NPL stock and credit growth are 60 per cent and 40 per cent, respectively.

The measure of the contribution of the active part (NPL stock contribution) is remarkably well aligned with the picture based on the overview of policies pursued by various countries if a 60 per cent threshold is used to define an active episode (that is, the reduction in NPL stock makes a contribution of at least 60 per cent to the reduction in the NPL ratio). Only in 10 cases does formula-based coding classify an episode as passive in the presence of activist policies (these episodes have been recorded as active in the baseline estimations). And only in nine episodes with no strong evidence of active policies did NPL stock reduction contribute more than 60 per cent to the overall change in NPL ratio. These episodes were also coded as active as the underlying dynamic may reflect bank-level policies on NPL resolution. The remaining treatment episodes were coded as passive (see Appendix for details).

Finally, we define a third group of "procrastinating" countries – those that experienced NPL ratios in excess of 7 per cent for at least three consecutive years. In some of these cases, an NPL reduction episode followed while in others it never did. Such episodes also occurred when the NPL ratio crept back up after an (unsuccessful) NPL reduction episode.

The remaining country-periods are those where the NPL ratio is small or a spike in NPL ratio is short-lived. When such "other" periods lasted for at least three years, they are included in our analysis as a baseline group for comparison (country-years with missing data or short-term NPL volatility are not included).

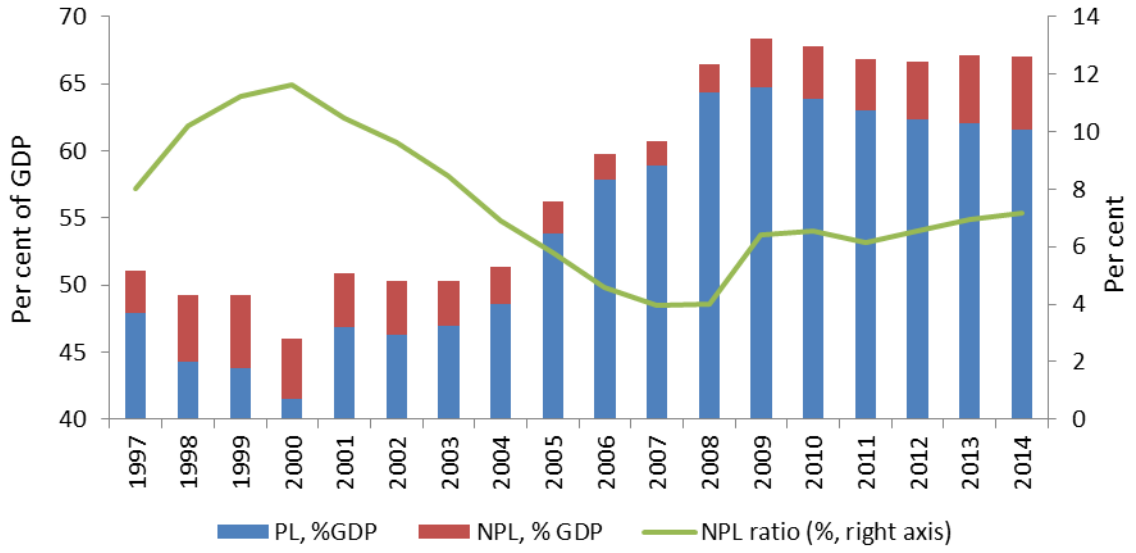
# 4. Descriptive statistics

The first step in our analysis involves looking at descriptive statistics. These averages cannot reveal any causal effects, but they may shed light on the differences between various episodes, and suggest some stylised facts about the treatment and control groups.

### 4.1. NPL ratios over time

Chart 4 presents the unweighted average of NPL ratios of the 100 countries in our sample. Starting in the early 2000s, we observe a strong continuous improvement in quality of bank assets, alongside a credit boom, in the run-up to the global financial crisis. The average NPL ratio dropped from 11 per cent in 2000 to a little below 4 per cent in 2007. In the aftermath of the global financial crisis the average quality of bank assets deteriorated quickly, with a jump of 2 percentage points between 2008 and 2009, and has resumed an upward drift since 2012, reaching 7 per cent by the end of 2014.

**Chart 4: Average NPL ratio, performing loans and NPLs as per cent of GDP**




Source: Authors' calculations.

Between 2000 and 2004 the reductions in the NPL ratio were primarily driven by a fall in the stock of NPLs relative to GDP. In the run-up to the financial crisis (2005-08), the stock of NPLs grew in line with GDP, while total lending increased sharply, pushing the NPL ratio further down. As the global financial crisis hit, the stock of NPLs increased as the flow of new credit slowed down.

The averages mask large cross-country differences in the health of loan books. Out of the 100 countries in our sample, 78 experienced NPL ratios above 8 per cent at some point; and in 58 of them NPL ratios surpassed 15 per cent. Of these, only 46 per cent achieved a meaningful reduction in NPL levels while elsewhere the overhang of NPLs persisted.

### 4.2. NPL ratio reductions versus episodes of persistent NPLs

Next we compare the descriptive statistics for the episodes of NPL reductions, the episodes of high and persistent NPLs and the periods of low NPLs. Table 1 summarises the unweighted

averages of various variables at the start and end of each type of episode, as well as the change over this period.

Perhaps unsurprisingly, the NPL situation in the "procrastinating" countries was less grave than in countries that saw a subsequent reduction in NPL ratios; the average starting NPL ratios were around 11 per cent and 22 per cent, respectively. In countries with persistent NPLs the ratio further increases by 7 percentage points on average, to reach 18 per cent. In contrast, episodes of NPL reductions result in the NPL ratio converging to the average levels observed in countries that did not have an NPL problem (around 4 per cent).

Average economic growth during the periods of NPL reductions (4.3 per cent) is much higher than during periods of persistent NPLs (1 per cent) or in countries with no NPL problem (2 per cent). Causality can run both ways here: strong economic activity helps to solve the NPL problem while cleaning bank and corporate balance sheets reinvigorates growth.

**Table 1: Descriptive statistics for various types of NPL reduction episodes**

| | *Averages* | | | | | *T-statistics* | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **NPL ratio reduction** | | | **Procrastinating** | **No NPL problem** | **NPL reduction vs. procrastination** | | **Active vs. passive** | | **Active vs. procrastinating** | |
| | **All** | **Active** | **Passive** | | | | | | | | |
| *NPL ratio at the start* | 21.17 | 22.42 | 20.25 | 11.38 | 3.57 | 62.05 | *** | 5.58 | *** | 32.38 | *** |
| *NPL ratio at the end* | 4.12 | 4.64 | 3.72 | 18.68 | 3.89 | -83.33 | *** | 6.02 | *** | -64.25 | *** |
| *Overall NPL ratio change* | -16.87 | -17.72 | -16.25 | 3.87 | 0.28 | | | | | | |
| *Debt/GDP at the start* | 37.48 | 49.64 | 28.80 | 57.71 | 57.48 | -16.13 | *** | 12.64 | *** | -4.24 | *** |
| *Debt/GDP at the end* | 42.69 | 43.65 | 42.00 | 54.21 | 76.01 | -9.52 | *** | 1.09 | | -6.05 | *** |
| *Overall debt/GDP change* | 6.20 | -3.94 | 13.20 | -1.19 | 18.52 | 15.55 | *** | -18.15 | *** | -2.83 | *** |
| *Annual loans growth* | 12.78 | 5.39 | 17.89 | 1.06 | 7.66 | 52.71 | *** | -25.85 | *** | 10.76 | *** |
| *Annual NPL growth* | -18.75 | -23.56 | -14.97 | 7.33 | 10.13 | -76.85 | *** | -16.90 | *** | -56.87 | *** |
| *Initial GDP per capita (US$)* | 6,092.9 | 6,773.6 | 5,590.4 | 8,363.8 | 16,222.5 | -8.15 | *** | 2.85 | *** | -3.70 | *** |
| *Annual GDP growth* | 4.31 | 4.32 | 4.60 | 1.03 | 2.23 | 50.17 | *** | -2.14 | ** | 28.93 | *** |
| *Initial investment-to-GDP ratio* | 20.55 | 19.63 | 20.95 | 22.26 | 25.01 | -11.07 | *** | -4.99 | *** | -10.56 | *** |
| *Investment growth* | 12.48 | 12.93 | 12.14 | -1.16 | 2.72 | 41.82 | *** | 0.94 | | 20.19 | *** |
| *Export growth* | 9.50 | 8.57 | 10.23 | 6.05 | 4.47 | 14.80 | *** | -7.02 | *** | 8.96 | *** |
| *Labour participation rate* | 61.67 | 61.53 | 61.77 | 56.97 | 61.14 | 20.98 | *** | -0.74 | | 15.26 | *** |
| *Unemployment rate* | 9.26 | 9.10 | 9.39 | 11.83 | 7.82 | -16.25 | *** | -1.20 | | -11.78 | *** |
| *Change in unemployment rate* | -0.30 | -0.41 | -0.23 | 0.32 | 0.00 | -28.03 | *** | -5.78 | *** | -22.63 | *** |
| *Number of episodes* | 73 | 31 | 42 | 46 | 74 | | | | | | |

Source: Authors' calculations.
Note: the t-statistics on the right-hand side panel of the table test the null hypothesis that the episode averages for the given groups are the same.

The differential in growth may also be partly a reflection of a catch-up process: the average GDP per capita in the NPL reduction group is at around US$ 6,100 compared with more than US$ 16,200 for the countries with no NPL problem (in other words, NPLs are a more common occurrence in developing economies). However, the average income of countries with a persistent NPL problem is comparable with that of the NPL reduction group.

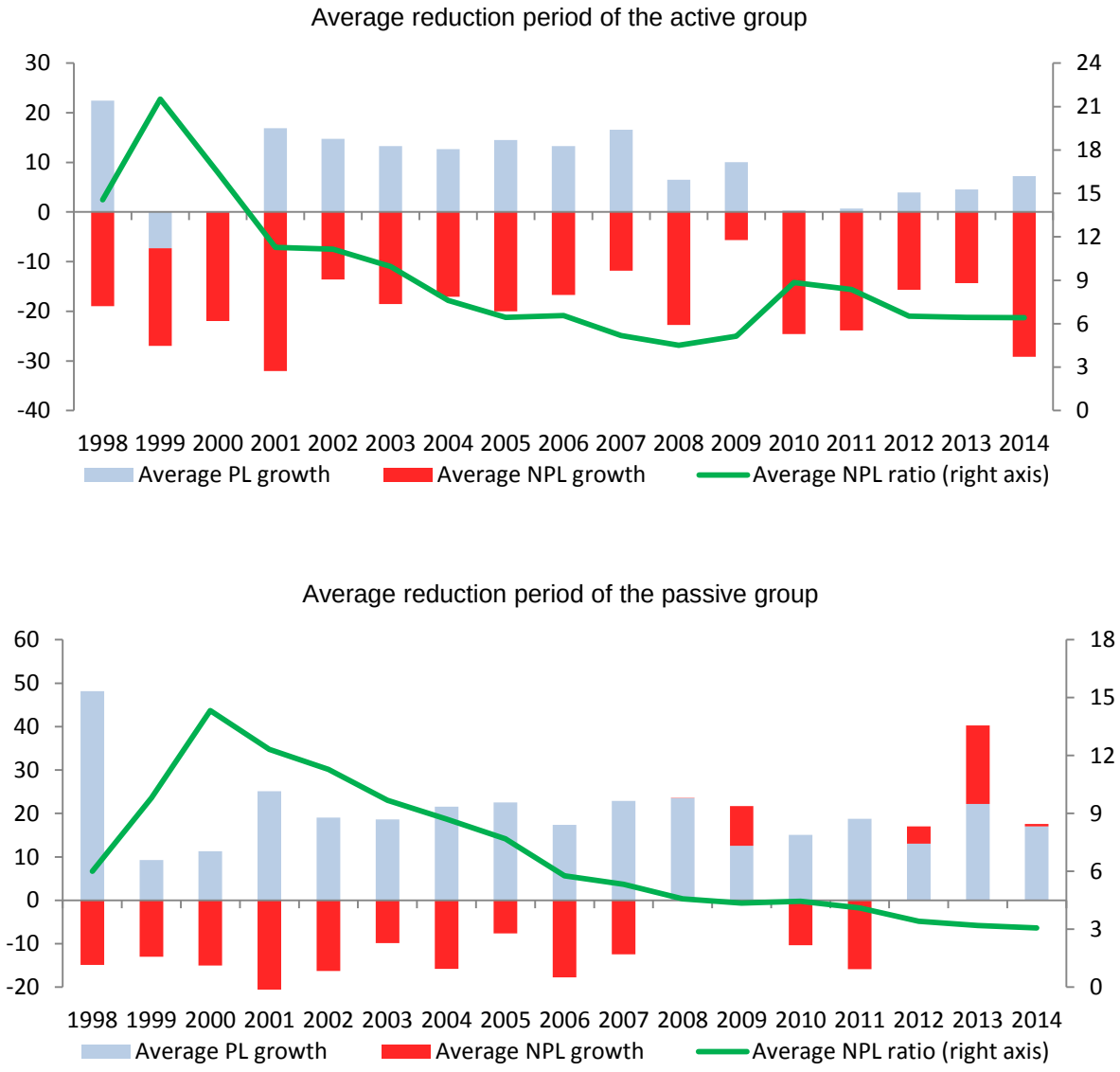
Similar conclusions can be drawn about other important economic indicators, such as investment growth, labour participation and unemployment. The only variable that does not seem to deteriorate materially during the periods of persistent NPLs is export growth.

The episodes of NPL reduction and persistent NPLs are fairly similar in terms of the initial investment-to-GDP ratios, initial GDP per capita and export growth. At the same time, the episodes of persistent NPLs are characterised by significantly higher indebtedness at the time when NPLs start building up.

Interestingly, the average growth rate of NPLs in countries with persistent NPLs is similar to that in countries without an NPL problem (7 per cent and 10 per cent, respectively). However, as high levels of NPLs at some point arrest credit growth, the NPL ratio starts rising rapidly while in “no NPL problem” countries it remains stable due to the healthy growth of credit and nominal GDP.

Although the drivers of NPL decline differ between active and passive NPL reduction episodes (Chart 5), the average NPL ratios in the two groups depart from and arrive at very similar values, from just over 20 per cent to around 4 per cent (Table 1). By construction, the active group experiences large falls in the NPL stock and small growth in overall lending. The opposite is true for the passive group.

**Chart 5: NPL ratio reduction in an average active and passive episode**




Source: Authors' calculations.
Note: Left axis shows growth of performing and non-performing loans; right axis shows the NPL ratio.

Active episodes tend to start with higher debt-to-GDP ratios than passive episodes (50 per cent versus 28 per cent). They also tend to happen in countries with higher per capita income (US$ 6,700 for the active group, compared with US$ 5,600 for the passive group). Indeed, it may be easier for poorer countries with lower credit-to-GDP ratios to enjoy rapid growth and/or a credit boom that is strong enough to resolve these countries' NPL problems.

How do the active and the passive episodes differ with regards to their economic outcomes? As expected, growth during "passive" episodes is somewhat higher. This extra growth in fact helps countries to overcome the NPL problem in a "passive" way. Yet the option NPL problems being resolved as a result of a credit boom and favourable external conditions may often be unavailable.

If that is the case, the economic costs of persistent NPLs appear to be high. The average growth during active episodes (4.3 per cent) is economically and statistically significantly

higher than what countries with persistent NPLs enjoy (1 per cent), tentatively suggesting a positive association between efforts to reduce the stock of NPLs and economic performance. Similarly, growth of investment is stronger and labour market outcomes are better during episodes of active NPL reductions compared with episodes of persistent NPLs.

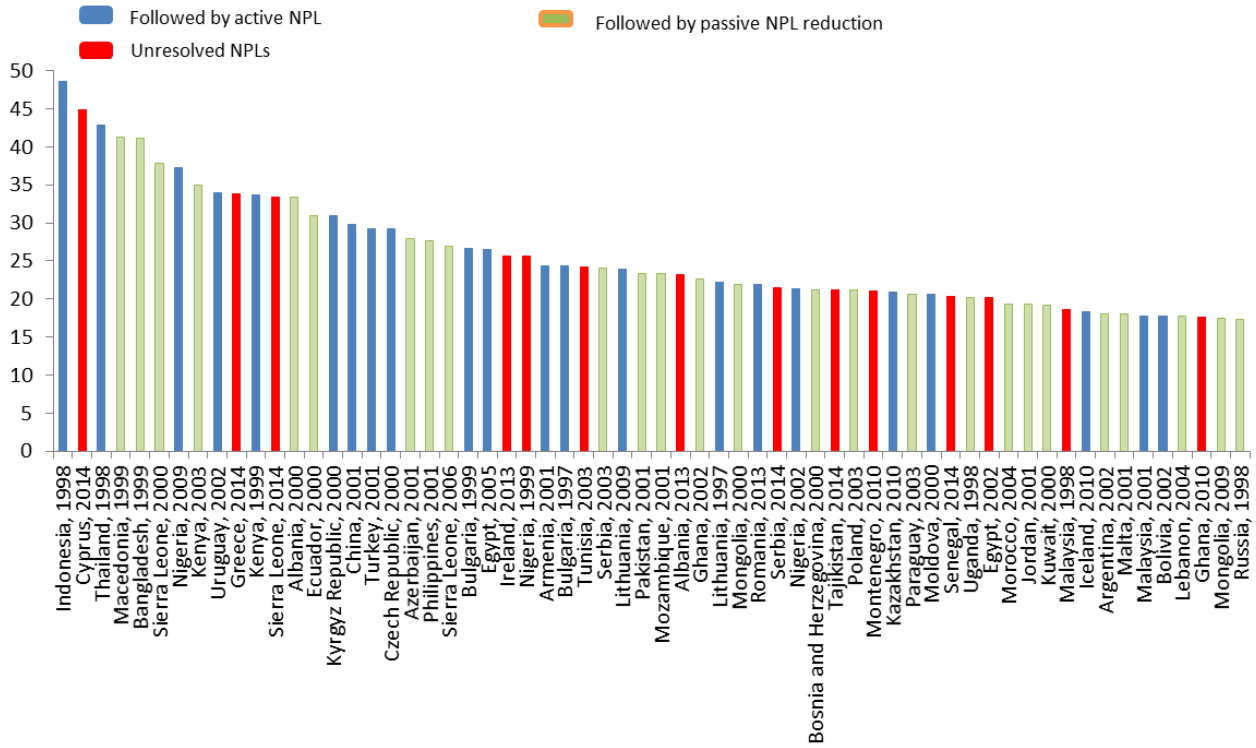
The only variable that does not seem to suffer strongly in the presence of persistently high NPLs is export growth (6 per cent during the episodes of high NPLs versus 8.5 per cent during active reduction episodes). It may reflect exporters' better access to cross-border credit, which makes them less dependent on domestic lending conditions.

### 4.3. Addressing self-selection into different types of episodes

One may argue that the trends observed in our stylised facts are the result of comparing fundamentally different episodes, not similar countries receiving different treatment. Self-selection into active or passive NPL ratio reduction or procrastination episodes is indeed a possibility. For example, if all the countries with lower NPL ratios actively sought to reduce NPLs and all the procrastinating countries were the ones with the highest NPL ratios, the differences in economic outcomes could have more to do with the severity of the problem than ways of addressing it.

Chart 6 plots various episodes in descending order of the initial NPL ratio (countries with a recurring NPL problem have been included more than once). The colour-coding reveals that the countries with the most severe NPL problem in fact fall both into the active and passive reduction group, while a number of episodes of persistent NPLs were also characterised by ratios in excess of 25 per cent (including in Cyprus, Ireland and Nigeria). Of course, since this paper works with actual historic data and not a randomised control trial, the possibility of self-selection and the resulting bias can never be fully ruled out, but this graph suggests reasonable variation of initial states in all treatment groups.

**Chart 6: Cases of the highest NPL ratio, in descending order**




Sources: WDI and authors' calculations.

Note: Blue indicates active reduction of NPL ratios; green indicates passive reduction of NPL ratios and red indicates no reduction.

# 5. Matching analysis

The aim of this paper is to understand the economic consequences of NPL ratio reduction, and compare its impact in two different scenarios. We hypothesise that a high NPL ratio affects an economy negatively via its adverse impact on credit creation. Although measures to reduce the stock of NPLs may be associated with short-term costs, they help to revive the flow of credit, boost economic confidence and thus stimulate economic activity.

To investigate these relationships while alleviating concerns about countries' selection into various episodes, we use matching to produce a plausible counterfactual episode and then calculate the various treatment effects of interest. In this section we also perform several robustness tests to check the sensitivity of our results to various assumptions.

## 5.1. Empirical analysis

In our empirical analysis we draw on the method of propensity score matching (Rosenbaum and Rubin, 1983). For each episode from a particular treatment group, the algorithm selects the set of episodes from the control group which resemble closest the treated episodes, based on some pre-defined economic characteristics. These are then combined to create a counterfactual for each treated episode. The difference in economic outcomes between the treated and the counterfactual episode gives the treatment effect, which takes into account selection patterns.

As a first step, we estimate a series of probit regressions to understand which countries opt for active NPL reduction, conditional on having an NPL problem (this means the control group consist of passive and procrastination episodes). We regress the dummy for active NPL reduction on a set of variables describing the state of the economy the year before the start of an NPL episode. We looked at a large set of indicators, including the state of the economy, Worldwide Governance Indicators as a proxy for the quality of institutions (political stability, rule of law, regulatory quality), selected questions from the World Bank's Bank Regulation and Supervision Survey that look at the asset quality and provisioning rules, and the World Bank *Doing Business* indicators of the depth of the credit market, ease of insolvency proceedings and the strength of legal rights. These characteristics can affect the ease of NPL work-out and the expected loss given default and thus may have an impact on attractiveness of active resolution policies as well as their effectiveness.

The two models best able to explain why a country experienced an active episode of reduction in the NPL ratio are presented in Table 2 below. The explanatory power of the regressions is relatively low, suggesting that countries that pursued active NPL reductions are not systematically different from those that "procrastinated" or whose NPL problems were resolved on the back of credit growth. The results nonetheless tentatively suggest that active NPL reduction is more likely to occur when the level of NPLs is higher. Higher inflation rates also make an NPL reduction episode more likely as debts, including bad debts, are easier to eliminate. Interestingly, stricter rules for debt write-offs are associated with a lower probability of an active NPL reduction episode – likely because active NPL reduction episodes are associated with the *introduction* or *tightening* of write-off requirements, which is less effective in cases where such requirements have already been in place (but failed to prevent a build-up of NPLs). We use these findings to create a counterfactual episode for each treated period using the matching approach.

**Table 2: Results of probit regression explaining active policy choice, conditional on high NPL ratio**

| | Active NPL reduction policy | | | |
|---|---|---|---|---|
| | [1] | | [2] | |
| Constant | -74.0572 | | -1.3593 | *** |
| | (69.5559) | | (0.4229) | |
| Start of the episode | 0.0358 | | | |
| | (0.0347) | | | |
| Initial GDP per capita | 0.0000 | | | |
| | (0.0000) | | | |
| Initial debt-to-GDP ratio | 0.0040 | | | |
| | (0.0037) | | | |
| Initial investment-to-GDP ratio | 0.0048 | | | |
| | (0.0237) | | | |
| Initial inflation rate | 0.0208 | ** | | |
| | (0.0110) | | | |
| Initial NPL ratio | 0.0596 | *** | 0.0675 | *** |
| | (0.0172) | | (0.0190) | |
| Proportion of banks owned by foreigners | | | -0.0060 | |
| | | | (0.0063) | |
| Compulsory debt write-off | | | -0.6751 | ** |
| | | | (0.3468) | |
| Observations | 114 | | 95 | |
| Pseudo R-squared | 0.1532 | | 0.1744 | |

Source: Authors' calculations.
Note: Control group comprises passive and procrastinating episodes. Robust standard errors in parentheses. *,** and *** correspond to statistical significance at the 10, 5 and 1% level, respectively.

For the matching analysis itself we use the psmatch2 command in STATA (Leuven and Sianesi, 2003) with kernel matching (a weighted average of multiple "neighbours" with weights proportional to the propensity scores estimated at the first stage) and a common support requirement. Under the assumption that the conditioning variables capture all the relevant differences between the treatment and control groups, this procedure creates a valid counterfactual for each treated episode. The treatment groups are active and passive NPL reduction episodes, and we use the episodes of high and persistent NPL ratios as the control group. We also use matching to compare the active and passive episodes.

## 5.2. Results

Table 3 presents the results of matching the active treatment group with control group of episodes of high and persistent NPLs. This explicitly excludes passive episodes that may be driven to a greater extent by favourable external environment. The first row of results reports the unmatched (gross) difference between the treated and the control for the five variables of

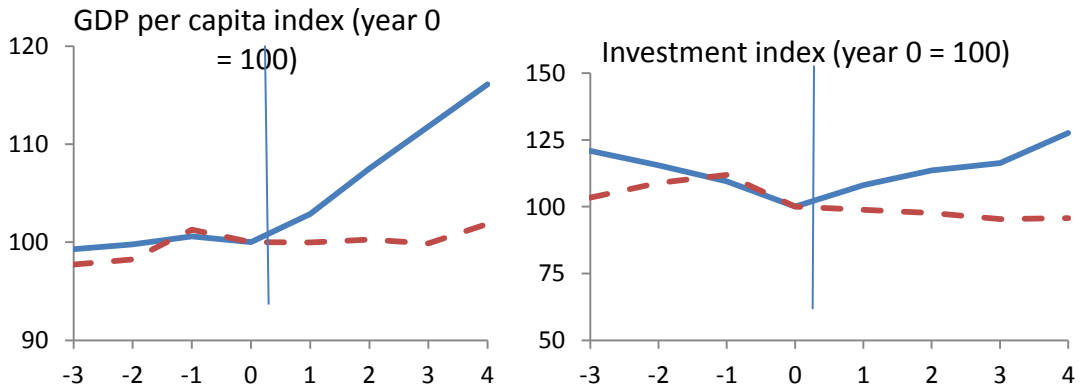
interest (growth, investment, and export and labour market performance). Subsequent rows present the average treatment effect on the treated (ATT) estimates obtained when matching on two different combinations of conditioning variables. The first one controls for the time-fixed effect, the initial NPL ratio and initial economic indicators; the second one looks at banking sector structure and supervisory rules.

The active group does better across all outcomes. For growth and investment, the average treatment effects are statistically significant despite the relatively small sample size. In fact, the estimated effects become somewhat larger than the unmatched (gross) differences. For labour market participation rates and export growth the effects are statistically significant in some specifications.

Quantitatively, active treatment of the NPL problem is associated with a 3 to 4 percentage point increase in GDP growth (compared with the cases of high and persistent NPLs), as well as an at least 13 percentage point increase in investment growth. The treatment effect for export growth, on the other hand, is weaker and not consistently different from 0. We will return to this result in section 5.3.

Chart 7 further shows the evolution of GDP per capita and investment for the treated and control groups over time (the episodes have been centred around the start year here). The gap between the solid and the dotted lines corresponds to the size of the average treatment effect.

**Chart 7: Results of the matching analysis**




Source: Authors' calculations.
Note: Treatment group (solid line): active NPL ratio reduction. Control group (dotted line): episodes of high and persistent NPLs.

Table 4 shows our estimates for the passive reduction group. Almost all of the results are statistically and economically significant. An important caveat regarding interpretation is that strong credit growth underpinning the passive episodes to a lesser extent represents a "treatment" in a strict sense insofar as it is also a manifestation of favourable external conditions.

**Table 3: Results of the matching analysis (active versus procrastinating)**

**ACTIVE vs PROCRASTINATING**

| Dependent variable: | **Average annual growth of GDP per capita** | | **Average annual growth of investment** | | **Average annual export growth** | | **Average annual labour participation rate** | | **Average annual unemployment rate** | |
|---|---|---|---|---|---|---|---|---|---|---|
| Unmatched (gross) difference | 3.22 *** | 3.72 *** | 10.06 *** | 14.83 *** | 2.58 | 4.64 *** | 4.33 ** | 4.46 ** | -2.61 * | -2.56 * |
| | (0.69) | (0.62) | (1.44) | (3.88) | (2.12) | (1.25) | (2.03) | (2.10) | (1.50) | (1.40) |
| ATT | 2.69 *** | 3.87 *** | 10.09 *** | 13.86 *** | 2.37 | 5.75 *** | 3.05 | 3.38 * | -1.52 | -0.14 |
| | (1.00) | (0.80) | (1.81) | (5.11) | (2.59) | (1.65) | (3.31) | (2.59) | (2.50) | (1.70) |
| *Matching on…* | | | | | | | | | | |
| Start year | Y | | Y | | Y | | Y | | Y | |
| Initial GDP per capita | Y | | Y | | Y | | Y | | Y | |
| Initial investment-to-GDP ratio | Y | | Y | | Y | | Y | | Y | |
| Initial debt-to-GDP ratio | Y | | Y | | Y | | Y | | Y | |
| Initial inflation rate | Y | | Y | | Y | | Y | | Y | |
| Initial NPL ratio | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Proportion of foreign banks | | Y | | Y | | Y | | Y | | Y |
| Compulsory NPL write-off | | Y | | Y | | Y | | Y | | Y |
| Number of observations | 65 | 62 | 58 | 57 | 64 | 62 | 67 | 63 | 67 | 63 |
| Treated | 21 | 23 | 19 | 22 | 21 | 25 | 22 | 24 | 22 | 24 |
| Control | 44 | 39 | 39 | 35 | 43 | 37 | 45 | 39 | 45 | 39 |

Source: Authors' calculations.
Note: Treatment group comprises active NPL ratio reduction; control group comprises episodes of high and persistent NPLs. Numbers in parentheses denote standard errors. *** is significance at 1%, ** at 5%, * at 10%.

**Table 4: Results of matching analysis (passive versus procrastinating)**

**PASSIVE vs PROCRASTINATING**

| Dependent variable: | **Average annual growth of GDP per capita** | | **Average annual growth of investment** | | **Average annual export growth** | | **Average annual labour participation rate** | | **Average annual unemployment rate** | |
|---|---|---|---|---|---|---|---|---|---|---|
| Unmatched (gross) difference | 3.32 *** | 3.34 *** | 13.26 *** | 10.23 *** | 3.83 ** | 4.48 *** | 4.89 ** | 5.49 ** | -2.19 * | -2.3 * |
| | (0.54) | (0.55) | (3.42) | (1.24) | (1.84) | (1.21) | (2.01) | (2.43) | (1.38) | (1.34) |
| ATT | 2.52 *** | 3.1 *** | 14.26 *** | 8.21 *** | -2.65 | 3.39 ** | 0.99 | 5.4 * | -0.76 | -0.91 |
| | (0.69) | (0.68) | (3.51) | (1.56) | (2.63) | (1.40) | (2.67) | (3.10) | (1.71) | (1.69) |
| *Matching on…* | | | | | | | | | | |
| Start year | Y | | Y | | Y | | Y | | Y | |
| Initial GDP per capita | Y | | Y | | Y | | Y | | Y | |
| Initial investment-to-GDP ratio | Y | | Y | | Y | | Y | | Y | |
| Initial debt-to-GDP ratio | Y | | Y | | Y | | Y | | Y | |
| Initial inflation rate | Y | | Y | | Y | | Y | | Y | |
| Initial NPL ratio | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Proportion of foreign banks | | Y | | Y | | Y | | Y | | Y |
| Compulsory NPL write-off | | Y | | Y | | Y | | Y | | Y |
| Number of observations | 80 | 66 | 79 | 62 | 77 | 63 | 82 | 66 | 82 | 66 |
| Treated | 36 | 27 | 40 | 27 | 34 | 26 | 37 | 27 | 37 | 27 |
| Control | 44 | 39 | 39 | 35 | 43 | 37 | 45 | 39 | 45 | 39 |

Source: Authors' calculations.
Note: Treatment group comprises passive NPL ratio reduction; control group comprises episodes of high and persistent NPLs. Numbers in parentheses denote standard errors. *** is significance at 1%, ** at 5%, * at 10%.

**Table 5: Results of matching analysis (active versus passive)**

| | ACTIVE vs PASSIVE | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Dependent variable: | Average annual growth of GDP per capita | | Average annual growth of investment | | Average annual export growth | | Average annual labour participation rate | | Average annual unemployment rate | |
| Unmatched (gross) difference | 0.00 | 0.38 | -2.88 | 4.60 | -1.05 | 0.16 | -0.26 | -1.03 | -0.36 | -0.26 |
| | (0.75) | (0.77) | (4.32) | (4.19) | (1.46) | (1.44) | (2.22) | (2.47) | (1.59) | (1.49) |
| ATT | -0.34 | 0.58 | -2.20 | 4.88 | 0.72 | -0.43 | 2.21 | -3.91 | -0.26 | 0.55 |
| | (0.87) | (0.93) | (4.08) | (4.92) | (1.76) | (1.86) | (2.56) | (3.53) | (1.94) | (1.98) |
| *Matching on…* | | | | | | | | | | |
| Start year | Y | | Y | | Y | | Y | | Y | |
| Initial GDP per capita | Y | | Y | | Y | | Y | | Y | |
| Initial investment-to-GDP ratio | Y | | Y | | Y | | Y | | Y | |
| Initial debt-to-GDP ratio | Y | | Y | | Y | | Y | | Y | |
| Initial inflation rate | Y | | Y | | Y | | Y | | Y | |
| Initial NPL ratio | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Proportion of foreign banks | | Y | | Y | | Y | | Y | | Y |
| Compulsory NPL write-off | | Y | | Y | | Y | | Y | | Y |
| Number of observations | 61 | 53 | 59 | 52 | 61 | 53 | 64 | 54 | 64 | 54 |
| Treated | 20 | 24 | 18 | 23 | 23 | 25 | 23 | 25 | 23 | 25 |
| Control | 41 | 29 | 41 | 29 | 38 | 28 | 41 | 29 | 41 | 29 |

Source: Authors' calculations.
Note: Treatment group comprises active NPL ratio reduction; control group comprises passive NPL ratio reduction. Numbers in parentheses denote standard errors. *** is significance at 1%, ** at 5%, * at 10%.

The final part of our matching analysis involves using passive episodes as a counterfactual for the active ones. In other words, what if countries that reduced the stock of NPLs got lucky and a positive shock to aggregate demand and credit growth enabled them to grow out of the NPL problem instead? The results are summarised in Table 5.

The results suggest that, in fact, there appear to be no systematic differences in economic outcomes between active and passive episodes. In other words, in the absence of a positive external shock, efforts to reduce the stock of NPLs are associated with economic benefits that are close to (and statistically indistinguishable from) those afforded by growing out of the NPL problem.

### 5.3. Discussion: revisiting the results for exports

Throughout our analysis, export growth was the only variable not to be systematically negatively impacted by an unresolved NPL issue. We hypothesise that the relatively greater availability of foreign lending to exporting companies makes these less dependent on domestic credit conditions. High domestic NPL ratios then restrict access to credit for companies serving the domestic market to a much greater extent than they do for exporters.

The asymmetric growth in Mexico in the second half of the 1990s is a good illustration. While the tradeables sector was able to rebound quickly after the 1995 banking crisis, non-tradeables grew sluggishly as domestic firms had to finance their operations from own resources. Krueger and Tornell (1999) attribute this discrepancy to the availability of credit, which has all but dried up for the domestic firms but left exporters relatively unscathed.

Underlying our results was the assumption that the differences in NPLs, and hence in credit conditions, is a key driver of the different economic outcomes. The fact that export growth is less sensitive to domestic credit conditions than the rest of the economy can be viewed as a certain placebo test. It provides evidence that the credit growth channel is likely to make an important contribution to the strong relationship between reduction in the stock of NPLs and growth of value added and investment.

While the matching analysis alleviates the problem of selection into episodes, the results can only be viewed as indicative as far as causal interpretation is concerned, as ultimately the macroeconomic outcomes such as growth and NPL ratios remain jointly determined by a number of common factors that cannot be fully accounted for in a country-level study. The analysis nonetheless produces a useful (upper-bound) estimate of the growth costs of unresolved NPLs.

### 5.4. Robustness checks

We carry out several robustness checks to see if our results are sensitive to the choice of episode classification. In particular, we consider four variations on our baseline approach. We report results for annual growth of GDP per capita as the headline variable of our analysis. We focus on the differences between active and procrastinating episodes (Table 6), and active and passive NPL reduction (Table 7).

First, we compare only the episodes of active and passive NPL reduction for which there is narrative evidence (the remaining cases of high NPL ratio are coded as procrastination). Our treatment group now mostly consists of active NPL reduction episodes and the number of observations in this case is smaller.

The second robustness check discards narrative evidence altogether and instead uses the data-based identification and classification only. Compared with our baseline methodology, this approach classifies some active episodes as passive, and excludes some of the short NPL reduction episodes.

Third, we revert to our original combination of data-based and narrative evidence, but we lower the threshold for an NPL reduction to be classified as active to a 40 per cent contribution to the fall in NPL ratio. This increases the number of episodes classified as active.

Finally, our fourth robustness test focuses on large falls in the NPL ratio (of at least 15 percentage points as opposed to 7 percentage points in our original specification). Stricter criteria for treatment minimise the possibility that a particular reduction period is the result of coincidence rather than concentrated effort.

On balance, our results are robust to these changes. For the comparison between active and procrastinating episodes, the extra GDP per capita growth associated with resolving a high NPL ratio is reduced to 1.6 per cent per annum in some specifications but remains statistically significant at the 5 per cent level (and arguably highly economically significant). The overall picture, including in terms of differences between the active and passive episodes, is one of minimal differences as far as the key results of the study are concerned.

**Table 6: Robustness checks for matching**

| ACTIVE vs PROCRAST | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Dependent variable: | Average annual growth of GDP per capita | | | | | | | |
| | *Narrative evidence only* | | *Data-based evidence only* | | *Active cut-off point: 40%* | | *NPL ratio at least 15%* | |
| Unmatched (gross) difference | 3.58 *** | 3.85 *** | 1.45 ** | 1.85 *** | 3.03 *** | 3.65 *** | 3.43 *** | 3.86 *** |
| | (0.70) | (0.66) | (0.63) | (0.60) | (0.54) | (0.51) | (0.70) | (0.67) |
| ATT | 2.77 ** | 3.94 *** | 1.60 * | 2.28 *** | 3.32 *** | 3.97 *** | 4.33 *** | 4.12 *** |
| | (1.12) | (0.90) | (0.84) | (0.72) | (0.75) | (0.64) | (1.17) | (0.95) |
| *Matching on…* | | | | | | | | |
| Start year | Y | | Y | | Y | | Y | |
| Initial GDP per capita | Y | | Y | | Y | | Y | |
| Initial investment-to-GDP ratio | Y | | Y | | Y | | Y | |
| Initial debt-to-GDP ratio | Y | | Y | | Y | | Y | |
| Initial inflation rate | Y | | Y | | Y | | Y | |
| Initial NPL ratio | Y | Y | Y | Y | Y | Y | Y | Y |
| Proportion of foreign banks | | Y | | Y | | Y | | Y |
| Compulsory NPL write-off | | Y | | Y | | Y | | Y |
| Number of observations | 69 | 62 | 58 | 52 | 83 | 75 | 62 | 57 |
| Treated | 15 | 16 | 13 | 12 | 39 | 36 | 15 | 17 |
| Control | 54 | 46 | 45 | 40 | 44 | 39 | 47 | 40 |

Source: Authors' calculations.
Note: Treatment group comprises active NPL reduction. Control group comprises procrastinating episodes. Numbers in parentheses denote standard errors.
*** is significance at 1%, ** at 5%, * at 10%

**Table 7: Robustness checks for matching**

| ACTIVE vs PASSIVE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Dependent variable: | Average annual growth of GDP per capita | | | | | | | |
| | *Narrative evidence only* | | *Data-based evidence only* | | *Active cut-off point: 40%* | | *NPL ratio at least 15%* | |
| Unmatched (gross) difference | 0.80 | 2.48 * | -2.51 *** | -2.08 ** | -0.96 | 0.28 | 0.53 | 1.25 |
| | (1.48) | (1.32) | (0.81) | (0.85) | (0.82) | (0.85) | (1.01) | (0.93) |
| ATT | 1.96 | 2.21 | -2.57 *** | -1.75 *** | -1.58 | 0.33 | 0.95 | 1.87 *** |
| | (1.56) | (1.54) | (0.88) | (0.74) | (1.29) | (1.13) | (1.36) | (0.99) |
| *Matching on…* | | | | | | | | |
| Start year | Y | | Y | | Y | | Y | |
| Initial GDP per capita | Y | | Y | | Y | | Y | |
| Initial investment-to-GDP ratio | Y | | Y | | Y | | Y | |
| Initial debt-to-GDP ratio | Y | | Y | | Y | | Y | |
| Initial inflation rate | Y | | Y | | Y | | Y | |
| Initial NPL ratio | Y | Y | Y | Y | Y | Y | Y | Y |
| Proportion of foreign banks | | Y | | Y | | Y | | Y |
| Compulsory NPL write-off | | Y | | Y | | Y | | Y |
| Number of observations | 22 | 27 | 60 | 52 | 66 | 54 | 42 | 38 |
| Treated | 8 | 19 | 9 | 12 | 40 | 39 | 15 | 19 |
| Control | 14 | 9 | 51 | 40 | 26 | 15 | 27 | 19 |

Source: Authors' calculations.
Note: Treatment group comprises active NPL reduction. Control group comprises passive NPL reduction. Numbers in parentheses denote standard errors. *** is significance at 1%, ** at 5%, * at 10%.

# 6. Conclusion

The aim of this paper was to revisit the relationship between NPLs and the performance of the economy by focusing on instances when countries took steps to address the issue of high NPLs. To do so, we distinguished between episodes when large and sustained drops in NPL ratios could be attributed to a credit boom, and when the main contribution came from the actual decline in the stock of NPLs. We used matching technique to control for selection bias.

Our findings on how NPLs affected the growth of GDP per capita, investment growth, labour market participation and the unemployment rate are in line with the literature: reducing the burden of NPLs has an unambiguously positive effect. Similar results derived from vector auto regression analysis, however, do not effectively distinguish between instances of rising and falling NPLs, nor do they analyse the drivers of change in NPL ratios and their role.

In this respect, our matching analysis is informative and complements VAR estimates. We show that when economies manage to grow out of NPL problems thanks to favourable external conditions and a credit boom, gains in terms of economic growth, investment growth and employment are highest. Yet when the high levels of NPLs persist, costs to the economy in terms of foregone growth are high relative to instances when action is taken to reduce the stock of NPLs – even in the absence of a large contribution from credit growth.

The foregone growth due to overhang of NPLs is estimated to be on average in excess of 2 percentage points annually until the NPL problem is addressed. In contrast, the differences in economic performance between "passive" and "active" episodes of NPL reduction are estimated to be small and not statistically significant. These estimates are also consistent with the estimates obtained by Reinhart and Trebesch (2016) for sovereign debt restructurings.

Drawing on these results, we discuss several policy recommendations. Unless a strong, V-shaped recovery appears imminent, it pays off to reduce the NPL ratio. Even though our analysis shows that the quantitatively most effective way to solve the NPL problem is to grow out of it as a result of credit expansion, engineering a credit boom may not be an advisable policy given the strong documented link between credit expansions and financial crises (Jorda, Schularick and Taylor, 2013). Besides, debt levels in most emerging markets and advanced economies today are well above historical averages (that implicitly underpin our analysis), making further credit booms both harder to generate and potentially costlier. At the same time, waiting for a marked pick-up in economic activity and credit growth when the NPL ratio is high is costly in terms of a country's economic performance (and might, in fact, delay recovery).

Our findings can thus be viewed as good news for the governments of the economies hit by the global financial crisis and suffering from the drag of NPLs. Reducing the NPL burden is associated with significant economic benefits in the medium term and past episodes of high NPLs provide valuable insights into resolution techniques and policies that can effectively encourage banks and corporations to clean their balance sheets.

# Appendix

**Table A.1: Treatment episodes and their classification**

| | | | Episode classification | | | NPL ratio | |
|---|---|---|---|---|---|---|---|
| **Country** | **Start** | **End** | **Mechanical** | **Narrative** | **Final** | **Start** | **End** |
| Albania | 2001 | 2005 | passive | passive | passive | 33.40 | 2.30 |
| Argentina | 2003 | 2013 | passive | missing | passive | 18.10 | 1.73 |
| Armenia | 2002 | 2005 | passive | active | active | 24.40 | 1.90 |
| Azerbaijan | 2002 | 2007 | passive | passive | passive | 28.00 | 2.1 |
| Bangladesh | 2000 | 2006 | passive | missing | passive | 41.10 | 12.80 |
| Belarus | 2002 | 2008 | passive | missing | passive | 14.90 | 1.70 |
| Bolivia | 2003 | 2012 | active | missing | active | 17.70 | 1.50 |
| Bosnia and Herzegovina | 2001 | 2007 | passive | missing | passive | 21.22 | 3.02 |
| Brazil | 1999 | 2007 | passive | missing | passive | 10.20 | 2.98 |
| Bulgaria | 1998 | 1998 | active | missing | active | 24.40 | 16.40 |
| Bulgaria | 2000 | 2004 | passive | missing | passive | 26.70 | 2.00 |
| China | 2002 | 2012 | passive | active | active | 29.80 | 0.95 |
| Colombia | 2000 | 2005 | active | passive | active | 13.60 | 2.70 |
| Czech Republic | 2001 | 2007 | active | active | active | 29.30 | 2.37 |
| Dominican Republic | 2004 | 2014 | active | missing | active | 8.70 | 1.54 |
| Ecuador | 2001 | 2013 | passive | passive | passive | 31.00 | 3.56 |
| Egypt, Arab Rep. | 2006 | 2014 | active | active | active | 26.50 | 8.90 |
| Gabon | 2005 | 2009 | active | missing | active | 16.00 | 7.20 |
| Georgia | 2002 | 2006 | passive | missing | passive | 11.60 | 0.81 |
| Georgia | 2010 | 2013 | missing | passive | passive | 6.26 | 3.03 |
| Ghana | 2003 | 2007 | passive | missing | passive | 22.70 | 6.40 |
| Greece | 2000 | 2001 | passive | passive | passive | 15.50 | 5.60 |
| Honduras | 2000 | 2007 | passive | missing | passive | 11.20 | 3.10 |
| Iceland | 2011 | 2013 | active | active | active | 18.30 | 4.30 |
| India | 1998 | 2009 | passive | active | active | 15.70 | 2.21 |
| Indonesia | 1999 | 2004 | active | active | active | 48.60 | 4.50 |
| Israel | 1999 | 2009 | passive | missing | passive | 9.90 | 1.40 |
| Jordan | 2002 | 2007 | passive | missing | passive | 19.30 | 4.10 |
| Kazakhstan | 2003 | 2006 | passive | missing | passive | 11.90 | 2.40 |
| Kazakhstan | 2011 | 2014 | active | missing | active | 20.93 | 12.3 |
| Kenya | 2000 | 2001 | active | missing | active | 33.70 | 13.10 |
| Kenya | 2004 | 2011 | passive | missing | passive | 34.90 | 4.43 |
| Korea, Rep. | 2001 | 2008 | passive | active | active | 8.90 | 0.57 |
| Kuwait | 2001 | 2007 | passive | missing | passive | 19.20 | 3.80 |
| Kuwait | 2010 | 2014 | missing | active | active | 11.50 | 3.50 |
| Kyrgyz Republic | 2001 | 2007 | passive | active | active | 30.90 | 3.60 |
| Kyrgyz Republic | 2011 | 2014 | passive | missing | passive | 15.80 | 4.50 |
| Latvia | 1998 | 2006 | passive | missing | passive | 10.00 | 0.50 |
| Latvia | 2011 | 2014 | active | missing | active | 15.93 | 4.60 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Lebanon | 2005 | 2011 | passive | missing | passive | 17.70 | 3.76 |
| Lithuania | 1998 | 2005 | passive | active | active | 22.20 | 0.60 |
| Lithuania | 2010 | 2014 | missing | active | active | 23.99 | 8.19 |
| Macedonia, FYR | 2000 | 2008 | passive | missing | passive | 41.30 | 6.71 |
| Malaysia | 2002 | 2014 | passive | active | active | 17.80 | 1.65 |
| Malta | 2002 | 2004 | missing | passive | passive | 18.00 | 6.50 |
| Mexico | 1999 | 2005 | active | active | active | 11.30 | 1.50 |
| Moldova | 2001 | 2007 | passive | active | active | 20.60 | 3.70 |
| Mongolia | 2001 | 2003 | passive | missing | passive | 21.89 | 4.78 |
| Mongolia | 2010 | 2014 | passive | missing | passive | 17.40 | 5.00 |
| Morocco | 2005 | 2010 | passive | missing | passive | 19.40 | 4.80 |
| Mozambique | 2002 | 2009 | passive | passive | passive | 23.40 | 1.84 |
| Nigeria | 2003 | 2006 | passive | active | active | 21.40 | 8.80 |
| Nigeria | 2010 | 2014 | active | active | active | 37.25 | 2.96 |
| Oman | 2004 | 2008 | active | missing | active | 12.50 | 2.00 |
| Pakistan | 2002 | 2006 | passive | passive | passive | 23.40 | 7.30 |
| Paraguay | 2004 | 2010 | passive | missing | passive | 20.60 | 1.27 |
| Peru | 2004 | 2008 | passive | missing | passive | 14.80 | 2.20 |
| Philippines | 2002 | 2014 | passive | passive | passive | 27.70 | 2.02 |
| Poland | 2004 | 2008 | passive | passive | passive | 21.20 | 2.82 |
| Romania | 2001 | 2002 | missing | active | active | 5.20 | 2.30 |
| Romania | 2014 | 2014 | active | active | active | 21.87 | 13.94 |
| Russian Federation | 1999 | 2006 | passive | missing | passive | 17.30 | 2.40 |
| Saudi Arabia | 2000 | 2005 | passive | missing | passive | 11.40 | 1.90 |
| Serbia | 2004 | 2006 | passive | missing | passive | 24.10 | 4.10 |
| Sierra Leone | 2001 | 2003 | passive | passive | passive | 37.90 | 7.40 |
| Sierra Leone | 2007 | 2009 | passive | passive | passive | 26.90 | 10.59 |
| Singapore | 2002 | 2014 | passive | missing | passive | 8.00 | 0.76 |
| Thailand | 1999 | 2013 | both | active | active | 42.90 | 2.30 |
| Turkey | 2002 | 2007 | passive | active | active | 29.30 | 3.32 |
| Uganda | 1999 | 2002 | passive | missing | passive | 20.20 | 3.00 |
| United Arab Emirates | 2002 | 2008 | passive | passive | passive | 15.70 | 2.30 |
| Uruguay | 2003 | 2008 | active | active | active | 33.90 | 0.51 |
| Venezuela, RB | 2003 | 2005 | passive | missing | passive | 9.20 | 1.10 |

**Table A.2: Narrative evidence**

| Country | Start | End | Narrative | Comment | Source |
|---|---|---|---|---|---|
| Albania | 2001 | 2005 | passive | A loan handling agency was set up. | IMF reports. |
| Armenia | 2002 | 2005 | active | The reduction in the NPL ratio was mainly due to write-offs of bad loans. | IMF Article IV Consultation 2002. |
| Azerbaijan | 2002 | 2007 | passive | According to the IMF, the reduction in the NPL ratio was largely caused by rapid credit growth. | IMF Article IV Consultation 2008. |
| China | 2002 | 2012 | active | China set up four asset management companies, each one matched to a specific bank, to deal with NPLs. Three of the banks were restructured and increased capital. | G. Ma and B. Fung (2002), "China's asset management corporations", BIS Working Paper; R. Podpiera (2006), "Progress in China's Banking Sector Reform: has Bank Behaviour Changed?", IMF Working Paper; IMF Article IV Consultation 2005; IMF Article IV Consultation 2006. |
| Colombia | 2000 | 2005 | passive | FOGAFIN, the state agency for bank resolution and deposit guarantees, managed a bank restructuring and recapitalisation programme. Four public banks were liquidated or merged in 2000. Regulation and supervision was tightened and some mortgage debt relief was granted. | IMF Article IV Consultation 2001; IMF Article IV Consultation 2002. |

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|---|---|---|---|---|---|
| Czech Republic | 2001 | 2007 | active | Konsolidacni Banka Praha (KOB), a consolidation bank, and its subsidiaries Ceska Financni and Konpo took over large amounts of NPLs and "ring-fenced" (guaranteed) loans worth over 20% of 2001 GDP. Additionally, Ceska Inkasni was set up to handle bad assets related to foreign trade. | IMF Financial System Stability Assessment 2001; CESIfo Bank Restructuring Index. |
| Ecuador | 2001 | 2013 | passive | The NPL reduction period was preceded by the dollarisation of the economy. | IMF reports. |
| Egypt, Arab Rep. | 2006 | 2014 | active | The central bank established a monitoring unit for NPLs and initiated a programme for resolving conflicts, initially targeting borrowers comprising 55% of NPLs in the public sector. | IMF Article IV Consultation 2004; IMF Article IV Consultation 2007. |
| Georgia | 2010 | 2013 | passive | The government simplified seizing and selling seized property. | Economic Policy Research Center (2014). Management of Non-performing Loans in Georgia - Analysis and Recommendations. |
| Greece | 2000 | 2001 | passive | Reduction in NPLs due to balance sheet restructuring. | OECD Economic Surveys: Greece 2002. |
| Iceland | 2011 | 2013 | active | Both household and corporate debt was restructured and/or written off. | IMF Article IV Consultation 2012; OECD Economic Surveys: Iceland 2013. |
| India | 1998 | 2009 | active | The government passed the SARFEASI Act in 2002, which enables banks to create asset reconstruction companies, which can seize and auction assets of non-performing debtors without the intervention of a court. | B. Pathakk (2010), *The Indian Financial System: Markets, Institutions and Services*, Pearson India. |

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|---|---|---|---|---|---|
| Indonesia | 1999 | 2004 | active | The Indonesian Bank Restructuring Agency (IBRA), an asset management company, recapitalised/closed banks and took over assets from former shareholders of failed banks, which were subsequently liquidated. | D. Woo (2000), "Two approaches to resolving Nonperforming Assets during Financial Crises", IMF Working paper 00/33. |
| Kazakhstan | 2011 | 2014 | active | Amendments to tax legislation enabled banks to write off bad loans. The two largest problem banks were merged **and** restructured into a good and bad bank. A special fund purchased NPLs. | EBRD; IMF reports. |
| Korea, Rep. | 2001 | 2008 | active | KAMCO, a small government loan collection agency before the Asian crisis, was transformed into a bad bank and started purchasing NPLs in 1997. By the end of 2002 it had purchased NPLs with a face value of US$ 93 billion. In order to increase recovery rates, KAMCO offered debtor support such as lowering interest rates, extending maturities and reductions of outstanding principal. Moreover, KAMCO provided loans to companies under private workout programmes, in which creditors agreed to restructure distressed assets. | H. Dong (2004), "The Role of KAMCO in Resolving Non-performing Loans in the Republic of Korea", IMF Working Paper; M. Pomerleano and W. Shaw (2005), *Corporate Restructuring: Lessons from Experience*, World Bank Stand Alone Books. |
| Kuwait | 2010 | 2014 | active | The NPL ratio declined largely on the account of write-offs of investment companies' loans and loan repayments related to loan restructuring. | IMF Article IV Consultation 2012. |
| Kyrgyz Republic | 2001 | 2007 | active | DEBRA, a debt resolution agency was already set up in 1996, but thought to be ineffective due to lack of independence from the Ministry of Finance. However, following the Russian crisis, the National Bank of the Kyrgyz Republic (NBKR) closed nine problem banks and increased capital requirements. | IMF and World Bank (2003), Financial Sector Assessment. |
| Lithuania | 1998 | 2005 | active | The two largest banks were recapitalised. One bank was liquidated and another one privatised. Turto Bankas, an asset management company, was created to take over NPLs. | OECD Economic Surveys: Baltic States 2000. |

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|---|---|---|---|---|---|
| Lithuania | 2010 | 2014 | active | The insolvency laws were changed and special purpose vehicles (SPVs) created. Two bankrupt banks, Snoras and Ukio Bankas, who held quite significant amounts of NPLs, were closed and, in the case of Ukio Bankas, split into a bad bank and a good bank (taken over by Siauliu Bankas). | EBRD; IMF reports. |
| Malaysia | 2002 | 2014 | active | The SPVs Danaharta Nasional Bhd and Danamodal Nasional Bhd were created to reduce and manage NPLs and recapitalise the banking sector. The Corporate Debt Restructuring Committee (CDRC) was set up to arrange out-of-court settlements between debtors and creditors. The CDRC was later granted more invasive powers, such as the authority to implement management changes. | J. K. Sundaram, K. F. Chin and S. C. Wong (2005), *Malaysian "bail outs"? Capital controls, Restructuring and Recovery*; OECD (2003), *Maximising Value of Non-Performing Assets - Proceedings from the Third Forum for Asian insolvency Reform*; D. Woo (2000), *Two approaches to resolving Nonperforming Assets during Financial Crises.* |
| Malta | 2002 | 2004 | passive | Decline in NPLs following improved risk management by banks. | Central Bank of Malta (2004). Thirty-Seventh Annual Report and Statement of Accounts. |
| Mexico | 1999 | 2005 | active | The Bank Savings Deposit Fund (FOBAPROA) was established in 1995 in order to buy subordinated debt of undercapitalised banks but restructured very little debt, as responsibility for loan recovery remained with the banks. FOBAPROA was therefore replaced in 1999 by the Institute for the Protection of Bank Savings (IPAB), which succeeded in selling the collection rights for several loan packages. The government conducted several debtor support programmes, including lengthening of maturities, discounts on debt payments and reductions in principal. The final wave of these programmes, dubbed “Punto final”, provided discounts of 45%-60% of outstanding principal and led to marked reduction in overdue loans by year end. | *Corporate Restructuring: Lessons from Experience*, M. Pomerleano and W. Shaw, eds. World Bank Stand Alone Books, 2005; OECD Economic Surveys: Mexico 2000. |

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|---|---|---|---|---|---|
| Moldova | 2001 | 2007 | active | The NPL ratios decreased from their peak level of 45% in 1996 on the back of both immediate write-offs of NPLs and rapid credit growth. | Commission of the European Communities (2004). European Neighbourhood Policy - Country Report: Moldova; IMF Financial System Stability Assessment 2005. |
| Mozambique | 2002 | 2009 | passive | The banks Banco Comercial de Moçambique (BCM) and Banco Austral (BA), which represented more than half of the banking sector, were merged/nationalised. BCM was merged with Banco Internacional de Moçambique (BIM). BA was first nationalised and then sold to Amalgamated Bank of South Africa (ABSA). It was agreed that NPLs considered unrecoverable by ABSA should be transferred to the treasury. | AfDB/OECD (2003), African Economic Outlook. |
| Nigeria | 2003 | 2006 | active | A major banking sector reform was undertaken in 2004/2005, which included up to 10-fold capital increases, strengthened regulation, banking sector consolidation and bank closures. | L. Cook (2011), "Were the Nigerian Banking Reforms of 2005 a Success…And for the Poor?", NBER Working Paper. |
| Nigeria | 2010 | 2014 | active | AMCON, an asset management company for bad loans, was established in 2010. AMCON purchased more than 12,000 problem loans and injected capital into five banks. | IMF Financial System Stability Assessment 2013; AMCON website. |
| Pakistan | 2002 | 2006 | passive | The Corporate Industrial Restructuring Company (CIRC), an asset management company, was created in 2000. All public sector financial institutions were required to offer their NPLs to CIRC. However, due to a variety of factors, including lack of expertise and bureaucratic procedures, CIRC is believed to have been only a mixed success. | OECD (2003), *Maximising Value of Non-Performing Assets - Proceedings from the Third Forum for Asian insolvency Reform*; IMF Article IV Consultation 2002. |

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|---|---|---|---|---|---|
| Philippines | 2002 | 2014 | passive | The corporate rehabilitation and insolvency systems were upgraded with special commercial courts. SPVs were set up to create the framework and provide tax incentives for the financial sector to sell and dispose of NPLs to asset management companies. Operations started slowly, however, and only gathered momentum in 2004. | OECD (2003), Maximising Value of Non-Performing Assets - Proceedings from the Third Forum for Asian Insolvency Reform; PriceWaterhouseCoppers (2008). NPL Asia; IMF Article IV Consultation 2004. |
| Poland | 2004 | 2008 | passive | The decline in NPLs was mostly driven by economic recovery, although a change in loan classification contributed to a decrease in the NPL ratio as well. | IMF Article IV Consultation 2004; IMF Article IV Consultation 2005. |
| Romania | 2001 | 2002 | active | Bancorex, a large state-owned bank with about 90% of its portfolio non-performing, was liquidated. AVAB, a newly created asset management agency, took over the bad loans, removing some US$ 2 billion (almost 6% of GDP) in NPLs from the banking system. Banca Agricola, another state-owned bank, underwent important restructuring and also ceded NPLs to AVAB. | K. Sherif, M. Borish and A. Gross (2003*), State-owned Banks in Transition: Origins, Evolution and Policy Responses*, World Bank; S. Barisitz (2004), *The Transformation of the Romanian Financial and Banking Sector*, Oesterreichische Nationalbank. |
| Romania | 2014 | 2014 | active | The National Bank of Romania (NBR) stimulated NPL resolution through higher provisioning, sales, and by allowing banks to write off provisioned NPLs while still retaining legal claims against borrowers. | EBRD *Transition Report* 2015-16. |
| Sierra Leone | 2001 | 2003 | passive | The decline reflects mostly improvements in corporates' financial positions and thus their ability to repay debt. | O. Johnson (2011), "Financial Sector Reform and Development in Sierra Leone", International Growth Centre Working Paper; IMF Article IV Consultation 2004. |

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|---|---|---|---|---|---|
| Sierra Leone | 2007 | 2009 | passive | Strong credit growth and/or better financial position of debtors likely to have driven the decrease in the NPL ratio, since Sierra Leone was at the time lacking any real banking supervision. | O. Johnson (2011). Financial Sector Reform and Development in Sierra Leone. International Growth Centre Working Paper. |
| Thailand | 1999 | 2013 | active | The Thai Financial Sector Restructuring Agency (FRA), a de facto asset management company, was set up in 1997 to deal with suspended finance companies and the Thai Asset Management Company (TAMC) was created to assume the "bidder of last resort" function at auctions of seized assets. | OECD (2003), *Maximising Value of Non-Performing Assets - Proceedings from the Third Forum for Asian insolvency Reform*; D. Woo (2000), *Two approaches to resolving Nonperforming Assets during Financial Crises*. |
| Turkey | 2002 | 2007 | active | Together with the World Bank, the "Istanbul approach" was developed in order to detect cases of temporary strain in corporates with otherwise strong fundamentals that would thus deserve debt rescheduling. Between 2002 and 2005, US$ 5.9 billion of loans in 318 companies had been restructured. The Savings Deposit Insurance Fund of Turkey (SDIF) took up the task of bank resolution through mergers, transfers, sales and liquidations. | Banking Regulation and Supervision (BRSA); Savings Deposit Insurance Fund (SDIF); Undersecretariat of Treasury (UoT) and Central Bank of the Republic of Turkey (2009); *From Crisis to Financial Stability: Turkey Experience*; OECD Economic Surveys: Turkey 2004; CESIfo Bank Restructuring Index; M. Pomerleano and W. Shaw (2005) *Corporate Restructuring: Lessons from Experience*, World Bank. |
| United Arab Emirates | 2002 | 2008 | passive | The law prohibits writing off NPLs as long as there is a chance of repayment. The decline in NPLs is thus likely to have been caused by credit growth; domestic credit to GDP increased from around 35% in 2001 to almost 70% in 2008. | IMF Article IV Consultation 2005. |
| Uruguay | 2003 | 2008 | active | A government-backed asset management company for NPLs of Banco de la Republica Oriental del Uruguay, a publicly owned bank, was created. | IMF (2004), Fifth Review under the Stand-By Arrangement and Requests for Modification of the Arrangement and Waiver of Nonobservance and Applicability of Performance Criteria; L. De |

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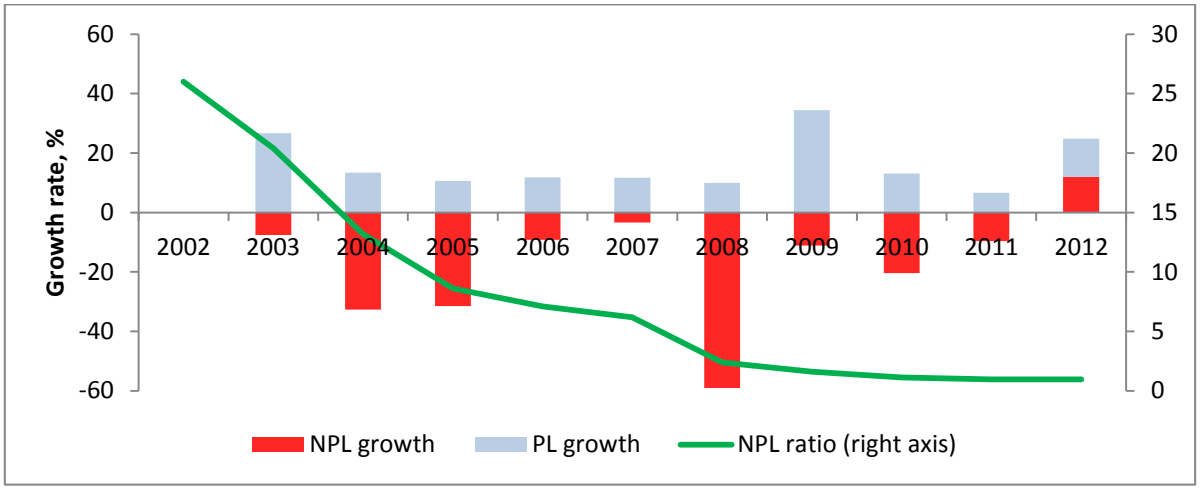
|---|---|---|---|---|---|
| | | | | | La Plaza and S. Sirtaine (2005), “An Analysis of the Uruguayan Banking Crisis”, World Bank Policy Research Paper. |

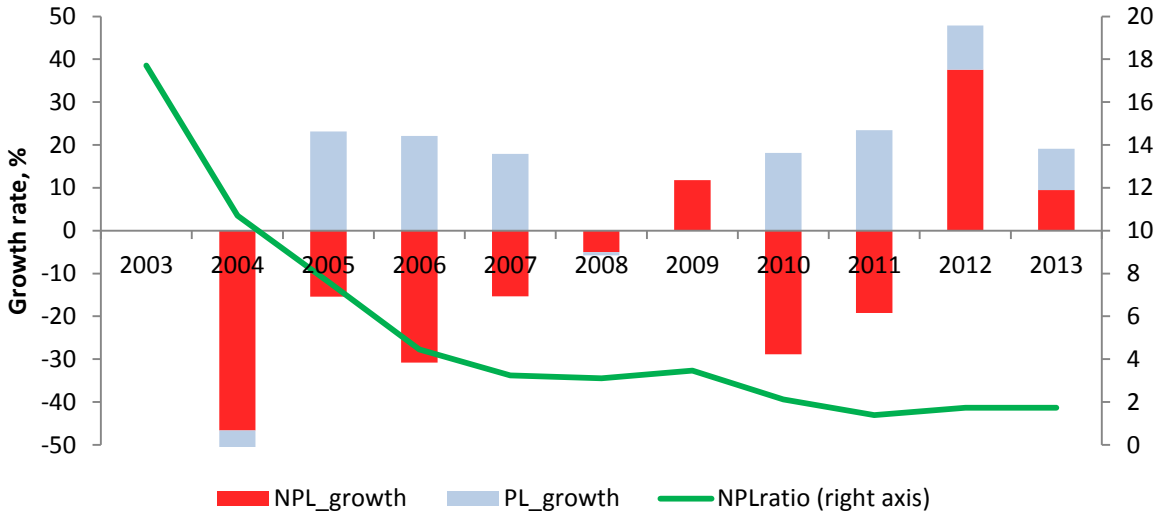
## A.3. NPL dynamics during selected episodes

**Chart A.3.1: NPL ratio in China (right axis), and growth in performing loans and NPLs (left axis)**



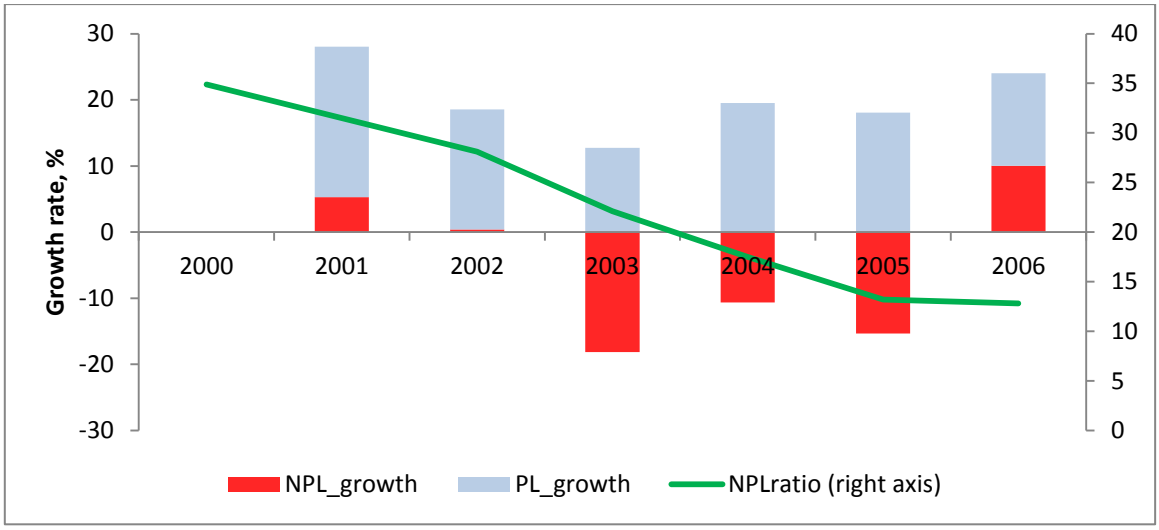

Sources: WDI, CEIC, authors' calculations.

**Chart A.3.2: NPL ratio in Argentina (right axis), and growth in performing loans and NPLs (left axis)**




Sources: WDI, CEIC, authors' calculations.

**Chart A.3.3: NPL ratio in Bangladesh (right axis), and growth in performing loans and NPLs (left axis)**




Sources: WDI, CEIC, authors' calculations.

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