Can Italy Grow Out of Its NPL Overhang? A Panel Threshold Analysis*

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July 31, 2017

Abstract

This paper examines whether a tipping point exists for real GDP growth in Italy above which the ratio of non-performing loans (NPLs) to total loans falls significantly. Estimating a heterogeneous dynamic panel-threshold model with data on 17 Italian regions over the period 1997–2014, we find that growth above 1.2 percent, if sustained for a number of years, is associated with a significant decline in the NPL ratio.

JEL Classifications: C23, E44, G33.
Keywords: Italy, non-performing loans, growth, panel tests of threshold effects.

1 Introduction

The ratio of non-performing loans (NPLs) to total loans in Italy has reached very high levels (Figure 1a) post global financial crisis. Total NPLs were about €349 billion at end–2016 (17.3 percent of total loans; 21 percent of GDP; and one-third of the Euro Area total), with significant regional differences in NPL ratios (Figure 1b).[1] In addition to active NPL-resolution measures, cyclical factors can play a role in reducing NPLs. Faster growth is

*We are grateful to Athanasios V. Arvanitis, Antonio Bassanetti, Oya Celasun, Carlo Cottarelli, Rishi Goyal, Bertrand Gruss, Dermot Monaghan, Maria Soledad Martinez Peria, and Rachel N. van Elkan as well as Italian authorities for helpful comments and suggestions. We would also like to thank the Editor in charge of our paper (Badi H. Baltagi) and one anonymous referee for helpful suggestions. The views expressed in this paper are those of the authors and do not necessarily represent those of the International Monetary Fund or IMF policy.

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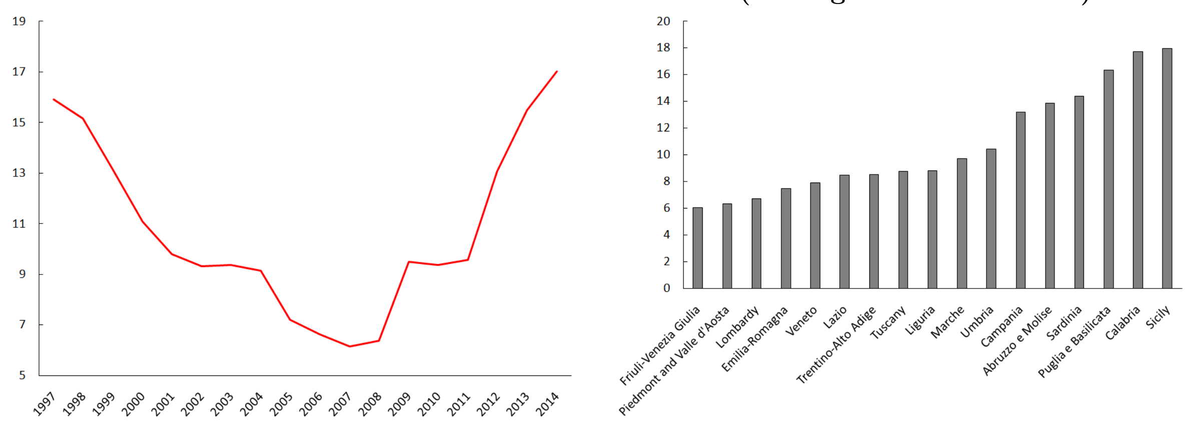
[1] High NPLs are a drag on bank profitability and may also adversely affect economic activity; see Peek and Rosengren (2005) and Caballero et al. (2008).

expected to lead not only to an expansion in total credit (the denominator of NPL ratio) but also in a stabilization or reduction in stock of NPLs (the numerator) through (i) a reduction in the new flow of NPLs as firms' probability of default falls; (ii) an improvement in prospects of firms whose loans may have become non performing, resulting in previous NPLs becoming performing again; (iii) an increase in the disposal of NPLs as recovery values improve; and (iv) an increase in bank profitability, leading to higher retained earnings, higher provisions and greater write offs. Empirical evidence also suggests that economic activity is one of the main drivers of NPLs; see Glen and Mondragón-Vélez (2011), Bofondi and Ropele (2011), and Notarpietro and Rodano (2016).

Figure 1: Italian NPL Ratios Over Time and Across Regions

(a) Evolution of the NPL Ratio Over Time **(b) Geographical Distribution of NPL Ratios (Averages over 1997-2014)**



Source: Authors' construction based on Bank of Italy data.

Motivated by the above cross-country experience, which highlights the importance of fast growth for reducing NPLs, and the Italian authorities' strategy for their banking sector, which rests partially on growing out of their NPL problems, this paper asks: Can Italy grow out of its NPL overhang? We estimate the rate of growth needed for this strategy to be viable (absent alternative/complementary measures to restore bank balance sheet health). This contrasts with most of the empirical literature which investigates the implications of higher debt on economic growth (see, for instance, Chudik et al. (2013) and the references therein). We contribute to the literature by investigating whether there is a non-monotonic relationship between real GDP growth and the NPL ratio in Italy while accounting for potential feedback effects from the NPL ratio to real GDP growth. In other words, we investigate whether there exists a tipping point for real GDP growth in Italy beyond which the NPL ratio falls significantly (i.e., by about 5–10 percent per year). To this end, we specify a heterogeneous dynamic panel-threshold model and provide formal statistical tests of growth-threshold effects on NPL ratios in a sample of 17 Italian regions over 1997–2014.[2]

We find a statistically significant growth-threshold effect on the NPL ratio in Italy at about 1.2 percent, once we account for cross-region heterogeneities, simultaneous determination of the NPL ratio and growth, and dynamics. Moreover, we find that there is a significant and robust negative long-run association between economic growth and NPL ratios. Quantitatively, a one percentage points faster growth than the baseline in Italy, if persistent, would reduce the NPL ratio by about 6.5 to 9.5 percent per year (i.e. halving the NPL ratio in $3-6$ years). Given Italy's moderate growth outlook, banks could thus struggle to grow out of their NPL overhang. Italy has experienced historically weak economic growth (and negative productivity growth) predating the global financial crisis (Figure 2). It is, therefore, important for Italy to improve its growth prospects compared to the currently moderate outlook—see Figure 2b—(with real GDP growth projected by a number of analysts to remain close to 1 percent over the next few years) by scaling up its structural reform efforts.

Figure 2: Real GDP and TFP Growth

(a) Real GDP and TFP Growth (averages over 1997-2014)

(b) Real GDP Growth (1997-2022)

Source: (a) The annual macro-economic database of the European Commission's Directorate General for Economic and Financial Affairs (AMECO); (b) Authors' estimates and IMF projections.

This also means that active NPL resolution measures are needed to bring NPL ratios on a firm downward trajectory over the medium term. The Italian authorities have already introduced several measures to deal with the NPL problem. These include steps to improve the insolvency system, foster consolidation within a fragmented banking sector, deal with

[2]Note that our estimation strategy takes into account dynamics, regional heterogeneity, and feedback effects between NPL ratios and growth. Acknowledging that cyclical developments are an important driver of NPL ratios in Italy, we distinguish between the short-term and long-term effects of faster growth on NPL ratios, and focus on the latter.

some problem banks, and facilitate securitization and sale of NPLs. Additionally, supervisors need to ensure that banks' NPL reduction strategies and targets are ambitious and credible. Sizeable NPL sales are planned in the coming year, which need to be implemented and backed up by strong and credible restructuring plans. Complementary measures include further advancing insolvency and debt enforcement reforms (beyond recent policy measures), and the facilitation of distressed debt markets; for more details, see Garrido et al. (2016). Should the need arise, making timely and effective use of the resolution framework to minimize costs to taxpayers and the rest of the financial system is also important, and concerns related to the bail-in of retail investors should be dealt with appropriately (International Monetary Fund 2016).

2 A panel threshold NPL ratio-growth model

We begin our econometric analysis with the following specification for the change in NPL ratio (Δd_{it}):

$$\begin{aligned} \Delta d_{it} &= \alpha_{i,d} + \varphi I\left(\Delta y_{it} > \tau\right) + \delta \Delta d_{i,t-1} + \eta \Delta y_{i,t-1} + e_{it}, \\ \text{for } i &= 1,2,...,N, \text{ and } t = 1,2,...,T, \end{aligned} \tag{1}$$

and combine it with an equation for real GDP growth, Δy_{it}

$$\Delta y_{it} = \alpha_{i,y} + \varkappa \Delta y_{i,t-1} + \psi \Delta d_{i,t-1} + \varepsilon_{it}, \tag{2}$$

Both specifications include fixed effects, $\alpha_{i,d}$ and $\alpha_{i,y}$, but to simplify the exposition, we initially assume homogeneous slopes. Equation (2) allows for feedbacks from lagged NPL-ratio growth ($\psi \neq 0$) to real GDP growth. It is important to note that even if τ was known, estimates of φ based on (1), would be subject to a substantial simultaneity bias when ε_{it} is correlated with e_{it}, regardless of whether lagged variables are present in (1) and/or (2). To deal with this bias, we model the correlation between the two innovations and derive a reduced form equation, which allows us to identify the threshold effect in the NPL-ratio equation, given that the threshold variable is excluded from the growth equation (our identification condition).[3] To this end, assuming a linear dependence between the innovations, we have

$$e_{it} = \kappa_i \varepsilon_{it} + u_{it}, \tag{3}$$

[3] Nonetheless, we do not rule out the possibility of indirect threshold effects through the feedback variable, $\Delta d_{i,t-1}$.

where $u_{it} = e_{it} - E(e_{it} | \varepsilon_{it})$, and by construction u_{it} and ε_{it} are uncorrelated. The coefficient κ_i measures the degree of simultaneity between NPL ratio and growth innovations for region i. Substituting (3) in (1) and then substituting (2) for ε_{it}, we obtain the following "reduced form" panel threshold-ARDL specification for Δd_{it}:

$$\Delta d_{it} = c_i + \varphi I (\Delta y_{it} > \tau) + \lambda_i \Delta d_{i,t-1} + \beta_{i0} \Delta y_{it} + \beta_{i1} \Delta y_{i,t-1} + u_{it}, \tag{4}$$

where $c_i = \alpha_{i,d} - \kappa_i \alpha_{i,y}$, $\lambda_i = \delta - \kappa_i \psi$, $\beta_{i0} = \kappa_i$, and $\beta_{i1} = \eta - \kappa_i \varkappa$. Conditional on $(\Delta d_{i,t-1}, \Delta y_{it}, \Delta y_{i,t-1})$ and under our identification assumption, u_{it} and $I [\Delta y_{it} > \tau]$ are uncorrelated and, hence, for a given value of τ, φ can be consistently estimated after the fixed effects and the heterogeneous dynamics are filtered out. The threshold coefficient, τ, can then be estimated by a grid search procedure, see Chudik et al. (2017) for details. Since the focus of the analysis is on φ, assumed to be homogeneous, (4) can be estimated treating the other coefficients, c_i, λ_i, β_{i0}, β_{i1}, as heterogeneous.[4] Note that testing the hypothesis $\varphi = 0$ requires non-standard test statistics because under $\varphi = 0$, the threshold parameter τ disappears. However, Chudik et al. (2017) develop such tests in the context of heterogenous dynamic panel data models (i.e., $Sup\mathcal{T}$ and $Ave\mathcal{T}$ test statistics), which we use.

3 Empirical findings

We construct regional NPL ratios based on supervisory returns data from the Bank of Italy and obtain regional real GDP data from Italy's National Institute for Statistics (Istat),[5] and then provide a formal statistical analysis of growth-threshold effects on NPL ratios.

[4] Owing to the intrinsic regional heterogeneities in Italy, the growth thresholds are most-likely region specific. Relaxing the homogeneity assumption, whilst possible in a number of dimensions, is difficult when it comes to the estimation of region-specific thresholds, because due to the non-linearity of the relationships involved, identification and estimation of region-specific thresholds require much larger time series data than are currently available. Moreover, the methodology treats the threshold variable as being time-invariant, while it might have decreased with underlying improvements in insolvency regime over time.

[5] We use end-of-year data on NPL ratios by region. From 1997-2007, we use supervisory returns data compiled by the Bank of Italy on the non-performing/total loans ratio (percentage) for the different regions. NPLs comprise overdue, substandard, restructured and impaired loans. From 2008-2014, we compile our own NPL ratio adding up loans across those four NPL categories and dividing them by total loans (total maturity). We have data on 17 regions, as opposed to 20, as some regions are grouped together in the Bank of Italy's statistical database after 2007.

3.1 Tests of the growth-threshold effects

We begin with the following baseline autoregressive distributed lag (ARDL) specification, which extends (4) to p lags,

$$\Delta d_{it} = c_i + \varphi I\left(\Delta y_{it} > \tau\right) + \sum_{\ell=1}^{p} \lambda_i \Delta d_{i,t-\ell} + \sum_{\ell=0}^{p} \beta_{i\ell} \Delta y_{i,t-\ell} + v_{it}, \tag{5}$$

and, following Chudik et al. (2016), we also consider the alternative approach of estimating the long-run effects using the distributed lag (DL) counterpart of (5), given by

$$\Delta d_{it} = c_i + \theta I\left(\Delta y_{it} > \tau\right) + \phi_i \Delta y_{it} + \sum_{\ell=0}^{p} \alpha_{i\ell} \Delta^2 y_{i,t-\ell} + v_{it}, \tag{6}$$

The threshold variable $I\left(\Delta y_{it} > \tau\right)$ takes the value of 1 if real GDP growth is above τ and zero otherwise. As before, y_{it} is the log of real GDP and d_{it} is the log of NPL ratio. As explained in Chudik et al. (2016), sufficiently long lags are necessary for the consistency of the ARDL estimates, whereas specifying longer lags than necessary can lead to estimates with poor small sample properties. The DL method, on the other hand, is more generally applicable and only requires that a truncation lag order is selected. We use the same lag order, p, for all variables/regions but consider different values of p, with $p_{\max} = 2$, to investigate the sensitivity of the results to the choice of the lag order.

Table 1: Tests of real GDP growth-threshold effects on changes in NPL ratios

	ARDL		DL		
lags:	(1,1)	(2,2)	p=0	p=1	p=2
Regressions with threshold variable $I\left[\Delta y_{it} > \tau\right]$					
$\widehat{\tau}$	1.2%	1.2%	1.2%	1.2%	1.2%
$Sup\mathcal{T}$	$4.31^{\ddagger}$	$4.54^{\ddagger}$	1.89	3.11^{*}	3.11^{*}
$Ave\mathcal{T}$	$3.00^{\ddagger}$	$3.13^{\ddagger}$	1.17^{*}	$1.88^{\ddagger}$	$1.98^{\ddagger}$

Notes: The ARDL and DL specifications are given by (5) and (6). The $Sup\mathcal{T}$ and $Ave\mathcal{T}$ test statistics for the statistical significance of the threshold variable $I\left[\Delta y_{it} > \tau\right]$ are reported in the Table. *, † and ‡ denote statistical significance at 10%, 5% and 1% level, respectively.

Table 1 reports the *Sup* and *Ave* test statistics for the presence of growth-threshold effects on NPL ratios based on the ARDL and DL specifications, (5) and (6). The *Sup* and *Ave* tests results are statistically significant in all cases, irrespective of the choice of the lag order and the estimation procedure (ARDL or DL). Therefore, there is support for the presence of growth-threshold effects on NPL ratios in Italy using ARDL and DL specifications at varying lag orders, with the estimates of the threshold being 1.2 percent in all cases.[6]

These non-linear effects could be working through several channels. First, sufficiently-fast growth will likely raise the value of collateral and therefore reduce the gap between market and book values of NPLs. Distressed debt investors may have an incentive to wait until they see sustained fast-paced growth before entering the NPLs market. At the same time, as the difference between market and book values of NPLs close, banks will be more willing to write off NPLs. Second, growth exceeding a certain threshold for a period of time may be needed for borrowers in distress to be able to service their debt obligations again, and for the likelihood of further defaults to be reduced. Third, once the economy grows above a certain rate for some time, profitability will be high enough for banks to use retained earnings to build higher capital buffers, further helping them with the write-off of NPLs.[7]

Against the backdrop of long-standing structural rigidities (including product and service market inefficiencies, wage growth in excess of productivity, high taxation, an inefficient public sector, and lengthy judicial processes), Italy is currently not expected to grow above 1.2 percent over the medium term (see Figure 2b). Therefore, further efforts are needed in three important areas to raise potential growth and help reduce NPL ratios faster: product and service markets; public administration; and wage bargaining reform to align wages with productivity at the firm level and across regions. Moreover, there is a need to actively resolve NPLs as outlined in Section 1.

3.2 Estimates of long-run effects

To investigate the long-run effects of a persistent pick-up in output growth on NPL ratios, regardless of whether there is a threshold effect, we rely on the ARDL and DL specifications in equations (5) and (6) while setting φ to zero. Pesaran and Shin (1999) show that the traditional ARDL approach can be used for long-run analysis, and that the ARDL methodology is valid regardless of whether the regressors are exogenous, or endogenous, and irrespective of whether the underlying variables are $I(0)$ or $I(1)$. These features of the panel ARDL approach are appealing as reverse causality could be very important in our empirical appli-

[6] To check the robustness of our results and to account for error cross-sectional dependence, we also estimated the cross-sectionally augmented version of the ARDL and DL regressions, CS-ARDL and CS-DL, and found very similar results to those obtained in Table 1. These findings are not reported in the paper but are available upon request. Given limited number of time-series observations ($T = 18$), adding additional regressors in the form of cross-sectional averages of all the variables and their lags imposes excessive parameter requirements on the data, and hence our preferred specifications are ARDL and DL.

[7] Although not explicitly testing for threshold effects, Fujii and Kawai (2010) show that in Japan over the period 1997-2007, the outstanding NPL ratio rose when GDP growth was below 1 percent and declined when it exceeded 1 percent, except in one year (2000).

cation. While high NPLs may have an adverse impact on economic growth, low GDP growth could also lead to higher NPLs. We are indeed interested in studying the relationship between output growth and NPL ratios after accounting for these possible feedback effects. We also utilize the DL approach for estimating the long-run relationships for its robustness. Both ARDL and DL specifications allow for a significant degree of cross-region heterogeneity and account for the fact that the effect of a persistent pick-up on growth on NPL ratios could vary across regions (particularly in the short run), depending on region-specific factors such as institutions, geographical location, or cultural heritage.

Table 2: Mean group estimates of the long-run effects of real GDP growth on changes in NPL ratios (1997-2014)

	ARDL		DL		
lags:	(1,1)	(2,2)	p=0	p=1	p=2
(a) Regressions with threshold variable $I[\Delta y_{it} > \tau]$					
$\widehat{\theta}$	-8.337‡	-8.635‡	-6.944‡	-8.588‡	-9.533‡
	(0.5719)	(0.6903)	(0.4643)	(0.5923)	(0.7528)
(b) Regressions without threshold variables					
$\widehat{\theta}$	-6.472‡	-6.522‡	-6.676‡	-7.016‡	-7.541‡
	(0.5616)	(0.7994)	(0.5811)	(0.7304)	(0.5139)

Notes: The ARDL and DL specifications are given by (5) and (6). Standard errors are given in parentheses. Statistical significance is denoted by *, † and ‡, at 10%, 5% and 1% level, respectively.

The results across all specifications suggest an inverse relationship between GDP growth and changes in NPL ratios. Specifically, Table 2 shows that the coefficients of real GDP growth, $\widehat{\theta}$, are negative and statistically significant at the 1 percent level, with their values ranging from -6.5 to -9.5 across various estimation techniques (ARDL and DL), and lag orders.[8] In other words, a one percentage point faster growth than the baseline, if it persists, would reduce the ratio of NPLs by about 6.5 to 9.5 percent per year (i.e., halving the NPL stock in 3–6 years).

[8] As shown in Pesaran and Smith (1995), the MG estimates are consistent under fairly general conditions so long as the errors are cross-sectionally independent.

4 Concluding remarks

We provided a formal statistical analysis of growth threshold effects on NPL ratios in a panel of 17 Italian regions over the period 1997–2014. Our results suggest that for Italy there is a growth-threshold effect of about 1.2 percent in the relationship between real GDP growth and NPL ratios. However, achieving average growth rates above 1.2 percent requires tackling long-standing structural rigidities. There is also a need for additional financial sector measures to clean up bank balance sheets, including more intensive use of out-of-court debt restructuring mechanisms and proactive supervision.

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