The determinants of the unlikely-to-pay and the flows towards performing and bad loans

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Abstract

Using a novel panel data set, we study the determinants of the unlikely-to-pay loans (UTP) and the out-flows from UTP to performing and to other categories of non-performing loans (NPL) of Italian banks during the period from 2010 to 2016. The paper investigates a specific category of NPL, which given their increasing importance in bank credit portfolios is a category which has attracted recent interest from supervisors, regulators and market operators. Results are that the determinants of UTP ratio are the same as determinants of bad loans ratio, and determinants of flows of new UTP match determinants of flows of new bad loans. But using stocks or flows of UTP with a dynamic GMM model yields conflicting results with regard to quality of management, bank efficiency and capitalization. This emphasizes the importance of choosing the measure of credit portfolio quality for both researchers and supervisory authorities. Lastly, considering the flows of UTP that either become performing loans again or worsen by becoming NPL, findings suggest that having a specific office/unit to manage NPL increases flows to performing loans and reduces flows to other categories of NPL. With regard to the coverage of UTP, banks with a higher ratio of loan loss provisions specific for UTP show higher flows to other categories of NPL.

Key words: unlikely-to-pay, banks, non-performing loans, flows of new unlikely-to-pay

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1. Introduction

The financial crisis which started in 2007 and exploded in 2012 in Europe, as well as recent bank crises, have revealed the importance of credit risk management and the asset quality of bank loan portfolios. It is widely recognized that a high level of non-performing loans (NPL) affects bank lending capacity, and lowers bank profitability and ability to raise new capital. Consequently, knowing NPL composition and determinants has become one of the most important goals for authorities and researchers.

During recent years, supervisors have issued numerous documents on the management and new classification of NPL. In particular, at the end of 2014, before the Asset Quality Review (AQR) published by ECB, the European Banking Authority (EBA) published new definitions of NPL, distinguishing three different categories of non performing loans: i) past due; ii) unlikely-to-pay (UTP) and iii) bad loans[1]. The new definition is designated for use by all banks in the European Union and means that for the first time, banks from different countries classify problem loans using identical criteria. The main objective is to define a level playing field and a homogeneous regulatory framework for the European Banking Union. The ECB (2017) also focused on the management of NPL, issuing two important documents on the new guidelines on NPL[2].

In the literature, several researchers focus on the determinants of NPL. They distinguish between macro-economic determinants (Bikker and Metzemakers, 2005; Bofondi and Ropele, 2011; Beck et al., 2013) and bank specific factors (Salas and Saurina, 2002; Boudriga et al., 2009; Louzis et al., 2011, Glen and Mondragon-Velez, 2011; Makri et al., 2014; Ghosh, 2015; Vithessonthi, 2016). Most studies aim to identify the cause of a high ratio of NPL to gross loans, but, even though definitions and the weight of each category on the total stock of NPL vary, studies tend not to distinguish between categories of NPL.

[1] In addition, forborne loans (FL) are defined as a item that can be part of all of the three categories identified.
[2] ECB (2017) Guidance to banks on non-performing loans and ECB (2017) Addendum to the ECB Giudance to banks on non-performing loans: Prudential provisioning backstop for non-performing exposures.

At the end of 2016, the NPL in the Eurozone reached 1,092 billion euro, which is a significant amount and accounts for 5.1% of gross loans[3], although it is down from the peak of 1,114 billion euro in April 2015 (European parliament, 2017). One third of EU non-performing exposure is attributable to Italian banks. In Italy, in fact, the amount of non-performing exposure is 324 billion euro, corresponding to 15.30% of gross loans[4]. Among total NPL in Italy, bad loans account for 200 billion euro (around 62%), UTP are 117 billion euro (36%), and, past due are 7 billion (2%)[5]. The weight of UTP is even higher for bigger banks. Restricting the sample to the 12 largest Italian banks, the quota of UTP increases to 40% of the total NPL portfolio (PwC, 2017). Moreover, if we look at net book value rather than the gross book value of loans, the total UTP of Italian banks equals 86 billion euro, compared to 85 billion for bad loans. In fact, the coverage ratio of bad loans in the Italian banking system is 57%, whilst that of UTP is just 27%. In other words, UTP appear to be the largest type of impaired loans if considered at net book value, higher even than the net book value of bad loans. Moreover, analysts expect that the main category of non-performing exposure to increase in the near future will be UTP (PwC, 2017). In addition, from January 2018, European banks are required by law to replace IFRS 39 with IAS 9. IAS 9 requires banks to define the credit quality with a forward looking view, and consequently, to provide a higher coverage ratio for this type of exposure. The introduction IAS 9 might also force banks to reclassify a significant portion of performing loans (i.e. forborne performing, loans with insolvent rates etc.) as underperforming.

In the light of the above, regulators and analysts believe that the real challenge for the banking system in the near future regarding NPL will be the management of UTP. Preventing UTP and encouraging the transition from UTP to performing loans is fundamental for reducing the weight of NPL on the bank credit portfolio. This is particularly crucial for European banks nowadays, in light of the new ECB requirements on the coverage ratio of the new flow of NPL (ECB, 2017). The new guidelines on NPL in fact require European banks to increase the coverage ratio up to 100% in two years for unsecured loans and seven years for secured loans, with no distinction between the different categories of NPL. Until today, banks have managed bad loans and UTP differently, and have tended to shelve more bad loans than UTP. Banks thus need to improve the management of UTP and if possible reduce the amount.

This study investigates the determinants of the UTP at bank level, and the impact of bank specific variables on both the stock and new flow of UTP. It also deepens the analysis on the flow of UTP

[3] Council of European Union – data from end 2016.
[4] Council of European Union – data from end 2016.
[5] This analysis focuses on UTP and bad loans, the biggest categories of NPL, and does not investigate past due as it is a low amount.

that returns *in bonis* or that moves to bad loans. This allows us to investigate not only the determinants of loan worsening, but also the determinants of improvement in their quality.

We focus on the Italian banking system for different reasons. First, even though the new definition of NPL has been adopted by all banks in the European Union, the balance-sheet data of Italian banks are more complete and detailed compared to other European countries. This allows us to collect data on the stock of UTP, as well as data on the new annual flows of UTP and the flows of UTP that become performing again, or shift category of NPL. Few European banks present information on the exposure of the structure of non-performing credit portfolio in the same detail as Italian banks. This study is thus able to focus on a homogeneous sample of Italian financial institutions. Findings are, however, relevant for the overall problem of NPL in Europe, since the Italian banking system holds one third of the total amount of European NPL. The period analyzed runs 2010-2016 and covers the whole Sovereign debt crisis in Europe and the subsequent economic recovery. During these years, the level of NPL increased dramatically and the focus is particularly on the later years of the financial crisis.

Our contribution to the existing literature is three-fold. Previous literature mainly focuses on determinants of NPL, without considering different categories, and this distinction is our first contribution. To our knowledge there are no studies on the determinants of a specific class of impaired loans, such as UTP. Secondly, previous studies focus on the stock of NPL, rather than flows of new NPL or the flows between NPL classes or towards performing loans. This study on the other hand examines both stocks and new flows of UTP, as well as the flows of UTP either returning *in bonis* or worsening to become bad loans. Lastly, to evaluate the determinants of the flows, we introduce two new managerial variables, in order to better explain the transition between non-performing and performing loans, as well as between categories of NPL. In particular, among regressors related to the quality of management, we test the impact of the level of loan loss provisions on UTP and the effect of the introduction of organizational units/offices for the management of impaired loans.

The rest of paper is structured as follows. Section 2 provides a brief literature review on the determinants of NPL. Section 3 presents stylized facts on UTP in Europe and Italy. Section 4 describes the sample and the data. Section 5 describes the methodology. Results are reported in Section 6 and robustness tests in Section 7. Lastly, conclusions and policy implications are described in Section 8.

2. Literature review and hypotheses

Non-performing loans are one of the biggest obstacles to the development of the banking sector, and have been increasingly studied by researchers and authorities in recent years. The financial crisis, and in particular the Sovereign debt crisis, reveals the importance of asset quality and in particular the loans portfolio and its determinants.

Two different strands can be distinguished in the literature: i) studies on the macro-economic factors influencing NPL ii) studies on the bank specific determinants of NPL.

In studies on the macro-economic factors influencing NPL, many authors underline the close relationship between the economic cycle and the credit portfolio quality of banks (Bikker and Metzemakers, 2005; Boudriga et al., 2009; Bofondi and Ropele, 2011; Beck et al., 2013; Castro, 2013). In particular, Bofondi and Ropele (2011) underline that loan portfolio quality, measured by the flow of new bad loans to the stock of performing loans at the end of the previous quarter, depends overall on a small number of macroeconomic variables, such as the growth of GDP, the house price index and inflation. They also find that these variables affect loan quality with a lag of one year. The crucial importance of the economic cycle on the bank loan portfolio quality is confirmed by other authors such as Laeven and Majnoni (2003), Bikker and Metzemakers (2005) and Glen and Mondragon-Velèz (2011), who find a close relationship between loan loss provisions and the GDP growth rate. Glen and Mondragon-Velèz (2011) emphasize that when economic growth slows or becomes negative, the quality of the loan portfolio decreases. Beck et al. (2013), adopting a dynamic panel model on a sample of 75 countries over the period 2002-2010, study the determinants of the NPL ratio. In line with the previous studies, their results confirm that the GDP growth rate affects negatively bank credit risk, particularly when the macro-variable is used with a lagged period. Glen and Mondragon-Velèz (2011) include other macro-economic variables, such as a proxy of the general financial conditions and the lending interest rate, which affect the NPL negatively and positively respectively.

To sum up, changes in macroeconomic conditions play a crucial role in the worsening of the loan portfolio quality, in pushing banks to increase loan loss provisions and in raising the level of NPL ratio. However, Marcucci and Quagliarello (2009), studying the effects of the business cycle on the default rate of bank loan portfolio, proxied by the flow of new bad loans to the existing stock of performing loans, underline that the cyclicality of the default rate is higher during the negative phases of the economic cycle, and that it is higher for those banks with riskier portfolios. This indicates asymmetry of the effect of the business cycle on bank credit risk.

In the second strand of literature on bank specific determinants of NPL, three important fields of studies can be distinguished: a) bank lending policy; b) bank capitalization and moral hazard behavior; and, lastly c) the quality of management.

In general, although the economic cycle explains most of the bank credit risk, financial institutions which display more conservative lending behavior, and have a low level of capitalization and better management, are more able to cope with an adverse period of the economic cycle.

One of the bank-specific factors most closely related to the specific phase of the economic cycle is bank lending policy. There are several contributions in the literature about the relationships between macroeconomic conditions, credit growth and loan portfolio quality, from before the crisis (Keeton, 1999; Radlet and Sachs, 1998 Ranjan and Dhal, 2003; Jimenez and Saurina, 2005), and from the ensuing period of financial turmoil (Dell'Arriccia and marquez, 2006; Foos, 2010, Amador et al., 2013; Vithessonthi, 2016). In particular, Keeton (1999), studying the relationship between rapid credit growth and loan losses, underlines that loan losses tend to increase when the business cycle contracts. Moreover, Rajan and Dhal (2003) emphasize a relationship between the economic cycle and credit growth. Their findings in fact demonstrate that banks are more willing to lend when the business cycle is positive, while NPL tends to increase during the subsequent financial distress. On this question, Jimenez and Saurina (2005) find that rapid credit growth is one of the main causes of financial crisis. In fact, banks that increase their lending activity during the positive business cycle tend to lower their credit standards, and accept a lower quality of borrowers. Although credit grows and bank profitability increases during the positive cycle, the lowering in credit standards causes an increase in impaired loans during the subsequent downturn period. The close relationship between loan standards and the business cycle is identified by several authors (Lown and Morgan, 2003; Berger and Udell, 2004; Dell'Arriccia and Marquetz, 2006). Their results suggest that standards applied by banks vary across financial institutions and over the cycle.

Lastly, Vithessonthi (2015), analyzing 85 public commercial Japanese banks during the period 1993-2013 and using both OLS and two-step GMM regressions, finds evidence that bank credit growth is positively correlated to NPL just before the crisis, and negatively correlated after the financial turmoil. This illustrates the time-varying nature of the impact of credit growth on NPL, and suggests that the financial crisis alters the relationship between the two variables. The financial crisis thus appears to alter the mechanisms through which bank lending impacts NPL.

Since the period observed in our analysis runs 2010 - 2016 and covers the entire Sovereign financial crisis, our hypothesis about UTP is:

1) Hp: Banks which adopted a more aggressive lending policy in previous years show a higher level of UTP (lending policy hypothesis).

With regard to the effect of bank capitalization and moral hazard behaviour, it has been found (Podpiera and Weill, 2008; Louzis et al., 2011; Klein, 2013; Chaibi, 2016) that banks with low capitalization could have incentives to assume a high level of risk. For example, given their limited liability, they may increase lending activity, as well as deposit insurance and bailout expectations (moral hazard hypothesis). In line with this hypothesis, a negative relationship has been noted between bank capitalization and NPL. In order to curb this behavior, regulators have imposed risk-sensitive capital requirements, so that only well-capitalized banks have an appetite for high risk. For this reason, the effect of bank capitalization on NPL can be ambiguous. In fact, as discussed by Ghosh (2015), managers in banks that are highly capitalized may resort to a liberal credit policy and thus face more risk, which implies a positive relationship between capital and NPL.

Since for UTP the weight for risk, and, as a consequence, the level of capital provision, is lower than other NPL, we hypothesize that:

2) Hp: Banks with lower capital emphasize a higher level of UTP (moral hazard hypothesis).

With regard to the quality of management, it has been investigated (Keeton and Morris, 1987; Berger and DeYoung, 1997; Salas and Saurina, 2002; Jimenez and Saurina, 2006; Klein, 2013; Makri et al., 2014; Chaibi, 2016) whether a poor quality of management, proxied by the previous low level of ROE and/or high cost to income ratio, implies a lower ability to select and monitor loans, and subsequently a higher NPL ratio. The bad management hypothesis was first tested by Salas and Saurina (2002), among the first authors to introduce bank specific variables as determinants of NPL. Salas and Saurina (2002) emphasize that bank credit risk increases when the economic cycle is in downturn, but bank characteristics are also important in the definition of the level of this risk. They underline that banks which show a higher degree of inefficiency display a higher level of NPL. Similar results are obtained by Baselga-Pascual et al. (2015) in a study based on a sample of European banks observed during the period 2001-2012. They emphasize a negative relationship between bank risk – proxied by two different measures, the NPL ratio and the Z-score ratio – and variables related to the quality of management, such as profitability and efficiency, as well as capitalization and liquidity.

Other studies however emphazise two different hypotheses related to efficiency and profitability. The first is a) the skimping hypothesis (Berger and De Yung, 1997; Rossi, Schwaiger and Morris, 2005; Louzis et al., 2011), according to which high cost efficiency may reflect the low level of

resources allocated to selecting and monitoring lending. The hypothesis is that banks which show high cost efficiency, in general, have higher levels of NPL; The second is b) the cyclical credit policy hypothesis by which Rajan (1994) explains the correlation between changes in credit policy and demand side conditions. In particular, credit policy in this model is determined by both the maximization of bank earnings and the short-term reputation concerns of bank management. In line with this, management may manipulate current earnings by resorting to a liberal credit policy, increasing profitability in an attempt to persuade the market it has a good performance. This makes it possible to increase current earnings, moving the risk into the future. In addition, a bank may also use loan loss provisions in order to boost its current earnings. Because of this, past earnings may be positively associated with future NPL (Louis et al., 2011; Abid et al., 2014).

In line with the literature about NPL, we distinguish three different hypotheses about UTP relating to the quality of management,:

3) *Hp(a): Banks with a worse quality of management (with lower profitability and higher cost inefficiency) show a higher level of UTP (bad management hypothesis).*
3) *Hp(b): Banks with higher cost efficiency (with less economic outlay for a better loan quality) show a higher level of UTP (skimping hypothesis).*
3) *Hp(c): Banks with higher profitability show a higher level of UTP (cyclical credit policy hypothesis).*

The literature about the role of cost efficiency and profitability as determinants of the level of impared loans shows varying findings. Cost income ratio, as well as profitability ratios like ROAE and ROAA, reflect a wide range of revenues and costs, related to different managerial areas, and they are not able to estimate effectively the real effort that a bank makes to ensure higher loan quality. In order to investigate this more closely, as well as testing the above hypotheses 3(a), 3(b), and 3(c) separately, we also verify the role of specific bank costs for improving the management of credit risk in general and non-performing loans in particular.

Recent research has in fact found that good credit risk management practices reduce the NPL ratio, even when they raise costs and lower bank efficiency. Cucinelli et al. (2017) emphasizes the importance of the advanced credit risk model (IRB versus Standardized) – as proxy of the quality of credit risk management – on a sample of 177 European banks during the period 2008-2016. More in general, Guo (2007) underlines that, in order to efficiently manage credit risk and NPL, it is important for each bank to improve governance structure, establish a sound and clear business development strategy and risk management strategy, and strengthen the credit decision mechanism to control the quality of newly issued credit assets. This is consistent with the findings of Cucinelli and Patarnello

(2015), which are that Italian banks define the segmentation of activities related to management of NPL and the related portfolio. A dedicated business unit allows the creation of specialized personnel structures, to assign responsibility for the entire monitoring and recovery process of NPL positions, and makes it possible to intervene on the basis of policies specifically defined for segments of similar positions or individual positions. In general, there is wide agreement in the literature on the relevance of mananagerial and organizational practice in lowering the NPL ratio. Previous studies analyse the determinants of the entire category of NPL, and do not consider different typologies of loans. In this study, we examine the bank specific and macro-economic determinants of impaired loans, and focus on a specific class of NPL: the unlikely-to-pay. This narrower focus clarifies that a reduction in the UTP ratio can occur when the credit merit of loans either improves or worsens. In order to test the impact of investments in organizational structures for the management of impaired loans, we examine separately collections and flows from UTP to performing loans compared to flows from UTP to bad loans.

4) Hp: Banks with a dedicated and proactive organization for non-performing credit management and recovery (through a specific unit or office) show a higher flow of UTP to performing and collections and a lower flow of UTP to bad loans.

Another cost which impacts heavily on bank performance and profitability ratios, specifically related to credit risk management, is provision for loan losses[6]. As underlined by Saurina (2009) "dynamic provisions are a macroprudential tool to enhance bank soundness and to help mitigate part of the procyclicality of the banking system". In line with this opinion, Jiménez and Saurina (2006) underline the strong relationship between rapid credit growth and loan losses, and develop a forward-looking regulatory prudential tool, based on loan loss provisions that takes into account the credit risk profile of the bank credit portfolio, in the light of the business cycle. It has also been shown that loan loss provisions contribute to the soundness and stability of the banking system. In particular, Ghosh (2015) includes loan loss provisions among variables used for measuring credit quality and for testing the overall attitude of the banking system to control risks, expecting a positive relationship with NPL.

With regard to UTP, we expect that:

5) Hp: Banks with higher UTP provisions show a lower flow of UTP to performing and collections and a higher flow of UTP to bad loans.

[6] According to ECB data, the risk cost in Italy during 2016 was approximately 54%, against 22% recorded for European banks (European Central Bank, CBD2 dataset, 2017).

The next section shows the evolution of the loan portfolio of European and Italian banks, emphasizing the trend of NPL and their components.

3. UTP stylized facts

During the financial crisis, macroeconomic conditions in the European Union deteriorated in terms of both GDP growth and unemployment rate. This has had a lasting effect on the banking sector with effects still visible today. Although the average European rate of NPL has gradually declined in recent years, from 6.5% at the end of 2014, to 5.7% in 2015, and 5.1% in 2016, economic conditions in the EU are still worse than in other major developed economies. In the USA and Japan, in fact, the average NPL ratio was 1.5% at the end of 2016.

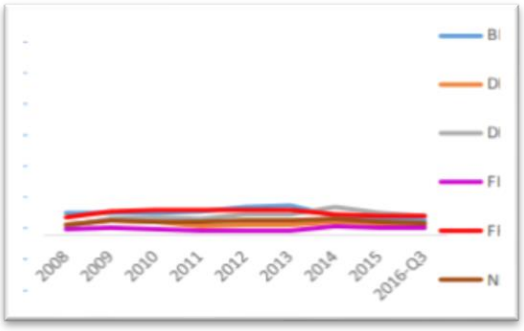
Looking at different countries, the distribution of NPL has been very different across Europe since the start of the crisis.

Figure 1. shows three clear groups of countries. The first group shows a low level of NPL during the whole period of the financial crisis and comprises continental and northern European countries. The NPL ratio of these countries at the end of 2016 was uder 4%. The second group are the countries which currently show a low level of NPL, but which reported a high level or a high increase of NPL during the crisis. Lastly, the third group includes countries with a current high level of NPL.

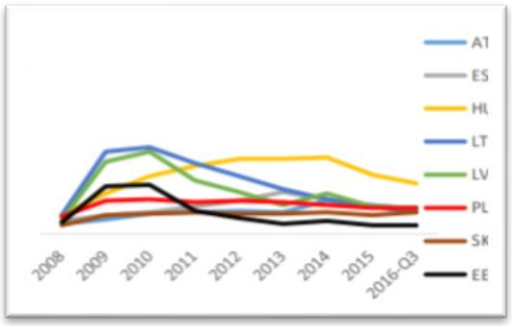
Italy is in the third group. During recent years, the dynamics of credit growth in Italy have in fact been slow, and there has ben a timid growth of credit to households and firms only since the end of 2016. The recent improvement in economic prospects has had positive effects on the quality of bank credit. Since 2016, the flow of new NPL has decreased and the NPL ratio is today showing a sight decrease for the first time since the beginning of the financial crisis. This decrease is however mainly due to the sale of bad loans, which many banks have resorted to in order to improve their credit portfolio, and risk and capital indicators.

Figure 1. Evolution of non-performing exposures across Europe

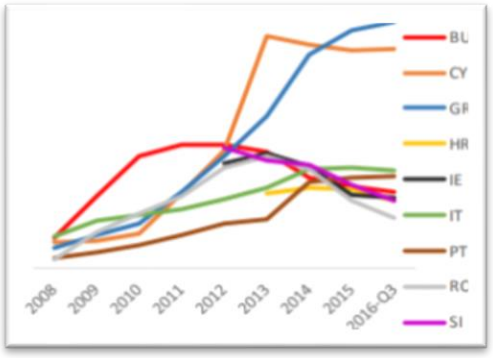
Group 1: Low level of NPL and no significant increase throughout the crisis



Group 2: Relatively low level of NPL, after a significant increase during the crisis



Group 3: High level of NPL



Source: EBA, ECB

Much of the NPL in Italian banks' credit portfolios is made up of unlikely-to-pay exposure. The total gross amount of UTP is lower than the gross amount of bad loans, but in terms of net value, the UTP portfolio accounts for more than a half of the total NPL. Bad loans show a higher coverage ratio than UTP: for example, with regard to significant banks, at the end of 2016 the coverage percentage for bad loans was about 63% compared to 34% for UTP (Table 1.).

Table 1. Italian banking system loan breakdown – December 2016

	Significant banks			*Less significant banks*		
	Gross (EUR mn)	Net (EUR mn)	Coverage ratio (%)	Gross (EUR mn)	Net (EUR mn)	Coverage ratio (%)
Customer loans	1,519	1,373	9.6	312	283	9.3
Performing	1,251	1,244	0.6	252	250	0.7
Non-performing	267	129	51.7	61	33	44.8
Bad loans	165	61	63.1	36	15	57.8
Unlikely-to-pay	98	65	33.7	22	16	27.9
Past-due	5	4	24.7	3	3	9.4

Source: Bank of Italy, ABN AMRO Group Economics

Looking at the composition of UTP, Bank of Italy (2017) underlines that 85% of NPL are corporate loans, 8% loans to households, 5% are SME exposure and 2% are consumer credit. Looking at the flows, in 2016, 57% of UTP remained UTP, 12% became collection, 5% returned to performing loans and finally, 21% became bad loans. In general, about one fifth of the total UTP become bad loans each year.

These data show the great importance of a sound management of UTP. Knowing the determinants of UTP and its in-flows and out-flows helps banks and authorities to plan ways of preventing an increase in UTP and their worsening to bad loans.

4. Sample

Our sample is made up of 73 Italian banks. They represent 72% of bank total assets at the end of 2016 and about 98% of the total Italian UTP. Because credit risk and the ensuing capital policies are usually managed at the group level, we consider the parent company and data at consolidated level. Only when the bank is not over 50% owned by other banks do we consider unconsolidated balance sheet data. The period observed runs 2010-2016 and covers the whole Sovereign financial crisis, a particularly difficult period for the Italian banking system.

We exclude very small banks, i.e. those with assets of less than 1 billion euros in 2016. A size threshold is necessary in order to exclude those smaller banks which are not usually full service institutions and tend to have specialized loan portfolios, which can thus be vulnerable to a particular sectoral or regional disturbance. Banks also need to have at least three sequential years of data.

We include both listed and unlisted banks, as well as banks which closed down during the period observed (e.g. Banca Marche and Banca Etruria). And in order to analyse only truly commercial banks, our sample includes only intermediaries that show a gross loans over total asset ratio higher than 50%. This because we believe that commercial banks are most exposed to credit risk.

A single database of unlikely-to-pay relating to the Italian banking system is constructed from different sources. Data are hand-collected from bank balance-sheet reports and run from 2010 to 2016. We include macroeconomic and bank specific variables; macroeconomic data are downloaded from the Word Bank database, and bank variables from the SNL Unlimited database.

5. Econometric methodology

Our analysis aims first to discover whether the hypotheses referring to NPL are verified for UTP. Secondly it investigates the determinants of the transition from UTP towards other NPL or *in bonis* positions.

In our analysis, we use an unbalanced panel of 72 Italian banks over a period of 7 years (2010-2016). We run panel data econometric regressions to detect first the determinants of UTP (stocks and new flows) and, secondly, the determinants of the out-flows from UTP to other NPL categories and to performing loans.

As underlined by the empirical literature on NPL, static models, mostly estimated with Fixed Effect (e.g. Podpiera and Weill, 2008; Foos et al., 2010; Klein, 2013), implicitly assume no significant persistence of the dependent variable across time. Dynamic models on the other hand insert one further lagged value of the dependent variable among the explanatory variables. It is crucial to note that if the data generating process displays time persistence, fixed effect estimates will be biased and inconsistent, i.e. not reliable in the empirical analysis. However, because the fixed effect model is widely used in the literature on the determinants of NPL, it is run as a robustness test in the next section. The main analysis is performed by running a GMM two-step model.

In order to assess the stationarity of the dependent and independent variables, we perform the Choi Fisher-type (2001) test for unit root non stationarity. This test is in line with specific charateristics of our unbalanced dataset, and strongly rejects the null hypothesis that all the panels contain unit roots for each dependent variable used.

We run a dynamic panel difference GMM two-step model as proposed by Arellano and Bond (1991) and generalized by Arellano and Bover (1995) and Blundell and Bond (1998). The GMM

estimation by Arellano and Bond is based on the first difference transformation. We adopt robust standard errors because, as recommended by Arellano and Bond, the standard errors tend to be biased downward. Consequently, we use the Windmeijer bias-corrected (WC) robust VCE, which Windmeijer (2005) showed to work well. Furthermore, this model is designed for small-T and large-N panels. This methodology helps to mitigate some of the endogeneity problems if the instruments are not correlated with the variables under investigation (Espinoza and Prasad, 2010; Said et al., 2013; Kohler et al., 2015).

We run the models on both the UTP over gross loans ratio and the flow from performing loans to UTP over gross loans, as well as on the bad loans over gross loans ratio and the flow from performing loans to bad loans over gross loans, in order to detect the differences in the determinants between UTP and bad loans. The aim is to assess whether the determinants of UTP are the same as those observed in previous studies of NPL, and whether these determinats also explain new flows of UTP from performing loans.

The dynamic GMM two step model is the following:

$$\Delta NPL_{i,t} = \alpha + \beta_1 \Delta NPL_{i,t-1} + \beta_2 \Delta E\_TA_{i,t-1} + \beta_3 \Delta ROAE_{i,t-1} + \beta_4 \Delta COST\_INCOME_{i,t-1} + \beta_5 \Delta Growth\_GL_{i,t-2} + \Delta \sum_{j=1}^{1} \beta_6 Bank\ specific_{i,t-j}\ \Delta \sum_{j=1}^{1} \beta_7 Macro\ variables_{i,t-j} + \Delta \varepsilon_{i,t} \quad (1)$$

where the Δ is the first difference operator. The dependent variable (NPL) takes four different values: the first is the UTP ratio, which is the stock of unlikely-to-pay over gross loans; the second refers to the flow of new UTP over gross loans, i.e. the flow of performing loans that increases the amount of UTP during the year. The third and the fourth dependent variables refer respectively to the stock of bad loans over gross loans and the flow of new bad loans from performing loans over gross loans. In this way, we analyse not only the stock level at the end of the year, which is influenced by in- and out- flows, which increase and decrease respectively the stock of UTP and bad loans. We also analyse the specific deterioration of performing loans which are downgraded to UTP and bad loans.

The independent variables are divided into bank specific variables and macroeconomic ones. In the first group, we consider variables which explain capitalization, measured by the equity over total assets and tier 1 ratio (E_TA; Tier1); the quality of management, proxied by the return on equity and return on average assets (ROAE; ROAA) and the cost to income ratio (C_I); the lending activity by banks, measured by the growth of gross loans (GRGL) at time t-2. We add also some control variables: the bank business model, proxied by the gross loans over total assets (GL_TA), the risk appetite, proxied by the risk weighted assets density (RWA_TA), and bank size, proxied by the

natural logarithm of total assets (Ln_TA) (Shrieves and Dahl, 1992, Aggarwal and Jacques, 2001 and Rime, 2001). All independent and control variables, except for the growth of gross loans, are inserted into the regression at time t-1. In the second group, the macro economic variables, we insert the GDP growth rate and the House price index both at time t-1 (Ghosh, 2015).

In order to detect the determinants of the decrease of UTP, both in positive with the flow from UTP to performing loans and in negative with the flow from UTP to bad loans, we run another regression, using the fixed effect model. In this case, we base our analysis on a subsample of banks for which the data of the flows are available. The subsample is made up of 56 banks, which represent 70.82% of the total assets of the Italian banking system at the end of 2016 and 98.62% of the total assets of our sample in 2016.

$$\Delta flow_{i,t} = \alpha + \beta_1 \Delta flow_{i,t-1} + \beta_2 \Delta MANAGE_{i,t-1} + \beta_3 \Delta PROVISIONS_{i,t-1} + \Delta \sum_{j=1}^{1} \beta_4 Bank\ specific_{i,t-j}\ \Delta \sum_{j=1}^{1} \beta_5 Macro\ variables_{i,t-j} + \Delta \varepsilon_{i,t} \quad (2)$$

The dependent variables of (2) are: the out-flows of UTP to performing loans and the out-flows of UTP to other categories of non-performing loans. The independent variables are always divided into macroeconomic and bank specific variables. Independent variables are the GDP growth rate at time t-1 and the House Price index at t-1. With regard to the bank specific variables, we consider the loan loss provisions specific for UTP over gross loans ratio at time t-1 (PROVISIONS); the management of NPL, proxied by a category variable equal to 1 if the bank states in the balance-sheet report that problem loans are managed by the legal office or by another office not specialized in managing NPL; equal to 2 if there exists a specific office that aims to recover non performing loans or if the bank uses an external office with the same purpose (e.g. cooperative banks); equal to 3 if the bank has a specific non-core unit to manage NPL; 0 if the bank does not explain in the balance-sheet how it manages NPL (MANAGE). In addition, we insert a set of control variables into our analysis: bank profitability and bank efficiency, respectively the ROAE and the cost to income ratio (C_I) at time t-1; the bank business model, proxied by the gross loans over total assets (GL_TA), the growth of gross loans at time t-2 and lastly, the risk appetite, proxied by the RWA over total assets (Jimenez and Saurina, 2005, Foos et al., 2010).

Table 2. reports the description of the variables used in the GMM models.

Table 2. Variables description

Variable	Description	Source	Sign expected
Dependent variables			
UTP_GL	The stock of unlikely-to-pay over the stock of gross loans	Table A.1.7 in the Additional information of balance sheet (data hand collected)	/

from PL to UTP	Flow of new UTP from Performing loans over unlikely-to-pay loans	Table A.1.7 in the Additional information of balance sheet (data hand collected)	/
Bad loans_GL	The stock of Bad Loans over the stock of gross loans	Table A.1.7 in the Additional information of balance sheet (data hand collected)	/
from PL to Bad Loans	Flow of new Bad Loans from Performing loans over the stock of bad loans	Table A.1.7 in the Additional information of balance sheet (data hand collected)	/
Flow to PL	The out-flow from UTP to performing loans over the stock of unlikely-to-pay loans	Table A.1.8 in the Additional information of balance sheet (data hand collected)	/
Flow to NPL	The out-flows from UTP to other categories of NPL over the stock of unlikely-to-pay loans	Table A.1.8 in the Additional information of balance sheet (data hand collected)	/
Independet variables			
E_TA	Equity over total assets as measure of bank capitalization	SNL Unlimited	+
ROAE	Return on average equity as measure of profitability	SNL Unlimited	+/-
COST_INCOME	Cost to income ratio as measure of bank efficiency	SNL Unlimited	+/-
Growth_GL	Growth of gross loans as measure of lending activity	SNL Unlimited	+
Control variables			
GL_TA	Gross loans over total assets as proxy of bank business model	SNL Unlimited	+
RWA_TA	Risk weighted assets over total assets as proxy of bank risk appetite	SNL Unlimited	+
Ln_TA	The natural logarithm of total assets as measure of bank size	SNL Unlimited	-
MANAGE	Category variable equal to 1 if bank states in the balance-sheet report that the problem loans are managed by the legal office or by another office not specific in managing NPLs; 2 for a specific office that aims to recover non performing loans and if bank adopts an external office (i.e. cooperative banks); 3 if bank has a specific non core unit to manage NPL; 0 if bank does not explain in the balance-sheet how NPLs are managed	Balance sheet	+ (with out-flow to PL) - (with out-flow to NPL)
PROVISIONS	Loan loss provisions specific for UTP over gross loans	Balance sheet	No relationship (with out-flow to PL) + (with out-flow to NPL)
NPL_GL	Non performing loans over gross loans	SNL Unlimited	+ (with out-flow to NPL) - (with out-flow to PL)
Macro economic control variables			
GDP	Annual growth of Gross domestic product	European Central Bank database	-
HPI	House price index	European Central Bank database	+/-

To test the absence of correlation between the instruments and error term, we carry out the Sargan test. In addition, we test the presence of first- and second-order autocorrelation in the first differenced residuals (AR-1 and AR-2).

6. Results

6.1 Descriptive statistics and correlation matrix

This section reports the descriptive statistics and the correlation matrix. Table 3 shows that on average bad loans are slightly higher than unlikely-to-pay, but the flow of new UTP from performing loans is about twice the size of bad loans, in terms of average. With regard to the out-flows from UTP to performing loans and other NPLs, the average value shows that the loans which worsen and become NPL are much higher than those which improve and come back to being performing loans.

Regarding bank structure, the descriptive statistics show a good capitalization of banks, with an average Tier 1 equal to 11.78% and low but positive profitability, with a ROAE of 0.8%. In terms of business model, banks in our sample show a high gross loans over total assets ratio, indicating that lending activity is the core activity. Lastly, with regard to the level of coverage ratio of UTP, the average value is equal to 22%.

Table 3. Descriptive statistics

	N	mean	p50	min	max	sd
UTP_GL	561	.0627	.0512	0	.6517	.0637
from PL_to_UTP	385	.1260	.0425	0	1.055	.1488
Bad Loans_GL	561	.0802	.0652	0	.7119	.0770
flow_from_PL_to_Bad Loans	557	.0667	.0369	0	.6573	.0831
flow_to_PL	418	.2777	.2211	0	1.536	.2077
flow_to_NPL	418	1.030	.3400	0	4.290	2.098
E_TA	563	.0813	.0786	.0111	.1856	.0255
Tier1	559	.1178	.1112	.0163	.4844	.0474
ROAE	520	.0081	.028	-1.073	1.060	.1448
ROAA	520	.0008	.0022	-.0515	.1238	.0103
GRGL	510	.0514	.0121	-.7437	2.357	.1840
COST_INCOME	557	.6579	.6563	.2041	2.308	.1429
GL_TA	561	.6803	.6991	.0411	.9601	.1468
RWA_TA	559	.6144	.6321	.0571	.9526	.1454
ln_TA	563	1.594	1.546	1.314	2.0767	1.730
HPI	414	.9389	.9229	.8616	1.007	.0566
GDP	594	-.0046	.0057	-.0548	.0200	.0203
MANAGE	594	.4747	0	0	3000	1.009
NPL_GL	561	.1203	.1030	.0021	.4249	.0841
PROVISIONS	246	.2075	.1988	.0070	.4420	.0772

Note: Table 3 shows the descriptive statistics (number of observations, mean, median, minimum, maximum and standard deviation) of: unlikely-to-pay over gross loans (UTP_GL); the flows from performing to unlikely-to-pay loans (from PL_to_UTP); the bad loans over gross loans ratio (Bad Loans_GL); the flows from performing to bad loans (flow_from_PL_to_Bad loans); the flows from unlikely-to-pay to performing loans (flow_to_PL); the flows from unlikely-to-pay to other categories of NPL (flow_to_NPL); the capitalization measures (E_TA and Tier1 ratio); the profitability ratios, respectively the return on average equity (ROAE) and the return on average assets (ROAA); the growth of gross loans (GRGL); the cost to income ratio (COST_INCOME); the proxy of business model measured by gross loans over total assets (GL_TA); the risk weight assets density (RWA_TA); size measured by the natural logarithm of total assets (ln_TA); the house price index (HPI), the annual growth of gross domestic product (GDP); the category variable equal to 1 if bank states in the balance-sheet report that problem loans are managed by the legal office or by another office not specific in managing NPLs; 2 if there is a specific office that aims to recover non performing loans or if the bank adopts an external office (e.g. cooperative banks); 3 if bank has a specific non core unit to manage NPL; 0 if bank does not explain in the balance-sheet how NPLs are managed (MANAGE); non performing loans over gross loans (NPL_GL); and finally the loan loss provisions for unlikely-to-pay over gross loans (PROVISIONS).

Table 4. Correlation matrix

	E_TA	Tier1	ROAE	ROAA	GRGL	C_I	GL_TA	RWA	ln_TA	HPI	GDP	MANAGE	NPL_GL	PROVISIONS
E_TA	1.000													
Tier1	0.629	1.000												
ROAE	0.092	0.213	1.000											
ROAA	0.211	0.278	0.948	1.000										
GRGL	-0.017	0.128	0.232	0.256	1.000									
C_I	-0.075	-0.137	-0.413	-0.408	-0.083	1.000								
GL_TA	0.301	-0.344	-0.364	-0.276	-0.181	0.232	1.000							
RWA	0.415	-0.301	-0.230	-0.165	-0.177	0.095	0.786	1.000						
ln_TA	-0.336	-0.360	-0.111	-0.136	-0.050	0.079	0.027	-0.174	1.000					
HPI	0.033	-0.195	0.104	0.120	0.038	0.179	0.148	0.309	0.061	1.000				
GDP	0.001	-0.020	0.001	0.012	-0.017	0.129	0.044	0.001	0.101	-0.220	1.000			
MANAGE	-0.012	0.198	-0.039	-0.012	-0.068	-0.065	-0.171	-0.282	0.037	-0.455	0.278	1.000		
NPL_GL	0.113	0.262	-0.259	-0.223	-0.141	-0.091	-0.100	-0.114	-0.346	-0.443	0.147	0.143	1.000	
PROVISIONS	-0.238	-0.013	-0.206	-0.209	-0.188	-0.143	-0.109	-0.281	0.260	-0.447	0.155	0.273	0.173	1.000

Note: Table 4 shows the correlation matrix of: unlikely-to-pay over gross loans (UTP_GL); the flows from performing to unlikely-to-pay loans (from PL_to_UTP); the bad loans over gross loans ratio (Bad Loans_GL); the flows from performing to bad loans (flow_from_PL_to_Bad loans); the flows from unlikely-to-pay to performing loans (flow_to_PL); the flows from unlikely-to-pay to other categories of NPL (flow_to_NPL); the capitalization measures (E_TA and Tier1 ratio); the profitability ratios, respectively the return on average equity (ROAE) and the return on average assets (ROAA); the growth of gross loans (GRGL); the cost to income ratio (COST_INCOME); the proxy of business model measured by gross loans over total assets (GL_TA); the risk weight assets density (RWA_TA); the size measured by the natural logarithm of total assets (ln_TA); the house price index (HPI), the annual growth of gross domestic product (GDP); the category variable equal to 1 if bank states in the balance-sheet report that problem loans are managed by the legal office or by another office not specific in managing NPLs; 2 if there is a specific office that aims to recover non performing loans and if bank adopts an external office (e.g.cooperative banks); 3 if bank has defined a specific non core unit to manage NPL; 0 if bank does not explain in the balance-sheet how NPL are managed (MANAGE); the non performing loans over gross loans (NPL_GL); and finally the loan loss provisions for unlikely-to-pay over gross loans (PROVISIONS).

6.2 Econometric results

The first results show the determinants of the UTP ratio and the flow of new UTP from performing loans. Table 5 reports results referring to the models about the UTP ratio, the flow of new UTP, bad loans ratio and the flow of new bad loans.

Table 5. Results of determinants of stock and flow of UTP and bad loans

	Mod. 1		**Mod. 2**		**Mod. 3**		**Mod. 4**	
	UTP_GL	**from PL to UTP**	**UTP_GL**	**from PL to UTP**	**Bad Loans_GL**	**from PL to bad loans**	**Bad Loans_GL**	**from PL to bad loans**
Constant	0.735***	0.938***	0.621***	1.173***	1.753***	-0.430**	1.534***	-0.419*
	(0.0419)	*(0.115)*	*(0.0351)*	*(0.137)*	*(0.0366)*	*(0.209)*	*(0.0421)*	*(0.218)*
Dependent t-1	0.497***	0.383***	0.533***	0.386***	0.666***	0.343***	0.680***	0.344***
	(0.00516)	*(0.0133)*	*(0.00442)*	*(0.0131)*	*(0.00405)*	*(0.0169)*	*(0.00280)*	*(0.0164)*
E_TA t-1	0.0732**	0.291**			-0.479***	-0.214		
	(0.0352)	*(0.115)*			*(0.0578)*	*(0.159)*		
Tier1 t-1			0.174***	-0.182*			0.0224	-0.149***
			(0.0243)	*(0.0966)*			*(0.0259)*	*(0.0517)*
ROAE t-1	-0.0165***	0.0566***			0.0163***	0.0676***		
	(0.00362)	*(0.00904)*			*(0.00625)*	*(0.0124)*		
ROAA t-1			-0.320***	1.227***			-0.126*	1.165***
			(0.0462)	*(0.104)*			*(0.0737)*	*(0.139)*
COST_INCOME t-1	-0.0131**	0.220***	-0.0127***	0.217***	-0.0425***	0.00114	-0.0473***	0.00178
	(0.00552)	*(0.0136)*	*(0.00430)*	*(0.0155)*	*(0.0116)*	*(0.0108)*	*(0.0125)*	*(0.0139)*
GRGL t-2	0.0294***	0.0270***	0.0312***	0.0292***	0.0375***	0.0571***	0.0392***	0.0544***
	(0.00609)	*(0.00589)*	*(0.00419)*	*(0.00898)*	*(0.00345)*	*(0.00804)*	*(0.00370)*	*(0.00654)*
Bank specific controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macro-variables controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	*487*	*379*	*487*	*379*	*487*	*480*	*487*	*480*
Number of banks	*72*	*56*	*72*	*56*	*72*	*71*	*72*	*71*
AR1	*0.1585*	*0.0083*	*0.1261*	*0.0077*	*0.1964*	*0.0026*	*0.1619*	*0.0025*
AR2	*0.296*	*0.201*	*0.328*	*0.183*	*0.283*	*0.145*	*0.286*	*0.133*
Sargan test (prob chi2)	*0.000*	*0.023*	*0.028*	*0.032*	*0.077*	*0.041*	*0.063*	*0.011*
Hansen test (prob chi2)	*0.926*	*0.201*	*0.473*	*0.872*	*0.829*	*0.274*	*0.295*	*0.474*

Note: The regression run is a GMM two step regression and the robust standard errors are reported in brackets. The dependent variables are: the unlikely-to-pay over gross loans (UTP_GL); the flows from performing loans to unlikely-to-pay (from PL to UTP); the bad loans over gross loans (Bad Loans_GL); and finally, flows from performing to bad loans (from PL to bad loans). The explanation variables are: the capitalization measures (E_TA and Tier1 ratio); the profitability ratios, respectively the return on average equity (ROAE) and the return on average assets (ROAA); the growth of gross loans (GRGL); the cost to income ratio (COST_INCOME). We insert the following into the bank specific controls: the proxy of business model measured by gross loans over total assets (GL_TA); the risk weight assets density (RWA_TA); the size measured by the natural logarithm of total assets (ln_TA); finally, in the macro-variable controls we have: the house price index (HPI), the annual growth of gross domestic product (GDP). Asterisks denote significance at: *** p<0.01, ** p<0.05, * p<0.1

The Hansen-test shows that the instruments used are not correlated with the residuals. With regard to the Arellano-Bond (AR) tests, looking at the flows, we can reject the hypothesis that errors are not autocorrelated in the first order (AR(1)), but we cannot reject this hypothesis for the second one

(AR(2)). But regarding the UTP and bad loans ratio, the tests make it possible to reject the hypothesis of absence of autocorrelation among errors at both first and second order (AR(1) and AR(2)).

The first hypothesis, regarding lending activity and the quality of portfolio, is confirmed in the case of UTP. The results show a positive relationship between the growth of gross loans and the four dependent variables, confirming findings of previous literature (Lown and Morgan, 2003; Berger and Udell, 2004; Dell'Arriccia and Marquetz, 2006; Vithessonthi, 2015).

Our findings suggest that banks with higher capitalization (both in terms of equity over total assets and Tier1 ratio) show a higher level of UTP and higher flows of new UTP, except for the relationship between Tier1 ratio and flows of new UTP from performing loans. In this case there a slightly significant negative relationship. We can reject the null hypothesis of moral hazard behavior, in which banks with a low capitalization take more risk and pile up more UTP than others (Podpeira and Weill, 2008). On the other hand, results for bad loans and the flow of new bad loans from performing loans show a negative and significant relationship, confirming the theory of moral hazard with regard to the worst class of NPL (Berger and DeYoung, 1997).

Regarding quality of management, findings are different according to the various dependent variables used in the models. Considering the UTP ratio, a higher level of profitability and a higher level of inefficiency show a lower UTP ratio. The negative relationship between cost income and UTP ratio could be interpreted as an increase in the cost of credit risk management when it is effective in reducing the level of NPL. These findings support the bad management hypothesis with regard to profitability, and the skimping hypothesis with reference to the cost inefficiency. Conflicting results are obtained for the flow of new UTP. Findings underline a positive relationship with both profitability and cost inefficiency, in line with the cyclical credit policy hypothesis, referring to the profitability relationship, and with the bad management hypothesis, referring to the cost inefficiency (i.e. the higher the cost to income ratio, the higher the flows of performing to UTP loans). With regard to bad loans, the results show a positive relationship between the dependent variables and profitability, and a negative relationship between bad loans ratio and cost to income ratio. These findings support the cyclical credit policy hypothesis and the skimping hypothesis, respectively.

Table 6 reports results of the second part of our research, the analysis of the out-flow from UTP to performing and other NPL, for testing hypotheses 4 and 5.

Table 6. Results of determinats of out-flows from UTP

	Mod. 1		Mod. 2		Mod. 3		Mod. 4		Mod. 5	
flow to	**PL**	**NPL**	**PL**	**NPL**	**PL**	**NPL**	**PL**	**NPL**	**PL**	**NPL**
Constant	-0.272***	-0.0768	-0.156	-1.246***	-0.275	-0.0417	-0.123	-1.313***	-0.0709	-1.5049
	(0.0973)	*(0.197)*	*(0.254)*	*(0.303)*	*(0.195)*	*(0.302)*	*(0.243)*	*(0.406)*	*(0.0937)*	*(0.450)*
flow_to_PL t-1	0.319***		0.407***		0.317***		0.402***		0.266***	
	(0.0704)		*(0.0894)*		*(0.0669)*		*(0.0685)*		*(0.0567)*	
flow_out_to_NPL t-1		0.381***		0.201***		0.551***		0.245***		0.2249**
		(0.114)		*(0.0620)*		*(0.165)*		*(0.0927)*		*(0.0666)*
Provisions t-1	-0.103	-0.0391	-0.0900	0.629*	-0.226	0.526	-0.206	0.911***	-0.0799	0.9511***
	(0.100)	*(0.349)*	*(0.157)*	*(0.335)*	*(0.200)*	*(0.599)*	*(0.179)*	*(0.305)*	*(0.214)*	*(0.267)*
Manage t-1	0.0168***	-0.0210*	0.0143*	0.0131	0.0166**	-0.0261**	0.0150***	0.00230	0.0151**	0.0052
	(0.00591)	*(0.0120)*	*(0.00744)*	*(0.0132)*	*(0.00730)*	*(0.0110)*	*(0.00516)*	*(0.0112)*	*(0.00639)*	*(0.0141)*
C_I t-1	0.259***	-0.180	0.203*	-0.0661	0.242***	0.261	0.192*	0.301	0.229**	0.2751
	(0.0761)	*(0.210)*	*(0.105)*	*(0.171)*	*(0.0771)*	*(0.194)*	*(0.108)*	*(0.232)*	*(0.109)*	*(0.180)*
RWA t-1	0.390***	0.670**	0.292	0.0420	0.292	1.316***	0.269	0.354	0.263**	-0.0068
	(0.136)	*(0.265)*	*(0.190)*	*(0.269)*	*(0.204)*	*(0.405)*	*(0.219)*	*(0.395)*	*(0.130)*	*(0.275)*
GRGL t-1					-0.0468	0.123	-0.0814	0.0959	-0.0474	0.04167
					(0.0536)	*(0.194)*	*(0.0571)*	*(0.152)*	*(0.0577)*	*(0.146)*
ROAE t-1					0.00138	0.526***	-0.0201	0.409***	-0.0226	0.0429***
					(0.0788)	*(0.1000)*	*(0.0492)*	*(0.0778)*	*(0.675)*	*(0.2380)*
GL_TA t-1					0.145	-1.234***	0.0355	-0.571	-0.0429	-0.0167
					(0.214)	*(0.410)*	*(0.195)*	*(0.421)*	*(0.128)*	*(0.351)*
NPL_GL t-1									-0.525	0.0262
									(0.452)	*(0.678)*
GDP t-1			0.468	-1.923**			0.504*	-1.790**	0.526**	-1.655*
			(0.322)	*(0.823)*			*(0.271)*	*(0.901)*	*(0.255)*	*(0.887)*
HPI t-1			-0.0410	1.478***			-0.0544	1.473***	-0.0324	1.694**
			(0.256)	*(0.413)*			*(0.200)*	*(0.469)*	*(0.340)*	*(0.562)*
Observations	277	277	277	277	277	277	277	277	277	277
Number of banks	41	41	41	41	41	41	41	41	41	41
AR1	0.0099	0.0039	0.0092	0.0011	0.0113	0.0023	0.0107	0.0009	0.0083	0.0104
AR2	0.1041	0.7093	0.1147	0.9745	0.1257	0.4897	0.1339	0.9823	0.1290	0.3862
Sargan test (prob. Chi2)	0.034	0.064	0.026	0.047	0.051	0.073	0.018	0.042	0.005	0.045
Hansen (prob. Chi2)	0.159	0.251	0.321	0.446	0.432	0.263	0.185	0.331	0.249	0.152

Note: The regression run is a GMM two step regression and the robust standard errors are reported in brackets. The dependent variables are the flows from UTP to performing loans (PL) and the flows from UTP to other non performing loans (NPL). The explanatory variables are: the flows from unlikely-to-pay to performing loans (flow_to_PL); the flows from unlikely-to-pay to other categories of NPL (flow_to_NPL); the category variable is equal to 1 if bank states in the balance-sheet report that the problem loans are managed by the legal office or by another office not specific in managing NPLs; 2 if there is a specific office that aims to recover non performing loans and if bank adopts an external office (e.g. cooperative banks); 3 if bank has a specific non core unit to manage NPL; 0 if bank does not explain in the balance-sheet how NPL are managed (MANAGE); the non performing loans over gross loans (NPL_GL); and finally the loan loss provisions for unlikely-to-pay over gross loans (PROVISIONS). The capitalization measures are as follows: (E_TA and Tier1 ratio); the profitability ratios, respectively the return on average equity (ROAE) and the return on average assets (ROAA); the growth of gross loans (GRGL); the cost to income ratio (COST_INCOME); the proxy of business model measured by gross loans over total assets (GL_TA); the risk weight assets density (RWA_TA); the size measured by the natural logarithm of total assets (ln_TA); the non performing loans over gross loans (NPL_GL); the house price index (HPI), the growth year on year of gross domestic product (GDP). All variables are at time t-1. The asterisks denote respectively significance at: *** p<0.01, ** p<0.05, * p<0.1

Results of the GMM models show no significant evidence of serial correlation in the first order-differenced errors at order 2 (AR2). The Hansen-test shows that the instruments used are not correlated with the residuals.

In line with our expectations, the presence of a specific non core unit, which permits proactive credit risk management, leads to an improvement in the credit portfolio quality, with a reduction in flows to bad loans and an increase of flows to performing loans. However, the findings suggest that with regard to the flows from UTP to performing, proactive management plays a bigger role than for flows to other NPL. In this second case, the level of coverage ratio shows a positive and significant relationship with the dependent variable.

Lastly, with regard to the economic cycle, findings confirm results obtained in previous literature. However, we can observe that a negative economic cycle affects the increase in NPL more than a positive economic cycle affects the improvement of credit portfolio. In line with Marcucci and Quagliarello (2009), these results emphazise the asymmetry of the effect of business cycle on the bank credit risk.

7. Robustness test

In order to check the robustness of our results we run other alternative regressors for measuring bank specific characteristics in our main models. First, in addition to ROAA and ROAE we use the net interest margin and the net income over gross revenues, in order to focus solely on bank core activity. The results show similar significance and magnitude to the main findings. We also insert other macroeconomic variables, such as the inflation and the unemployment rate, but as our study focuses on one single country, the best indicator to summarize macroeconomic conditions is undoubtedly GDP.The findings obtained are however in line with those for GDP and the house price index.

In addition to the GMM model, in order to check the robustness of our results, we also run the fixed effect model, following previous literature (Klein, 2013; Ghosh, 2015; Beck et al., 2015). The FE model makes it possible to control for unobserved heterogeneity across banks.

We run the fixed effect model for the both the first and second analysis.

The model of the first analysis is as follows:

$$NPL_{i,t} = \alpha + \beta_1 NPL_{i,t-1} + \beta_2 E\_TA_{i,t-1} + \beta_3 ROAE_{i,t-1} + \beta_4 COST\_INCOME_{i,t-1} + \beta_5 Growth\_GL_{i,t-2} + \sum_{j=1}^{1}\beta_6 Bank\ specific_{i,t-j}\ \sum_{j=1}^{1}\beta_7 Macro\ variables_{i,t-j} + \varepsilon_{i,t} \quad (3)$$

And the second analysis is as follows:

$$flow_{i,t} = \alpha + \beta_1 flow_{i,t-1} + \beta_2 MANAGE_{i,t-1} + \beta_3 PROVISIONS_{i,t-1} + \sum_{j=1}^{1}\beta_4 Bank\ specific_{i,t-j} \sum_{j=1}^{1}\beta_5 Macro\ variables_{i,t-j} + \varepsilon_{i,t} \quad (4)$$

Results of Eq. (3) are reported in Table 7, and show similar relationships and significances to those in the main model. In particular, capitalization (proxy by E_TA) shows a negative relationship with the UTP ratio and with the bad loans ratio, so we can reject the hypothesis of moral hazard behaviour of banks, although the calculation gives no information about the flows of UTP. Profitability also shows a negative relationship, confirming the theory that banks with higher profitability show lower levels of problem loans, in line with the bad management hypothesis. Here too, results with regard to the ratios are confirmed, but not flow measures.

Regarding cost inefficiency, the relationship is negative only with regard to the UTP and bad loans ratios. Looking at the flows of new UTP from performing loans, findings suggest a positive relationship, in line with the results described above.

Lastly, with regard to lending policy, findings confirm that banks adopting an expansive lending policy in the previous two years show a higher level of problem loans, in both UTP and bad loan ratios and in flows.

Table 7. Results of the Fixed effect model on the UTP and Bad Loans ratio and on the flow from performing loans to UTP and to Bad Loans

	UTP_GL	from PL to UTP	UTP_GL	from PL to UTP	Bad Loans_GL	from PL to bad loans	Bad Loans_GL	from PL to bad loans	UTP_GL	from PL to UTP	UTP_GL	from PL to UTP	Bad Loans_GL	from PL to bad loans	Bad Loans_GL	from PL to bad loans
Constant	0.979***	1.417*	1.375***	1.532**	2.835***	-0.380	2.715***	-0.359	1.362***	1.448*	1.153***	1.551**	2.587***	-0.106	2.512***	-0.098
	(0.185)	*(0.761)*	*(0.186)*	*(0.736)*	*(0.260)*	*(0.357)*	*(0.254)*	*(0.349)*	*(0.175)*	*(0.737)*	*(0.182)*	*(0.716)*	*(0.248)*	*(0.349)*	*(0.243)*	*(0.343)*
E_TA t-1	-0.163	-0.014			-0.599**	0.184			-0.367**	0.114			-0.631**	0.172		
	(0.185)	*(0.698)*			*(0.250)*	*(0.334)*			*(0.177)*	*(0.712)*			*(0.251)*	*(0.341)*		
Tier1 t-1			0.045	-0.292			-0.065	0.068			0.051	-0.184			-0.140	0.078
			(0.088)	*(0.325)*			*(0.120)*	*(0.163)*			*(0.0910)*	*(0.333)*			*(0.122)*	*(0.167)*
ROAE t-1	-0.092***	-0.001			-0.023	0.002			-0.053***	0.004			-0.026	-0.001		
	(0.018)	*(0.059)*			*(0.022)*	*(0.029)*			*(0.017)*	*(0.059)*			*(0.022)*	*(0.030)*		
ROAA t-1			-1.125***	0.058			-0.921***	0.196			-1.142***	0.144			-0.932***	0.118
			(0.233)	*(0.846)*			*(0.317)*	*(0.418)*			*(0.242)*	*(0.875)*			*(0.323)*	*(0.434)*
C_I t-1	-0.049**	0.123	-0.027	0.124	-0.032	-0.040	-0.034	-0.0399	-0.027	0.169**	-0.024	0.165*	-0.051*	-0.051	-0.051*	-0.051
	(0.023)	*(0.080)*	*(0.021)*	*(0.081)*	*(0.028)*	*(0.038)*	*(0.029)*	*(0.0385)*	*(0.022)*	*(0.085)*	*(0.022)*	*(0.0864)*	*(0.030)*	*(0.040)*	*(0.030)*	*(0.041)*
GRGL t-1	0.0036	0.027	0.027***	0.019	0.044***	0.072***	0.043***	0.074***	0.025***	0.022	0.028***	0.018	0.047***	0.071***	0.044***	0.074***
	(0.008)	*(0.034)*	*(0.009)*	*(0.035)*	*(0.012)*	*(0.016)*	*(0.0130)*	*(0.0172)*	*(0.008)*	*(0.034)*	*(0.009)*	*(0.035)*	*(0.012)*	*(0.016)*	*(0.012)*	*(0.017)*
BANK SPECIFIC	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*
MACRO	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*	*NO*	*NO*	*NO*	*NO*	*NO*	*NO*	*NO*	*NO*
FE TIME	*NO*	*NO*	*NO*	*NO*	*NO*	*NO*	*NO*	*NO*	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*
Observations	*487*	*379*	*487*	*379*	*487*	*480*	*487*	*480*	*487*	*379*	*487*	*379*	*487*	*480*	*487*	*480*
R-squared	*0.228*	*0.154*	*0.336*	*0.158*	*0.462*	*0.286*	*0.456*	*0.286*	*0.389*	*0.175*	*0.339*	*0.176*	*0.482*	*0.288*	*0.479*	*0.289*
Prob > F	*0.000*	*0.001*	*0.000*	*0.0001*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.0002*	*0.000*	*0.0002*	*0.000*	*0.000*	*0.000*	*0.000*

Note: The regression run is a Fixed effect regression and the standard errors are reported in brackets. The dependent variables are: the unlikely-to-pay over gross loans (UTP_GL); the flows from performing loans to unlikely-to-pay (from PL to UTP); bad loans over gross loans (Bad Loans_GL); and finally, flows from performing to bad loans (from PL to bad loans). The explanatory variables are: the capitalization measures (E_TA and Tier1 ratio); the profitability ratios, i.e. the return on average equity (ROAE) and the return on average assets (ROAA); the growth of gross loans (GRGL); the cost to income ratio (COST_INCOME). We insert the following into bank specific controls: the proxy of business model measured by gross loans over total assets (GL_TA); the risk weight assets density (RWA_TA); the size measured by the natural logarithm of total assets (ln_TA); finally, in the macro-variables controls we have: the house price index (HPI), the growth year on year of gross domestic product (GDP). Asterics denote respectively significance at: *** p<0.01, ** p<0.05, * p<0.1

Table 8. shows results referring to the relationship between the quality of management and the out-flows from UTP. Here too, the fixed effect results confirm the results of the GMM model. They suggest that the presence of a specific office or unit to manage problem loans has a positive impact on the quality of credit portfolio management – i.e the flow from UTP to performing increases whilst the flow from UTP to NPL decreases. Looking at the provisions for UTP ratio, it affects positively the passage of UTP to NPL. Lastly, with regard to cost inefficiency, results again confirm those of our main analysis. Higher cost are not associated with higher NPL, so the bad management hypothesis referring to cost efficiency is rejected. Banks that invest less in their risk management activity, in other words which have other things being equal a lower cost income ratio, show higher flows to NPL and lower flows to performing loans.

Table 8. Fixed effect as robustness on the out-flows from UTP

VARIABLES	PL	NPL	PL	NPL	PL	NPL	PL	NPL	PL	NPL
Constant	-0.168	0.106	-0.453*	-1.466***	-0.307**	0.224	-0.641**	-1.463***	0.0427	-1.274**
	(0.105)	*(0.201)*	*(0.241)*	*(0.264)*	*(0.144)*	*(0.239)*	*(0.282)*	*(0.303)*	*(0.359)*	*(0.500)*
PROVISIONS	-0.249*	0.068	-0.163	0.654***	-0.158	0.158	-0.074	0.788***	-0.025	0.801***
	(0.132)	*(0.327)*	*(0.146)*	*(0.230)*	*(0.145)*	*(0.317)*	*(0.170)*	*(0.236)*	*(0.178)*	*(0.238)*
MANAGE	-0.001	-0.043***	0.004*	0.001	-0.003	-0.043***	0.003**	-6.09e-05	-0.001	-0.001
	(0.008)	*(0.0132)*	*(0.010)*	*(0.012)*	*(0.008)*	*(0.012)*	*(0.009)*	*(0.012)*	*(0.0102)*	*(0.013)*
C_I t-1	0.220*	-0.301*	0.196*	-0.103	0.234**	-0.078	0.194*	0.054	0.190	0.053
	(0.111)	*(0.151)*	*(0.115)*	*(0.114)*	*(0.110)*	*(0.147)*	*(0.113)*	*(0.114)*	*(0.115)*	*(0.114)*
RWA t-1	0.459***	0.759***	0.276**	-0.142	0.408***	1.076***	0.174	-0.008	0.279	0.020
	(0.121)	*(0.237)*	*(0.133)*	*(0.217)*	*(0.149)*	*(0.280)*	*(0.159)*	*(0.224)*	*(0.174)*	*(0.247)*
ROAE t-1					0.093	0.190**	0.083	0.216***	0.027	0.200***
					(0.058)	*(0.083)*	*(0.055)*	*(0.053)*	*(0.0571)*	*(0.062)*
GL_TA t-1					0.206	-0.660**	0.258	-0.210	0.193	-0.228
					(0.172)	*(0.308)*	*(0.169)*	*(0.236)*	*(0.176)*	*(0.227)*
GRGL t-2					-0.027	0.117	-0.061	0.038	-0.041	0.044
					(0.069)	*(0.149)*	*(0.066)*	*(0.130)*	*(0.0678)*	*(0.133)*
NPL_GL t-1									-1.075**	-0.297
									(0.499)	*(0.722)*
GDP t-1			0.811**	-1.676**			0.837**	-1.801**	0.740**	-1.828**
			(0.305)	*(0.725)*			*(0.317)*	*(0.714)*	*(0.351)*	*(0.727)*
HPI t-1			0.426*	1.973***			0.484**	1.909***	-0.135	1.738***
			(0.235)	*(0.330)*			*(0.230)*	*(0.325)*	*(0.345)*	*(0.533)*
Observations	277	277	277	277	277	277	277	277	277	277
R-squared	0.286	0.214	0.314	0.490	0.312	0.263	0.344	0.516	0.390	0.518

Note: The regression run is a Fixed effect regression and the standard errors are reported in brackets. The dependent variables are the flows from UTP to performing loans (PL) and the flows from UTP to other non performing loans (NPL). The explanatiory variables are: the flows from unlikely-to-pay to performing loans (flow_to_PL); the flows from unlikely-to-pay to other categories of NPL (flow_to_NPL); the category variable is equal to 1 if the bank states in the balance-sheet report that problem loans are managed by the legal office or by another office not specific in managing NPLs; 2 if there is a specific office that aims to recover non performing loans and if bank adopts an external office (e.g. cooperative banks); 3 if bank has a specific non core unit to manage NPL; 0 if bank does not explain in the balance-sheet how NPL is managed (MANAGE); non performing loans over gross loans (NPL_GL); and finally the loan loss provisions for unlikely-to-pay over gross loans (PROVISIONS). The capitalization measures (E_TA and Tier1 ratio); the profitability ratios, respectively the return on average equity (ROAE) and the return on average assets (ROAA); the growth of gross loans (GRGL); the cost to income ratio (COST_INCOME); the proxy of business model measured by gross loans over total assets (GL_TA); the risk weight assets density (RWA_TA); the size measured by the natural logarithm of total assets (ln_TA); the non performing loans over gross loans (NPL_GL); the house price index (HPI), the growth year on year of gross domestic product (GDP). All variables are at time t-1. The asterisks denote respectively significance at: *** p<0.01, ** p<0.05, * p<0.1

8. Conclusions and policy implications

Several European countries, including Italy, still have a high level of NPL, demonstrating banks' difficulties in managing impaired exposures and "cleaning up" their balance sheets.

Among NPL, a specific category of problem loans is currently emerging as one of the most relevant and challenging for the banking system: the unlikely-to-pay loans. Indeed, they cover a high portion of NPL and, due to the lower coverage, they present a relatively higher net value than other classes. Moreover, analysts expect that UTP will increase in the near future and they will strongly affect banks' economic results, also considering the introduction of IAS 9 and the new ECB requirements on coverage ratios.

In order to deepen the analysis on this specific category of NPL, the study investigates the determinants of the UTP at bank level, as well as the determinants of the flow of UTP that returns *in bonis* or that moves to bad loans.

First, studying the NPL of the Italian banking system during the period from 2010 to 2016, the analysis aims to verify whether the determinants of NPL at bank level studied in literature are confirmed also for the different components of impaired loans. In particular, we test the lending policy- , the moral hazard-, the bad management-, the skimpin- and the cyclical credit policy-hypothesis.

Comparing the determinants of UTP ratio and bad loans ratio, our findings show some relevant differences. In particular, for UTP the moral hazard hypothesis is rejected (we find a positive relationship between bank capitalization and UTP ratio) and, referring to profitability, the bad management hypothesis is confirmed. On the contrary, for bad loans we confirm the hypotheses of moral hazard behavior and cyclical credit policy respectively with regard to capitalization and profitability. These findings highlight the relevance for banks, authorities, and researchers to respectively manage, regulate, and study the different categories of NPL separately, for better understanding the specific determinants and, consequently, for better planning ways of preventing their increase and the worsening in their quality.

On the other hand, studying the determinants of the UTP at bank level, the analysis tests whether the hypotheses confirmed for UTP ratio are the same than those for the flows of new UTP from performing loans. Findings show the positive relationship between the lending activity and the level of UTP, as well as between bank capitalization and UTP, both considering the stocks and the new flows of problem loans. However, with reference to the quality of management, the results are conflicting. In fact, the cost-income ratio affects negatively the UTP ratio: the higher the bank

inefficiency, the lower the ratio, confirming the skimping hypothesis. But regarding the flow of new UTP, the sign changes and shows a positive relationship, confirming the bad management hypothesis. Profitability also shows results which conflict considering the UTP ratio and the flow of new UTP. With regard to the UTP ratio, findings suggest a negative relationship, and for the flow of new UTP a positive one. So in the first case, the bad management hypothesis is confirmed and in the the second case the cyclical credit policy hypothesis is confirmed.

To sum up, results differ depending on the variable chosen as a measure of the credit portfolio quality. They vary depending on whether we adopt the stock- or the flow-measure, which reveals the importance of the proxy used in studies and in regulations and controls. The stock measure is more static and appears less suitable for analyzing UTP, which are an intermediate category of exposure, between performing and bad ones. Consequently, UTP stocks can increase every year due to the new flow from performing loans, indicating a drop in credit quality, as well as new flows from other NPL loans, leading to an improvement of the credit portfolio quality. In the same way, the stocks of UTP, and the consequent UTP ratio, is affected by the decreases towards both better and worst exposures. On the other hand, the flow-measure is more dynamic and depends only on the performing loans that deteriorate to become UTP. Consequently, it is more suitable for the evaluation of the determinants of a worsening in the credit quality of the loan portfolio. Also the authorities should refer to new flows of UTP, rather than UTP ratio, in their supervising activities.

Literature on NPL shows conflicting results about the relationship between the efficiency/profitability of a bank and the credit quality of its portfolio. Our results can demonstrate that these different findings can be related to the role of the different components of the NPL portfolio. The interpretation of the variables related to the quality of management needs a more in-depth analysis, for verifying if the costs that affect both efficiency and profitability can be interpreted as a proxy of bad management or a proxy of investments for improving the management of credit risk. In fact, good credit risk management practices can be useful for reducing the level of NPL, but it can raise costs and lower both bank efficiency and profitability. In order to verify the role of specific bank costs, our study tests the impact of investments in organizational structures for the management of impaired loans, examining separately collections and flows from UTP to performing loans compared to flows from UTP to bad loans. This analysis allows to distinguish the reduction in the level of UTP that occurs when the credit merit of loans either improves or worsens.

Findings confirm that banks with a dedicated and proactive organization show a higher flow from UTP to performing loans and a lower flow from UTP to bad loans. Moreover, proactive management plays a bigger role with regard to the flows from UTP to performing exposures than for flows to other

NPL. These results generate relevant policy implications for banks: organizational costs about NPL management (a dedicated division, specialized personnel structures, specific policies…) should not be interpreted as an increase in cost inefficiency, but as an increase in investments to improve credit quality. In fact, the existence of a specific business unit specialized in the management of NPL allows banks on one hand to improve the proactive recovery and management of impaired loans, and on the other, to focus the rest of the bank on the core activity.

Besides, the study verifies the impact of loan loss provisions, confirming that banks with higher UTP provisions show a lower flow from UTP to performing loans and a higher flow from UTP to bad loans. In this case, findings highlight a stronger relationship between provisions and flows to bad loans than flows to performing loans. These results are relevant for supervisors, that are evaluating the effects of the addendum to the ECB guidance to banks on non-performing loans, related in particular to prudential provisioning backstop for non-performing exposures. Furthermore, the analysis of the collections and the flows of UTP that returns *in bonis* allows banks to investigate the determinants of improvement in the credit quality of their loan portfolios.

To sum up, whilst the first part of our study, about the determinants of UTP ratio and flows of UTP from performing loans, is useful for preventing new UTP, the second part of the analysis, about the flows that reduce UTP, is relevant for encouraging the transition from UTP to performing loans and for preventing their worsening to bad loans.

In general, findings show the great importance of a sound and dedicated UTP management, also considering that, given the current inadequate coverage ratio for UTP, the sales of this category of non-performing loans is more difficult and less appropriate if compared with the bad loan market which appears by now adequately developed.

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