BANCA D'ITALIA

EUROSISTEMA

# Temi di discussione

(Working Papers)

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October 2019

Number 1236

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EUROSISTEMA

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Number 1236 - October 2019

ISSN 1594-7939 (print)
ISSN 2281-3950 (online)

*Printed by the Printing and Publishing Division of the Bank of Italy*

**FORWARD-LOOKING EFFECTIVE TAX RATES IN THE BANKING SECTOR**

by Ernesto Zangari* and Elena Pisano*

**Abstract**

The paper extends to the banking sector the Boadway-Bruce-Mintz framework used to compute marginal and average effective tax rates for non-financial firms. The model focuses on loans and considers the interactions between taxation, accounting, company law and regulation for the Italian banking sector, following the Nordic view of corporate taxation. It allows to disentangle the tax components of loan price, namely tax rates, deductibility of the cost of equity under partial and full ACE systems, taxes on net worth, and limits to the deductibility of interests and loan loss provisions (LLPs), also highlighting the role played by deferred tax assets. The effective tax rates on loans indicate, among other things, that the ACE introduced in 2011 has been effective in reducing the debt bias, and that until 2015 the deductibility limits on LLPs could have generated several distortions, discriminating between borrowers, economic sectors and geographical areas, inducing a pro-cyclical increase in the cost of credit during downturns, and providing disincentives to the timely setting aside of sufficient provisions for non-performing loans.

**JEL Classification**: H25, G21.
**Keywords**: taxation, banks, effective tax rates, EMTR, EATR, allowance for corporate equity, Basel III, loan loss provisions, deferred tax assets.

**Contents**



* Bank of Italy, Tax Department, Tax Analysis Division.

## 1. Introduction[*]

Since the financial crisis, the taxation of the financial sector has attracted renewed attention from both academics and policy-makers. New taxes on the financial sector have been proposed and in some countries actually introduced.[1] The potential negative effects on financial stability of the debt bias embedded in traditional corporate tax systems have been widely debated, as well as the possible use of taxation as a complement to bank regulation in strengthening financial structures. As regards the new Basel III regime, the tax effects of the new capital requirements on the lending spread have been discussed and the impact of the new regulation on Deferred Tax Assets (DTAs) has been evaluated.[2] More recently, concerns about the high level of Non-Performing Loans (NPLs) weighing on banks' balance sheets have led to emphasis being placed on the possible role of tax impediments in the resolution of NPLs.[3]

Assessing the tax burden on banks is a necessary step in order to provide insights and empirical evidence on the effects of taxation on banks' choices, as well as to shed light on the issues recalled above. This paper extends one of the frameworks set up for non-financial firms to the banking sector in order to compute forward-looking effective tax rates[4] on banks' loans.[5] The work focuses on corporate taxation[6] and it draws primarily on Boadway, Bruce and Mintz (1984), who assumed an investment funded by a mix of sources of finance.[7] In line with the Nordic view of corporation tax, the model also considers the possible effects of reporting conventions and company law on effective taxation and loan pricing.[8]

The model is built on the evolution of the taxation system of the Italian banking sector over the period 1994-2017. In fact, Italy offers an interesting case study for several reasons.

Over the period considered, the taxation system of the Italian banking sector has been characterized by many changes and bank-specific tax rules. Several rules and changes are closely linked to the

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* The views expressed in this paper are those of the authors and do not necessarily reflect those of the Banca d'Italia. The authors are grateful for the helpful comments made by participants at the 74th Annual Congress of the International Institute of Public Finance (IIPF) held in Tampere (21-23 August 2018) and the XXX Annual Conference of the Italian Society of Public Economics (SIEP) held in Padua (20-21 September 2018). Responsibility for any errors and omissions lies solely with the authors. An extended version of the paper is available online on the web pages of the authors.

1 See IMF (2010). For a discussion of proposals and developments in the taxation of the financial sector, see de Mooij and Nicodème (2014).

2 For an analysis of the effects of Basel III on lending rates, see Elliott et al. (2012). For descriptive statistical evidence on DTAs in the Basel III phase-in period, see ECB (2014).

3 See IMF (2015) for a discussion of obstacles to NLP resolution, including taxation. For an analysis of the Italian case, see Jassaud and Kang (2015) and De Vincenzo and Ricotti (2014).

4 Forward-looking indicators consider a hypothetical investment, incorporating only some elements of the tax code, typically statutory tax rates and main tax base allowances. These indicators are independent of tax planning and, therefore, they are exogenous from an empirical point of view. For a discussion of the different indicators of effective taxation in the banking sector, see Monacelli and Pazienza (2006) and Ricotti et al. (2010).

5 Banks are multiservice firms and generally taxes affect the pricing of every banking product. In this work we only focus on the tax effect on loan-pricing, considering just one aspect of banking activity. Notice that loans represent roughly half of the overall assets of Italian banks.

6 Another approach in the literature considers all taxes levied on businesses, focusing on production rather than on investment (see McKenzie et al., 1997 and McKenzie, 2000).

7 Alworth and Violi (1998) also used different sources of finance in the analysis of the cost of capital for the Italian banking sector in the period 1985-1996, following Kuprianov (1997).

8 See Sinn (1987) and Kanniainen and Södersten (1994). For a general discussion of the different views of the corporation tax, see Sørensen (1995).

recent tax policy debates mentioned above. For instance, with regard to the relationship between financial stability and taxation, from 2008 to 2016 a straight limitation on interest deductibility was applied to the banking sector only; moreover, in 2011 an Allowance for Corporate Equity (ACE) regime came into force in Italy, allowing the deductibility of a notional return on equity in the financial sector as well. As regards the current debate on the resolution of NPLs, the Italian bank-specific tax rules on loan loss provisions (LLPs) and write-offs, limiting immediate deductibility, are believed to have contributed to discouraging provisioning and write-offs for many years.[9] Moreover, Italy provides a valuable chance to analyse the interactions between regulatory, accounting and tax rules. Indeed, the strong accumulation of DTAs in the balance sheets of Italian banks owing to the rules on LLPs makes it particularly interesting to analyse the accounting change in 1999 – with the shift from cash-based to accrual-based accounting for corporate taxes – as well as the new Basel III rules regarding DTAs.

Although the model has been built on the tax system of the Italian banking sector, its insights are more general, regarding among others the effects of the ACE and the limits on the deductibility of interest costs, and the economics of deferred taxation.

The contributions of this paper to the literature are twofold.

From a methodological point of view, we adapt to the banking sector the Boadway, Bruce and Mintz (1984) approach used to measure the cost of capital for non-financial firms, interpreting it as a model of loan pricing. With respect to the other applications of the loan pricing formula – as in Elliot et al. (2012) – and to other extensions to the banking sector of the standard models used for non-financial firms (see, for instance, Alworth and Violi, 1998; McKenzie, 2000), our model is richer because it explicitly considers financial constraints stemming from company law, as well as from regulatory capital requirements, and more generally because it takes into account the interaction between regulation, accounting, company law and taxation. The model also incorporates the new Basel III regulatory framework, including the requirements on DTAs. Moreover, following the Devereux-Griffith approach, we apply to the banking sector the distinction between EMTR and EATR, which in principle relate to different types of choices.

From an empirical point of view, the work provides theoretically-based measures of the tax spread on loan pricing and effective marginal tax rates for the Italian banking sector over a long time span. The work also explores the neutrality properties of the DIT and ACE regimes, taking into account the details of the Italian tax and accounting frameworks, as well as the relationship between notional DIT/ACE rates and market interest rates. Moreover, the paper analyses the potential effects of the tax system on bank financial reporting choices and loan sales by computing effective average tax rates.

The paper is structured as follows. The main features of the Italian tax system for the banking sector are illustrated in Section 2. In Section 3, the theoretical framework to measure the cost of capital is derived. Section 4 briefly discusses the calibration of the model. Section 5 provides results. Section 6 presents the conclusions.

[9] See De Vincenzo and Ricotti (2014), IMF (2015) and Garrido et al. (2016).

## 2. The tax system for the banking sector in Italy in the period 1994-2017

As regards the taxation of profits, over the period 1994-2017 the tax system for the Italian banking sector was subjected to several changes affecting its structure, the tax rates and the tax base.

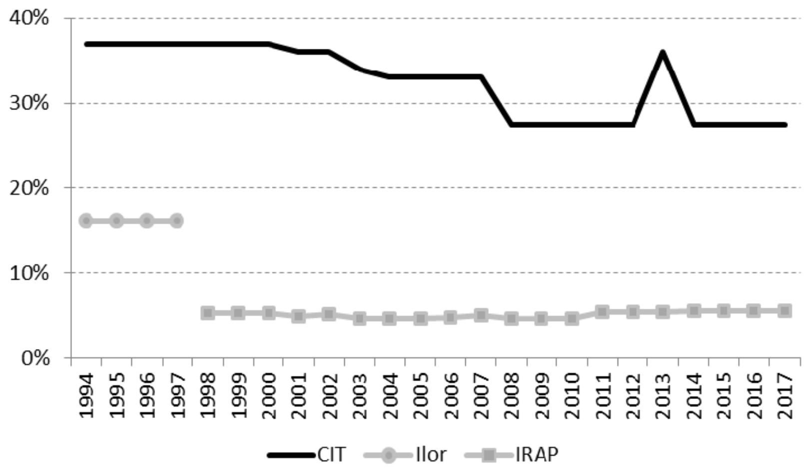
*2.1 Taxes on profits: tax rates*

Currently, banks are subject to two income taxes: IRES and IRAP. IRES (*Imposta sul reddito della società*) is the corporate income tax (CIT). In 2017, the CIT rate for banks was 27.5% (a 24% basic tax rate plus a 3.5% sector-specific surtax). IRAP (*Imposta Regionale sulle Attività Produttive*) is a value added tax, applied with the addition method; its base includes not only profits but also labour cost; in 2017, the tax rate was 4.65% plus the regional surcharges.[10] In 1998, IRAP replaced another local income tax, ILOR (*Imposta locale sui redditi*), that was levied only on profits, with a tax rate of 16.2%.[11] Figure 1 shows the evolution of the rates of the taxes on profits of the banking sector over the period 1994-2017.

For modelling, define ($p+\delta_t$) as the additional income accrued over time $t$ due to a 1 Euro increase in loans at the beginning of period $t$, where $p$ is the (pre-tax) nominal rate of return on loans *over and above* the loan loss provisioning rate, $\delta_t$.[12] The taxation of the return on loans brings about a negative cash flow at time $t$ equal to $\tau(p+\delta_t)L_{t-1}$, where $L_{t-1}$ is the amount of loans at the beginning of period $t$, and $\tau$ is the overall tax rate on profits (CIT + ILOR/IRAP).

With regard to the tax base, the following will focus on the rules applying to loan value adjustments and the cost of finance.[13]

**Figure 1**. Statutory tax rates on bank profits, 1994-2017




**Notes**: in 2013 a surtax of 8.5% was applied to banks.

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10 The IRAP tax rate is higher for the banking sector (in 2017, 4.65% vs 3.90% for non-financial firms).

11 In addition to ILOR and other minor taxes, IRAP also replaced the net worth tax (see Annex B) and several social contributions on wages earmarked for health expenditure. Since this paper focuses on the taxation of profits, we do not consider the labour cost component of IRAP. This is in line with the literature modelling the IRAP for the computation of effective tax rates on profits. See for instance Bordignon et al. (1999) and ZEW (2016).

12 The loan loss provisioning rate corresponds to the expected loss rate (EL rate) in the loan pricing formula.

13 In our computations we do not consider the sector-specific IRAP tax rules regarding dividends, administrative expenses and depreciation for physical capital introduced in 2008, as well as the possibility to deduct against the CIT base 10% of IRAP (from 2008) and the whole of IRAP relating to labour costs (since 2016) (see Ricotti et al., 2016 for an analysis of these provisions).

### 2.2. Tax base: the provisions for loan value adjustments

The rules for the deductibility of loan value adjustments changed many times during the period 1994-2017. While the tax treatment is currently standardized and allows full and immediate deductibility, for a long period it depended both on the tax (CIT and ILOR/IRAP) and on the accounting rules for write-downs, write-offs and losses realized on disposals.

#### 2.2.1 The tax treatment of write-downs

As regards write-downs, while until 1994 the same rules applied to all firms, since 1995 the tax system has been different for the banking sector. Table 1 summarizes the evolution of CIT rules for write-downs (henceforth, loan loss provisions or LLPs) for the period 1994-2017.

In 1994 LLPs were deductible against the CIT base only up to a fixed percentage of the loans, equal to 0.5%, and only if the overall LLP stock was lower than 5% of loans. From 1995 to 2015, only a part, $\phi$, of the yearly LLP rate, $\delta_t$, was immediately deductible, while the remaining part ($\delta_t$ - $\phi$) was carried forward and could be deducted in equal parts over a given number of years ($n$).[14] Since 2016, the entire yearly flow of LLPs can be deducted immediately.[15] Therefore, since 2016 tax and book deductions coincide.

**Table 1**. The corporate income tax rules for loan loss provisions,1994-2017

| | **1994**[a] | **1995 -2003** | **2004** | **2005 -2007** | **2008-2012** | **2013-2015**[b] | **2016 -2017** |
|---|---|---|---|---|---|---|---|
| **Tax threshold % ($\phi$)** | 0.5 | 0.5 | 0.6 | 0.4 | 0.3 | $1/5*\delta$[c] | Full and immediate deductibility |
| **# Years to deduct the excess ( $n$ )** | ∞ | 7 | 9 | 9 | 18 | 4 | |

a) Case when the overall LLP stock was lower than 5% of loans; ∞ is used for the cases when the excess provisions over the threshold are not deductible; b) In June 2015, it was established that for 2015 75% of LLPs would be immediately deducted, while the remaining part would be treated as the stock of past un-deducted LLPs; c) $\delta$ is the loan loss provisioning rate.

A further source of tax variation was due to the IRAP. Table 2 summarizes the ILOR/IRAP tax treatment of LLPs compared with the CIT. While there has been full symmetry between CIT and IRAP since 2013 (as there was between 1994 and 1997 between CIT and ILOR), in the period 1998-2012 the tax treatment of LLPs was different: in 1998-2004, LLPs were fully deductible against the IRAP tax base; in 2005-2012, LLPs were fully non-deductible.

**Table 2**. The ILOR/IRAP tax rules for LLPs, 1994-2017

| | **1994-1997**[a] | **1998-2004** | **2005-2012** | **2013-2017** |
|---|---|---|---|---|
| **Tax treatment** | As CIT | Full and immediate deductibility | Not deductible | As CIT |

a) Period when ILOR was in force.

[14] In our computations we do not consider that until 2007 when $\delta_t < \phi$ it was possible to deduct the higher rate $\phi$, and that since 2010 $\phi$ has been raised to 0.5% and $n$ lowered to 9, but only for new loans exceeding the average of the loans granted over the previous two years.

[15] For the purpose of our model we do not consider the transitional regime introduced in June 2015 for the stock of LLPs existing at the end of 2014; therefore, for 2015 we consider the LLPs rules that were in force at the beginning of the year.

For modelling, in what follows we define $\Omega^{LLP}$ as the yearly tax savings due to the tax rules on LLPs.

**Deferred tax assets in the balance sheet.** As described above, from 1995 to 2015 the LLPs not immediately deducted did cause temporary differences between the book and tax values of loans. Since 1999, all the temporary misalignments between the book and tax values of assets have been accounted for in the balance sheet with the recording of deferred tax assets (DTAs).[16] For LLPs, DTAs measure the cash value of the future LLP deductions that were not made immediately. Therefore, since 1999 the model bank balance sheet has been the following:

| Assets | Liabilities and capital |
|---|---|
| Loans ($L_t$) | Debt ($B_t$) |
| Deferred Tax Assets ($DTA_t$) | Equity ($E_t$) |

Given a set of tax parameters ($\tau$, $\phi$, $n$) and a pattern of LLP rates and loans ($\{\delta_{t-i}\}_{i=0}^{n}$ and $\{L_{t-1-i}\}_{i=0}^{n}$ respectively), the dynamic equation of the stock of deferred tax assets, $DTA_t$, can be written as follows:

$$DTA_t = DTA_{t-1} + \tau\left[\max[(\delta_t - \phi), 0]L_{t-1} - \frac{1}{n}\sum_{i=1}^{n}\max[(\delta_{t-i} - \phi), 0]L_{t-1-i}\right] \qquad [1]$$

where $\delta_t$ is the LLP rate, $\phi$ the tax threshold, and $\tau$ the relevant tax rate depending on the period (see Table 2).

### *2.2.2 The tax rules for loan write-offs and capital losses*

The parameter $\delta$ can be interpreted as a loan write-down, but also as an expected loan write-off, or as an expected capital loss in the case of a loan sale. Table 3 summarizes the tax treatment of loan write-offs and capital losses in the period 1994-2017, for CIT and ILOR/IRAP.

Table 3 shows that since 2016 the tax treatment has been common to write-offs and capital losses, as well as to write-downs, as seen above. Before 2016 this was not the case and the tax system could potentially affect accounting policies and loan choices other than loan pricing, such as loan sales, loan restructuring and loan duration. As regards the accounting policy, in some periods there were three different tax treatments corresponding to write-downs, write-offs supported or not by precise and objective elements (*elementi certi e precisi*), such as bankruptcy proceedings. Therefore, given the stringent conditions for write-off deductibility until 2011, for many years there could have been a tax incentive to write down bad loans gradually so as to take advantage with certainty of the related cash flow effect, rather than to write them off and be challenged, with some likelihood, by the tax administration for the lack of 'precise and objective elements'. With regard to loan sales, note that until 2011 the case-law derived from some Supreme Court decisions of 2000 – confirmed in the following years and embraced by the tax administration – made even the conditions for the deductibility of capital losses in case of loan sales stringent. For a given loan depreciation, this implies that until 2011 the Ires tax rules may have provided a tax disincentive to

[16] The same accounting treatment is envisaged under the International Accounting Standards (IAS), and in particular under IAS 12 – Income Taxes.

loan sales, since it was preferable from a tax point of view to keep the loan and write it down[17]; in the period 2013-2014 the scenario may have reversed somewhat, since it could have been more advantageous for Ires tax purposes to sell the loan and immediately deduct the depreciation, rather than write it down under the stricter tax rules for deductibility.

**Table 3**. Tax treatment of loan write-offs and capital losses, 1994-2017

<table>
<tr><th>Period</th><th>Write-off</th><th>Capital loss</th></tr>
<tr><td></td><td colspan="2">CIT</td></tr>
<tr><td>1994-2011</td><td colspan="2">Deductible if supported by precise and objective elements (elementi certi e precisi)</td></tr>
<tr><td>2012</td><td colspan="2">Deductible if supported by precise and objective elements (elementi certi e precisi)<br>+ Derecognition according to the International Accounting Standards (IAS 39)</td></tr>
<tr><td>2013-2014</td><td>Deductible in 5 years</td><td>Deductible</td></tr>
<tr><td>2015-2017[a]</td><td colspan="2">Deductible</td></tr>
<tr><td></td><td colspan="2">ILOR/IRAP</td></tr>
<tr><td>1994-1997</td><td colspan="2">Deductible if supported by precise and objective elements (elementi certi e precisi)</td></tr>
<tr><td>1998-2004</td><td colspan="2">Deductible</td></tr>
<tr><td>2005-2007</td><td colspan="2">Non-deductible</td></tr>
<tr><td>2008-2012</td><td>Non-deductible</td><td rowspan="2">Deductible[b]</td></tr>
<tr><td>2013-2014</td><td>Deductible in 5 years</td></tr>
<tr><td>2015-2017[a]</td><td colspan="2">Deductible</td></tr>
</table>

a) In June 2015, it was established that for 2015 75% of write-offs would be immediately deducted, while the remaining part would be treated as the stock of past un-deducted write-downs and deducted gradually over a certain number of years. b) An administrative tax regulation issued in 2009 provided that, in the case of a loan sale, it was possible to deduct also the possible previously non-deducted write-downs against the IRAP tax base (Agenzia delle Entrate, "Modifiche alla determinazione della base imponibile IRAP", Circolare n. 27, 26 May 2009).

### *2.3 Tax base: provisions for the cost of finance*

Over the period 1994-2017, not only were the rules on loan value adjustments subject to several changes, but also the tax provisions for the cost of finance.

#### *2.3.1 Debt*

With regard to debt financing, the whole amount of interest cost is currently deductible against the CIT and IRAP tax bases. During the period 2008-2016, only a part of interest was deductible (96%; 97% for 2008); this limit was specific to the banking sector. In terms of the model, in each year the deductibility of interest costs permits a tax saving, $\Psi_t^{debt}$, equal to:

$$\Psi_t^{debt} = (\tau_{cit} + \tau_{irap/ilor})\beta\, i_d\, B_{t-1} \qquad [2]$$

where $B_{t-1}$ is the stock of debt at the beginning of period t, $i_d$ is the cost of debt, and β represents the part of interest costs that can be deducted. Note that for banks interest costs are also deductible against IRAP, differently from non-financial companies. This is important because it implies that IRAP affects the debt bias in the banking sector, while it does not for non-financial firms.

#### *2.3.2 Equity*

As regards equity funding, over the period 1994-2017 there are three regimes to consider: 1) a wealth tax was in force in the period 1993-1997; 2) from 2000 to 2003, a regime called Dual

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17 Instead, in the period 2009-2012, the possibility to deduct, in addition to the loan loss, also the previously un-deducted write-downs against the IRAP tax base, provided a tax incentive to loan sales.

Income Tax (DIT) was applied that allowed lower taxation of the return on equity; 3) since 2011, an Allowance for Corporate Equity (ACE) has been available that allows the deduction of a notional return on equity against the CIT base. In what follows, the focus is on the most recent ACE regime[18].

The ACE deduction was introduced in 2011 for all firms in order to address the gap in the tax treatment of debt and equity by allowing the deduction against the CIT base of a notional return on equity. The notional return on equity was computed multiplying a notional ACE rate by a ACE base that was computed as the accounting equity accumulated from 2010 (so called 'incremental' ACE).[19]

The ACE allows a tax saving equal to:

$$\Psi_t^{\text{equity}} = \tau_{cit}\, i_{ace}\, E^{tax}_{t-1} \quad [3]$$

where $\tau_{cit}$ is the CIT rate, $i_{ace}$ is the notional ACE rate, and $E^{tax}_{t-1}$ is the ACE base at the beginning of time $t$. For the purpose of the model, it is possible to neglect the 'incremental' feature and express the ACE base as the book equity $E_t$:

$$E_t^{tax} = E_t \;\; = E_{t-1} + (p+\delta_t)L_{t-1} - i_d B_{t-1} - \delta_t L_{t-1} - T_t - D_t + N_t \quad [4]$$

Note that what matters in [4] is the book definition of profit (the book depreciation, $\delta_t L_{t-1}$), as opposed to the tax base (the tax depreciation, $\phi L_{t-1}$), and the book definition of corporate taxes, $T_t$, as opposed to the cash definition, $T_t^{cash}$. This has important consequences for the ACE neutrality properties whenever there are temporary differences between book profit and tax base since it basically neutralizes the ACE property of making these differences irrelevant for the cost of capital (in our case, for loan pricing).[20]

The ACE notional rate, $i_{ace}$, was set at 3% for the first three years of the new regime, 2011-2013; it was equal to 4%, 4.5% and 4.75% in 2014, 2015 and 2016. The notional rate was set at 1.6% and 1.5% in 2017 and 2018, respectively.

### *2.3 The tax bill and the accrual definition of corporate taxes*

After the derivation of the different components, the corporate tax bill can be written down in the following manner:

$$T_t^{cash} = \left(\tau_{cit} + \tau_{ilor/irap}\right)\left[(p+\delta_t)L_{t-1}\right] - \Omega_t^{\text{llp}} - \Psi_t^{debt} - \Psi_t^{equity} \quad [5]$$

where $\Omega_t^{llp}$ , $\Psi_t^{debt}$ and $\Psi_t^{equity}$ are the cash flows at time $t$ due to the tax rules on LLPs, debt and equity funding, respectively. For the period 1999-2014, for the purpose of the model interpretation, it can be shown that the book definition of corporate taxes can be expressed in terms of the cash definition and the DTA dynamic as follows:

$$T_t = T_t^{cash} - \left(DTA_t - DTA_{t-1}\right) \quad [6]$$

where the DTA change can be derived from equation [1] above.

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[18] The modelling of wealth tax and the DIT regime is discussed in Annex B.

[19] The maximum amount of the deduction in a given tax year was the taxable income; however, a carry forward regime was available without time limits. We do not consider this detail for the DIT, or for the current ACE regime.

[20] See IFS (1991) and IMF (2012).

Equation [6] shows that in accounting terms the DTAs relating to LLPs (like all DTAs relating to time differences between tax base and book profits) represent the link joining the corporate tax bill, $T_t^{cash}$ (*imposte di cassa*), and the book definition of corporate taxes, $T_t$ (*imposte di competenza*). In terms of our model, since 2016 the two definitions of corporate tax on profits coincide. Beyond the model, note that equation [6] is more general and holds in every tax system where there are temporary differences between book and tax values and deferred taxes are recognized in the financial statement.

## 3. The model

The approach used to compute effective tax rates is primarily based on the model of Boadway, Bruce and Mintz (1984) for non-financial firms, which is general enough to be adapted to the banking sector and interpreted as a model of loan pricing. This is one of the frameworks available for the computations of effective tax rates, as discussed in Devereux (2003a). Under this approach, the cost of debt and the cost of equity differ and are calibrated using actual costs as observed in the market[21]. This is considered appropriate for the banking sector for two reasons: firstly, as banks have easier and cheaper access to debt than other companies, it seems more compelling than for other firms to take into account the different costs of funding sources; secondly, given the existence of capital regulatory constraints, a bank loan investment is generally funded by a mix of finance sources.[22]

The model also assumes a fixed financial policy using both debt and equity. From a theoretical point of view, the previous two assumptions are compatible with finance frameworks in which the cost of debt and the cost of equity increase with the debt-equity ratio.[23] Ultimately, in terms of corporate finance models, the framework is akin to an aggregated discounted cash flow model since the free cash flows to assets are discounted using a weighted average cost of capital whereby the tax benefits related to debt and equity are included in the discount rate[24]; in terms of the economics of banking, the model is an extension of an accounting-based loan pricing formula, which has been used to measure the impact on lending spreads of the new Basel III regulatory capital requirements.[25]

Our theoretical framework is based on a dynamic model of the bank. The model is deterministic, so it considers banks acting only on expected values[26]. We only consider the tax system at the bank

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21 Recent contributions based on the Boadway-Bruce-Mintz approach include Bazel *et al*. (2018) – comparison of the corporate tax systems of US and Canada - and Mintz (2018), who analyses the effects of the 2017 US tax reform.

22 In Devereux and Griffith (1998a) the costs of different funding sources are not differentiated and a single marginal source of funding is assumed.

23 See Boadway (1987) and the discussion in Devereux (2003a) and Sørensen (2004). A recent application of this model of corporate finance is Sørensen (2017) who analyzes the socially optimal debt/asset ratio in a small-open economy.

24 For a discussion of different corporate finance models for the banking sector see Beltrame and Previtali (2016) and Beltrame et al. (2018).

25 For recent analyses relying on this type of approach, see Elliott (2009), Santos and Elliott (2012) and Elliott et al. (2012). For an early application, see Zimmer and McCauley (1991).

26 Risk may affect the effect of taxation on the cost of capital (in our case loan pricing) and the effective tax rates in several ways, depending crucially on the assumptions on the stochastic distributions of the rate of returns on investment in the presence and absence of tax. Implicitly, our computations are based on the simplifying assumption of no change in the stochastic distributions of the loan return when moving to an investment which is marginal in presence of taxation. For a discussion of the role of risk in the measurement of effective tax rates, see Boadway (1987) and Devereux (2003b).

level. For simplicity, we assume no share issues ($N_t$ = *0*), so that equity funding only comes as retained earnings. All the variables are expressed in nominal terms and we do not explicitly model inflation.

Annex A gives definitions of all the variables used in this paper.

The starting point is a standard capital market arbitrage condition:

$$i_k E_t = (E_{t+1} - E_t) + D_{t+1} \qquad [7]$$

The left-hand side is the return from investing an amount $E_t$ in bank capital; the right-hand side is the pay-off earned at the end of period *t+1* by an individual owing the bank equity over period *t+1*; this pay-off is composed of dividends and capital gains. In equilibrium, for an investor, the right- and left-hand sides of equation [7] should be equal and this allows it to be solved for the value of equity at time *t*.

Dividends can be derived from the bank cash flow constraint (the equality of sources and uses of funds):

$$D_t = (p + \delta_t)L_{t-1} - i_d B_{t-1} - I_t - T_t^{cash} + S_t \qquad [8]$$

where $(p + \delta_t)L_{t-1}$ are bank revenues in period *t* (which depend on the beginning-of-period bank loans, $L_{t-1}$, and the overall rate of return on loans; the latter is equal to the sum of the rate of expected losses over period *t*, $\delta_t$, and the return in excess to the rate of expected losses, *p*); $i_d$ is the cost of debt; $B_{t-1}$ is the beginning-of-period stock of debt; $S_t$ is the new debt issued at time *t*; $I_t$ is the gross change in loans; and $T_t^{cash}$ is the corporate tax bill (see equation [5] above).

Bank loans evolve according to the following dynamic equation:

$$L_t = (1 - \delta_t)L_{t-1} + I_t \qquad [9]$$

The equation of motion of debt is the following:

$$B_t = B_{t-1} + S_t \qquad [10]$$

As seen above, since 1999 the dynamic equation of book equity has been the following:

$$E_t = E_{t-1} + (p + \delta_t)L_{t-1} - i_D B_{t-1} - \delta_t L_{t-1} - T_t - D_t \qquad [11]$$

where the definition of book CIT over the period 1999-2015 is given by equation [6] above. Before 1999, the dynamic equation of book equity was equal to [11] with $T_t^{cash}$ replacing $T_t$ .

### *3.1 Bank financial structure*

As a first step in solving the bank optimization problem, it is necessary to characterize the bank's financial structure as debt and equity are treated differently by the tax system.

In principle, there are several types of constraints to bank financial policy: like every company, banks are subject to financial constraints that are enshrined in company law with the aim of maintaining share capital, as well as to constraints stemming from market imperfections, for instance relating to uncertainty, asymmetric information and bankruptcy costs;[27] in addition, banks

[27] For a general discussion of market constraints in the context of the corporate taxation literature, see Shaviro (2009). For a financial structure model of the banking firm, considering regulatory, bankruptcy and agency costs, see Keen and de Mooij (2016).

are subject to regulatory constraints. In what follows, the focus will be on legal and regulatory constraints. These constraints are implicitly affected by accounting conventions: even if accounting rules do not directly affect cash flows (and for this reason one may think that they do not matter for measuring effective tax rates), they may affect financial choices and, indirectly, cash flows, ultimately influencing effective tax rates.

**Constraints stemming from civil law.** Company law generally sets legal constraints on financial policy with the objective of preserving equity and protecting investors.[28] In Italy, the Civil Law Code limits dividend distributions to the amount of 'effective profits' (*utili realmente conseguiti)* from the balance sheet.[29] Since 2005, for IAS (International Accounting Standards) adopters (such as banks), the law limits the distribution of profits deriving from the application of fair value and written in a reserve unavailable for distribution.[30] Given the time period under analysis, it is important to consider two cases.

Until 1998, tax accounting was cash-based and temporary differences between the carrying amount of loans in the financial statement and its tax definition were not recorded in the balance sheet. Hence, the corporate law constraint on dividends could be written as follows:

$$D_t \leq (p + \delta_t)L_{t-1} - i_D B_{t-1} - \delta_t L_{t-1} - T_t^{cash} \qquad [12]$$

By substituting the equation of dividends [8] into [l2], the limit to dividend distributions becomes a constraint on borrowing policy stemming from the company law:

$$S_t \leq (I_t - \delta_t L_{t-1}) \qquad [13]$$

This inequality simply states that, in order to maintain share capital, borrowing cannot be greater than net investment.

In 1999 there was a shift from cash-based to accrual-based accounting of corporate taxes, and since 1999 DTAs are recorded in the financial statement. The corporate law constraint on dividend distributions changed as follows:

$$D_t \leq (p + \delta_t)L_{t-1} - i_D B_{t-1} - \delta_t L_{t-1} - T_t \qquad [14]$$

By exploiting the relationship between corporate tax bill and accrual-based definition of corporate taxes (see equation [6] above), the previous constraint can be rewritten as:

$$D_t \leq (p + \delta_t)L_{t-1} - i_D B_{t-1} - \delta_t L_{t-1} - T_t^{cash} + (DTA_t - DTA_{t-1}) \qquad [15]$$

The previous inequality shows that since 1999 civil legislation *implicitly* considers DTAs components of available capital, which means that for company law DTAs are available for distribution. The adoption of the IAS in 2005 does not entail changes to equation [15] since the profits associated with DTAs are not recorded in a reserve unavailable for distribution.

By substituting the equation of dividends [8] into [15], one obtains the constraint on borrowing policy since 1999:

$$S_t \leq (I_t - \delta_t L_{t-1}) + (DTA_t - DTA_{t-1}) \qquad [16]$$

28 For an analysis of these legal constraints and their consequences for the cost of capital, see Sinn (1987) and Kanniainen and Södersten (1994).

29 The reference is to Art. 2433 of the Civil Law Code 'Distribuzione degli utili ai soci'.

30 The reference is to Legislative Decree No. 38/2005 (Art. 6 'Distribuzione di utili e reserve').

Comparing [13] and [16] it emerges that the change from cash- to accrual-based accounting of corporate taxes made it possible to distribute immediately the future lower taxes due to the postponement of the LLP deduction, funding this distribution (and therefore the DTAs) with debt.

**Constraints stemming from regulatory rules.** Banks are subject to several regulatory requirements that have been changing progressively since the first 1988 Basel Capital Accord, through the 2004 Basel II Accords, and up to Basel III agreed in 2010-2011, phased-in from 2014 and becoming fully operational in 2019. These requirements aim to strengthen the soundness and stability of the banking system by limiting risk exposure and constraining banks' financial choices.

For the purpose of deriving measures of effective taxation, we only consider constraints on loans and DTAs.[31] As regards loans, the standard regulatory capital provision requires that the bank equity ratio does not fall short of a given requirement α:[32]

$$E_t \geq \alpha\, L_t \tag{17}$$

With regard to DTAs, after 1999 they were not subject for many years to general regulatory rules under the Basel agreements. Therefore, the constraint [17] above could also represent the regulatory requirement on capital for this period. Under the Basel III framework, developed after the financial crisis, regulatory provisions on DTAs have been introduced because the value of DTAs is uncertain, depending on future profitability.[33] In our simplified framework, we only consider the basic regulatory rules for DTAs. Under the new regime, from 2014 the stock of DTAs that rely on future profitability (such as those relating to the tax rules on LLPs) has to be deducted from regulatory capital.[34] Given this additional requirement, the regulatory constraint changes as follows:

$$E_t - DTA_t \geq \alpha\, L_t \tag{18}$$

Because of the sizeable accumulation of DTAs by Italian banks – well above their EU competitors, who are generally able to deduct LLPs fully and immediately – this additional requirement could have brought about a large one-off capital shortfall. In order to avoid the negative consequences of the deduction of DTAs from regulatory capital, from 2011 in Italy DTAs relating to loan depreciation were made convertible into a tax credit in some specific circumstances, such as in the case of financial statement loss and tax loss. Thanks to this provision, DTAs stemming from the LLP tax rules are no longer regarded as relying on future profitability and therefore they are not deducted from regulatory capital; however, a risk weighting of 100% is applied to them. Assuming for DTAs the same capital requirement as for loans, the regulatory constraint can be written as follows:

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[31] We do not consider the regulatory rules concerning general loan loss provisions/reserves that can, up to certain limits, be included in Tier 2 capital (see Art. 61 of the Capital Requirement Regulation; Regulation (EU) No 575/2013).

[32] Expression [17] could be also written in more general terms, more akin to a 'real' regulatory constraint, without affecting the main results of the analysis.

[33] In our model that does not explicitly consider risk-weighting, the new leverage ratio (operational only from 2018) is basically absorbed by the general regulatory constraint given by expressions [17]-[19] in the main text (See Basel Committee on Banking Supervision, 2010).

[34] See Art. 36 and 39 of the Capital Requirement Regulation (Regulation (EU) No 575/2013). DTAs that rely on future profitability are the ones whose future value can be realized only if the bank generates taxable profits in the future. To simplify, we consider the worst case scenario that the new DTAs that rely on future profitability are above the threshold exemptions set in article 48 of the Capital Requirement Regulation. This is the worst case scenario. The new DTAs that rely on future profitability that are below the threshold exemptions would not be deducted and would be risk-weighted at 250%.

$$E_t \geq \alpha\left(L_t + DTA_t\right) \qquad [19]$$

By exploiting the pre- and post-1999 accounting identities ($L_t = E_t + B_t$ and $L_t + DTA_t = E_t + B_t$, respectively), and moving from stocks to flows, it is possible to express the previous regulatory requirements on capital [17]-[19] as regulatory implicit constraints on borrowing. Table 4 shows the different cases.

Table 4 provides several insights regarding the possible effect on financial choices of the interaction between regulatory rules and accounting provisions, under different regulatory regimes. Firstly, by comparing the constraints on borrowing in Table 4 with the constraints stemming from company law ([13] vs. first row; [16] vs. second row), it is clear that the regulatory constraints always override company law constraints, since the former limits on borrowing are stricter than the latter ones. Secondly, in the pre-1999 period, since debt financing was limited to $(1-\alpha)(I_t - \delta_t L_{t-1})$, the 'DTA-related' cash flows (the larger taxes temporarily paid owing to LLP rules) had to be totally equity-funded. Thirdly, since 1999 bank borrowing policy could be *indirectly* affected by the tax rules on provisioning, since DTAs are present in the regulatory constraint on borrowing both in the period 1999-2013 and under the Basel III regime for those DTAs that do not rely on future profitability. Therefore, even under the stricter regulatory requirements, the recording of DTAs in the financial statement since 1999 effectively increased banks' financial flexibility. Finally, as regards in general the effects of Basel III: for DTAs that rely on future profitability, the new regulatory treatment translates into a constraint on borrowing equal to the one in the 1995-1998 period, when DTAs were not recorded in the balance sheet; for DTAs that do not rely on future profitability, it can be seen that, out of 1 euro of new DTAs, the amount of 'free' DTAs – namely DTAs available for dividend distribution – is only (1-α) under the Basel III regime, while in the 1999-2013 period the full new DTA amount was distributable.

**Table 4**. Capital requirements and implicit constraints on borrowing under different regulatory and accounting regimes

| | | **Regulatory capital requirement** | **Constraint on borrowing** |
|---|---|---|---|
| **1995-1998** | | $E_t \geq \alpha L_t$ | $S_t \leq (1-\alpha)(I_t - \delta_t L_{t-1})$ |
| **1999-2013** | | $E_t \geq \alpha L_t$ | $S_t \leq (1-\alpha)(I_t - \delta_t L_{t-1}) + \Delta DTA_t$ |
| **<u>Basel III</u> 2014-2017** | **DTAs that rely on future profitability** | $E_t - DTA_t \geq \alpha L_t$ | $S_t \leq (1-\alpha)(I_t - \delta_t L_{t-1})$ |
| | **DTAs that do not rely on future profitability** | $E_t \geq \alpha\left(L_t + DTA_t\right)$ | $S_t \leq (1-\alpha)(I_t - \delta_t L_{t-1}) + (1-\alpha)\Delta DTA_t$ |

In order to derive the bank cost of capital, as is common in the literature on effective tax rates, we take as given a certain debt-equity ratio. For loans, we assume that the capital requirement is binding: for every euro of loan, α is funded with equity and (1-α) with debt. As regards DTAs: in 1995-1998, given the above analysis of the financial structure, the cost of the tax rules on LLPs will be the same as in the case where DTAs are all equity-funded; in the 1999-2013 period, in order to highlight the different possible costs of the LLP tax rules, we consider the two polar cases of how DTAs could be funded, assuming that the full amount of new DTAs is either all-debt-funded or all-equity-funded;[35] in the period 2014-2015, we assume that DTAs are funded in the same way as loans.

### *3.2 The gross-of-tax rate of return on issuing an additional loan*

Once the bank financial structure has been characterized, it is possible to solve for the optimal level of loans by deriving the gross-of-tax rate of return on issuing an additional loan (the loan price) and thus the tax spread over the net-of-tax return required by the financial market. Annex C provides the details. Under the corporate tax system in 2017, in terms of the model, the loan price is the following:

$$p^{\wedge} = \underbrace{\alpha i_k + (1-\alpha) i_d}_{r*=cost\ of\ capital\ in\ absence\ of\ taxation} + \underbrace{\alpha \frac{1}{(1-\tau_{cit+irap})}\left[\tau_{cit}(i_k - i_{ace}) + \tau_{irap} i_k\right]}_{spread\ due\ to\ the\ incomplete\ deductibility\ of\ the\ cost\ of\ equity} \qquad [20]$$

From equation [20], in 2017 the tax wedge depends on the proportion of equity funding, $\alpha$, the difference between the cost of equity and the ACE notional rate, $(i_k - i_{ace})$, and the two statutory tax rates, $\tau_{cit}$ and $\tau_{irap}$. This wedge measures the corporate tax penalty on equity, owing to the imperfect deductibility of the cost of equity, and it is present in spite of the ACE. Indeed, the ACE does not completely close the tax gap between debt and equity. This is due to two factors. First, $i_k$ can be different from $i_{ace}$. As regards this point, in the computation of the effects of the ACE deduction, the cost of equity to be considered is the rate at which shareholders discount the tax savings due to the deduction. This rate is not necessarily the observed cost of equity.[36] We will come back to this point when we analyse the effects of the ACE system. Secondly, for banks, interest costs are also deductible against the IRAP tax base, in contrast to what happens for non-financial firms; therefore, for banks, IRAP broadens the tax wedge between debt and equity; since the ACE deduction is only against the corporate income tax base, a part of the tax gap between debt and equity remains because of this specific IRAP tax treatment for the banking sector.

The conciseness of expression [20] masks the large number of tax factors contributing to the wedge in the past, even in the recent past. Table C1 in Annex C shows all the elements of the spread that were present during the period under analysis, 1994-2017.

### *3.3 Marginal and average taxation and bank choices*

In the literature, the analysis of the effects of corporate taxes on firms' incentives relies on two different indicators of the tax burden: the Effective Marginal Tax Rate (EMTR) and the Effective Average Tax Rate (EATR) (Devereux and Griffith, 1998a). The same distinction can be usefully applied to the banking sector and it can be transposed into our theoretical framework.

The EMTR is defined as the proportionate increase in the gross-of-tax rate of return on the investment due to taxation:

$$\text{EMTR} = (p^{\wedge} - r^*)/p^{\wedge} \qquad [21]$$

[35] We are not aware of any empirical analysis dealing with the specific issue of DTA funding. In general, DTAs will be debt-funded if the bank targets a certain leverage level.

[36] See the discussion in Griffith et al. (2010).

where $p^{\wedge}$ is the gross-of-tax rate of return discussed above and r* is the cost of capital in the absence of taxation.

The EMTR measures the corporate tax burden on marginal investments, namely on those investments that earn the minimum required rate of return to be undertaken: if the EMTR is different from zero, the choice of the investment level is distorted; if the EMTR is positive (negative), investment will be lower (higher) than what would have been chosen with no taxes. In our banking framework, the EMTR is related to loan pricing and it is therefore an indicator of competitiveness in the supply of loans. Although the EMTR conveys the same information as the cost of capital, it can be directly compared with the statutory tax rate. It has also some other useful properties, defining upper and lower bounds in specific polar cases: for instance, EMTR = 0 if there is full deductibility of the cost of finance (with a fully operating ACE) and tax depreciation is equal to economic depreciation.

There are choices banks make regarding loans that are fundamentally different from the optimal level of loans/assets or, equivalently, from optimal pricing. For example, a loan could be renegotiated at specific points in time and/or at the occurrence of specific events (such as a deterioration in the borrower rating); in these cases, the bank may decide to close a position rather than continue with it. Other examples, given an outstanding loan, are that the bank may consider the possibility of selling it or securitizing it; or – stretching the model to include accounting issues regarding depreciation – the bank may in some cases have the choice between writing the loan down or writing it off. Other interesting examples refer to banking activity in the international environment. Indeed, the international tax dimension may affect both the choice of internal and external financial structure of the loan (asset) portfolio, as well as the mix of domestic and foreign loans (assets) and the flows of financial FDIs.[37]

The above decisions are 'discrete', as opposed to the marginal decisions regarding the optimal asset/loan level or optimal pricing. When the decisions are discrete, the bank compares the available alternatives – which may be infra-marginal, when they allow returns in excess of the minimum to be earned – and chooses the one with the highest rent.

Like 'marginal' choices, discrete choices may be distorted by the tax system. As argued by Devereux (2003a), for such choices the role of taxes is not captured by the cost of capital and the EMTR: it is the effective average tax rate (EATR) that is relevant.[38]

The EATR measures the proportion of economic rent arising from the investment that is taken in taxes; it affects the post-tax economic rent of the investment and, as long as the tax treatment of alternative mutually exclusive investments/choices differs, it can change their ranking.

In our framework, it can be shown that the EATR so defined can be usefully expressed as a weighted average of the EMTR and a modified statutory tax rate, with weights that depend on the profitability of the investment:

$$EATR = EMTR\frac{p^{\wedge}}{p} + \tau^{*}\left(1 - \frac{p^{\wedge}}{p}\right) \qquad [22]$$

[37] For empirical analyses of the effects of international taxation on banks, see Demirguc-Kunt and Huizinga (2001), Huizinga et al. (2014), Merz and Overesh (2016) and Merz et al. (2017).

[38] For a discussion of the EATR see also Devereux (2003a), Devereux (2012) and Devereux and Griffith (2003). For empirical evidence on non-financial firms, a standard reference is Devereux and Griffith (1998b).

where:

$$\tau^* = 1 - \left(1 - \tau_{cit+irap}\right)\left(\frac{1 + r^*}{1 + r^* - \xi}\right) \qquad [23]$$

In [23] $\xi$ represents the value of the tax deductions for the cost of finance (for the current corporate tax system: $\xi = \tau_{cit}\alpha i_{ace} + \tau_{cit+irap}(1-\alpha)i_d$) and $r^*$ measures the pre-tax cost of capital[39].

As in Devereux (2003a), from equation [22] it is possible to derive two useful and intuitive properties of the EATR, defining a lower and an upper bound: when the rate of return of the investment is equal to the cost of capital, the EATR is equal to the EMTR; when the rate of return of the investment approaches infinity, the EATR tends to the adjusted statutory tax rate $\tau^*$. The intuition of the latter result is that tax allowances are less and less relevant when the profitability of the investment increases.

In this paper, we provide some EATR computations accounting for the different tax treatment of write-offs, write-downs and loan capital losses during a part of the period analysed.[40]

## 4. Model calibration

In order to use the previous model to compute the gross-of-tax rate of return on issuing an additional loan and the effective tax rates, it is necessary to assign specific values to the parameters. In the results, two sets of measures are provided: first, in order to pin down the effects of the tax system only (see Table 5), in the baseline computations the 1994-2017 averages of the economic parameters are used (see Table 6); second, we also present tax spreads and effective tax rates computed with time-varying economic parameters, accounting for both economic and tax changes[41].

39 If the marginal source of funding does not attract any tax relief ($\xi$ =0), then $\tau^* = \tau_{cit+irap}$ and the EATR decomposition is equal to Devereux-Griffith's, where it is assumed that the marginal source of funding is retained earnings (with no tax relief) (see Devereux, 2003a: p. 10, equation 15).

40 The analysis of the EATR in the international context is beyond the scope of this paper.

41 The reader is referred to the extended version of the paper for details of the model parametrization.

**Table 5.** The tax system for the Italian banking sector, 1994-2017

| Year | Taxes (%) | | | | Equity: DIT/ACE | | | Debt | Loan loss provisions (LLPs) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Corporate income tax (IRPEG-IRES) | Local taxes (ILOR-IRAP) (a) | Bank-specific surcharge | Tax on net worth | Tax rate on notional return to equity ($\tau_{dit}$) (%) | Notional return (IDIT/IACE) (%) | DIT/ACE-base multiplier (λ) | Allowed deductibility of interest costs (β) (%) | Deductibility threshold (CIT) (% of loans) (ϕ) (b) | Number of years to deduct excess (CIT) (*n*) | Deferred tax assets recorded in balance sheet | Deductible against ILOR/IRAP |
| 1994 | 37 | 16.20 | | 0.75 | | | | 100 | 0.5 | ∞ | NO | YES (as CIT) |
| 1995 | 37 | 16.20 | | 0.75 | | | | 100 | 0.5 | 7 | NO | YES (as CIT) |
| 1996 | 37 | 16.20 | | 0.75 | | | | 100 | 0.5 | 7 | NO | YES (as CIT) |
| 1997 | 37 | 16.20 | | 0.75 | | 7 | 1.0 | 100 | 0.5 | 7 | NO | YES (as CIT) |
| 1998 | 37 | 5.40 | | | | 7 | 1.0 | 100 | 0.5 | 7 | NO | YES |
| 1999 | 37 | 5.40 | | | | 7 | 1.0 | 100 | 0.5 | 7 | YES | YES |
| 2000 | 37 | 5.40 | | | 19 | 7 | 1.2 | 100 | 0.5 | 7 | YES | YES |
| 2001 | 36 | 5.00 | | | 19 | 6 | 1.4 | 100 | 0.5 | 7 | YES | YES |
| 2002 | 36 | 5.19 | | | 19 | 6 | 1.0 | 100 | 0.5 | 7 | YES | YES |
| 2003 | 34 | 4.71 | | | 19 | 5.7 | 1.0 | 100 | 0.5 | 7 | YES | YES |
| 2004 | 33 | 4.71 | | | | | | 100 | 0.6 | 9 | YES | YES |
| 2005 | 33 | 4.72 | | | | | | 100 | 0.4 | 9 | YES | NO |
| 2006 | 33 | 4.82 | | | | | | 100 | 0.4 | 9 | YES | NO |
| 2007 | 33 | 5.09 | | | | | | 100 | 0.4 | 9 | YES | NO |
| 2008 | 27.5 | 4.78 | | | | | | 97 | 0.3 | 18 | YES | NO |
| 2009 | 27.5 | 4.73 | | | | | | 96 | 0.3 | 18 | YES | NO |
| 2010 | 27.5 | 4.77 | | | | | | 96 | 0.3 (c) | 18 (c) | YES | NO |
| 2011 | 27.5 | 5.52 | | | | 3 | 1.0 | 96 | 0.3 | 18 | YES (d) | NO |
| 2012 | 27.5 | 5.52 | | | | 3 | 1.0 | 96 | 0.3 | 18 | YES (d) | NO |
| 2013 | 27.5 | 5.47 | 8.5 | | | 3 | 1.0 | 96 | 1/5* δ | 4 | YES (d) | YES (as CIT) |
| 2014 | 27.5 | 5.57 | | | | 4 | 1.0 | 96 | 1/5* δ | 4 | YES (d) | YES (as CIT) |
| 2015 | 27.5 | 5.57 | | | | 4.5 | 1.0 | 96 | 1/5* δ (e) | 4 | YES(d) | YES (as CIT) |
| 2016 | 27.5 | 5.57 | | | | 4.75 | 1.0 | 96 | δ | 0 | YES(d) | YES (as CIT) |
| 2017 | 24 | 5.57 | 3.5 | | | 1.6 | 1.0 | 100 | δ | 0 | YES(d) | YES (as CIT) |

**Notes**: (a) ILOR until 1997; IRAP since 1998. Since 2002 the IRAP tax rate includes regional surcharges (average across regions); (b) δ = loan loss provisioning rate; (c) 0.5% limit and 9 years applied in the period 2010-2012 only for the amount of loans granted in a year exceeding the average of the loans granted in the two previous years; (d) with effect from 2011, the DTAs relating to loan depreciation can be transformed into tax credits in cases of accounting or tax loss; (e) this is the rule in force at the beginning of 2015. In June 2015, the tax rules for 2015 were changed, establishing that 75% of LLPs could be deducted immediately, while the remaining part would be treated as the stock of past un-deducted LLPs.

**Table 6.** Economic parameters used in the computations, average 1994-2017 (%)

| Cost of debt ($i_d$) | Cost of equity ($i_k$) | Equity/asset ratio (α) | LLP rate (δ) |
|---|---|---|---|
| 3.2 | 11.5 | 8.9 | 1.1 |

**Source**: the cost of debt is the ratio between interests and costly liabilities; the cost of equity is computed estimating a CAPM model over the period 1987-2017; the equity/asset ratio is parametrized using regulatory data; the LLP rate is estimated using the flow of new adjusted bad debts in *t* (*nuove sofferenze rettificate*) and the loss-given-default (LDG) rate.

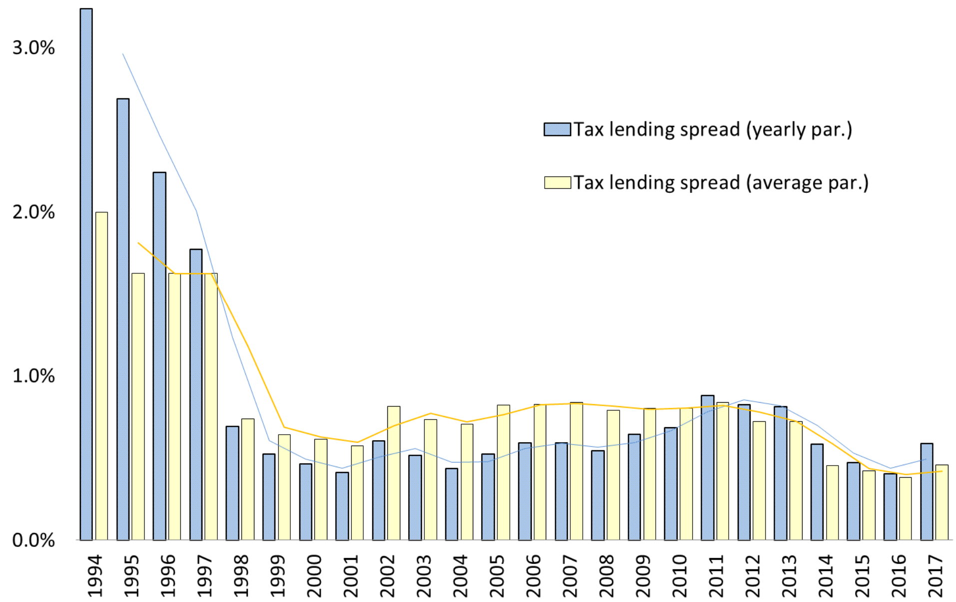
## 5. Results

### *5.1 Tax spread*

Figure 2 shows the lending spread due to the corporate tax system over the cost of capital in the absence of taxation for the period 1994-2017, computed using equation [20] and the expressions in Table C1 in Annex C, both with time-varying and average economic parameters (Table 6). The latter computations allow the role of tax changes to be disentangled from the evolution of economic variables.

Overall, the two computations provide a consistent picture of the dynamics of the tax spread; indeed, both indicators show a decreasing trend until 2001, followed by a mild increase or stability over the 2002-2011 period; then, a new declining pattern is recorded from 2012. The similar trends of the yearly and average-based tax spread indicators suggest that the role of economic changes is secondary to that of tax variations. It can be shown that the marked decreasing pattern of the tax spread computed with yearly parameters in the first sub-period (until 1999) is due not only to the dynamic of the statutory tax rates (Figure 1) and the fall in the equity ratio and the provisioning rate, but also to the decrease in the cost of equity partly related to the decline in interest rates in the run-up to European Monetary Union (EMU)[42].

**Figure 2**. 'Tax' lending spread, yearly and average parameter-based computations, 1994-2017




**Notes**: Authors' calculations. In 1999-2013, lending spreads are computed as the average over the two scenarios of debt- and equity-funded DTAs. For the average economic parameters see Table 6.

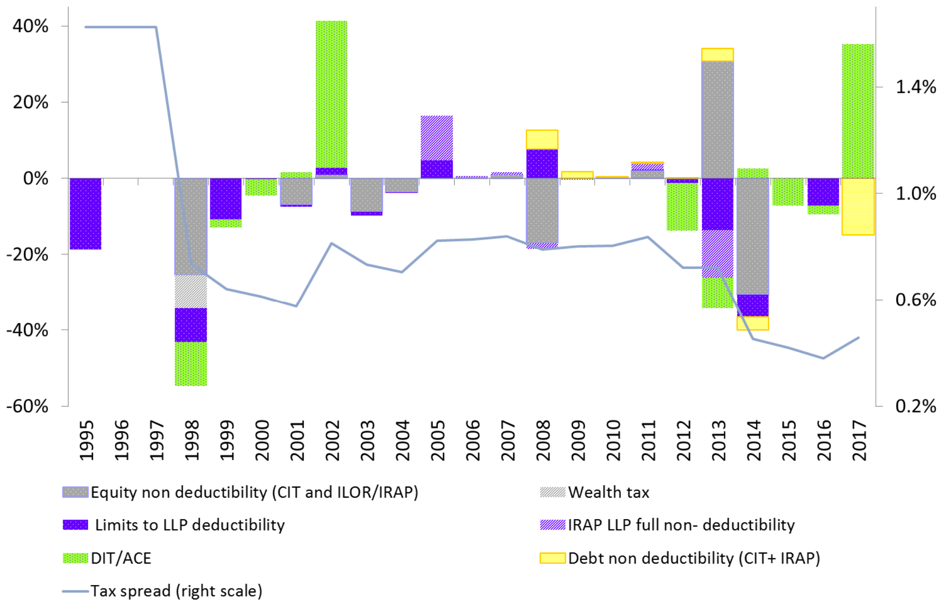
42 An indirect validation of the model has been made by comparing market interest rates and the model loan price plus the delta component, computed using time-varying economic parameters. For the former, we have used the variable "harmonized interest rates - loans - non-financial companies - flows", drawn from the Statistical Data Base. Although this comparison suffers from some limitations (since the theoretical framework neglects some relevant elements affecting the interest rates, and especially those related to credit demand), the "true" and the model-derived rates are very similar in level and the dynamics is largely consistent, suggesting the model is able to match some stylized facts of the Italian banking sector.

For the scenario with average economic parameters, Figure 3 shows the contributions to the variations in the lending spread due to the different tax components. Some years are worth focusing on, owing to the size of the variation or to the offsetting effects of components[43].

In 1998 the considerable decrease in the tax spread was due to the effect of the DIT incentive, as well as to the abolition of wealth tax and the substitution of ILOR with the lower-rate IRAP - which affected the equity components. The full deductibility of LLPs against the IRAP tax base allowed a further decrease in the spread. In 1999 the inclusion in the balance sheet of the deferred tax assets (DTAs) arising from the LLP tax rules leads to a further reduction in the tax spread (as discussed in Section 3.1).[44]

In 2008, the tax spread is the result of components of opposite sign. The substantial decrease in tax rates (CIT and IRAP) is indeed offset by the lower part of LLPs that can be immediately deducted and by the increase in the number of years (from 9 to 18) to deduct the LLP excess, as well as by the introduction of the partial non-deductibility of interest costs.

**Figure 3**. Contributions to 'tax' lending spread variations, 1995-2017.




**Notes**: Authors' calculations on average-based computations (Table 6). In 1999-2013 lending spreads are computed as the average over the two scenarios of debt- and equity-funded DTAs.

In 2013, the abolition of the total non-deductibility of LLPs against the IRAP tax base and the reduction in the number of years to deduct the excess of LLPs over the tax threshold (from 18 to 4) exert a negative impact on the tax spread, while the additional rate (8.5%) on banks causes a peak in the positive contributions of equity non-deductibility and partial debt deductibility.

Since the additional rate was in force in 2013 only, its expiry in 2014 led to a mirror situation, with a negative contribution of equity and debt limits on deductibility to the tax spread and a positive contribution of the ACE component, which counterbalances the increase in the notional rate. It is

[43] Notice that in Figure 3 the abolition of tax rules affecting the spread generates in the following year an opposite effect to the one when the provision was in place.

[44] It should be recalled that the computations are the average over the two scenarios of debt- and equity-funded DTAs; if we considered debt-funded DTAs, the effect would be more visible.

also worth noting that in 2014 the new regulatory rules on DTAs produced a negative contribution of the LLP component to the tax spread since a larger share of DTAs is funded with less expensive debt compared with the proportions it acquired over the period 1999-2013.[45]

Finally, the total deductibility in 2016 explains most of the reduction in the lending spread in that year. In 2017 the fall in the ACE notional rate is partly offset by the elimination of debt partial non-deductibility.[46]

Figure 4 shows the relative importance of the different components in the overall tax spread computed with average economic parameters in the period 1994-2017.

Not surprisingly, the figure reveals that the tax penalty on equity (sum of CIT, IRAP, wealth tax) is the largest tax component, accounting on average for more than 80% of the overall spread. However, the incidence of this component is variable along the time span considered: it is relatively less important at the very beginning of the period (1994), as well as in the 2008-2012 period, mostly because of the greater incidence of the highly distorting tax rules on provisioning (LLP limits on deductibility and IRAP full non-deductibility) and the tax base broadening effects through the partial non-deductibility of interest. Since 2005 the figure documents the important role played by the non-deductibility of LLPs against the IRAP tax base: the role of this penalty is of similar magnitude to the IRAP equity non-deductibility and the CIT tax penalty on LLPs relating to time limits on deductibility up to 2007; it is also higher than the tax penalty on debt since 2008.

Consistently with recent tax changes, the tax penalty on LLPs loses importance in the recent years (since 2013). This is due, initially, to several measures lowering the amount not immediately deductible and the time to deduct the excess, and then later to the full deductibility (since 2016).

From Figure 4 it is also possible to identify the correcting impact of the DIT/ACE allowances in 1998-2001 and 2012-2017. On average, over the period 1998-2001, the DIT effect on lending spread amounts to about -21 basis points in absolute terms, while in 2012-2017 the ACE component of the spread is around -14 basis points; in relative terms, the incidence of these two components on the overall spread (gross of the DIT/ACE effect) is on average around 25% for DIT and 21% for ACE.

Focusing on the comparison, in spite of the fact that the DIT was only basically a partial ACE scheme (the notional return to equity was taxed at 19% instead of being exempt as under the ACE), the DIT spread-reducing effect appears on average larger than the ACE one, especially if compared with the first period of application (2012-2014). This is due to three factors: first, in the DIT period, the corporate income tax rate was about 10 percentage points higher than in 2012, and therefore, other things being equal, the tax savings stemming from the allowance were greater; second, the equity benefiting from the tax break was multiplied by 1.2 in 2000 and 1.4 in 2001; finally, and most importantly, the notional rates (re-scaled to take into account the different level of market interest rates in the two periods) were relatively higher in the DIT period than in the ACE first years, narrowing the gap with the cost of equity.

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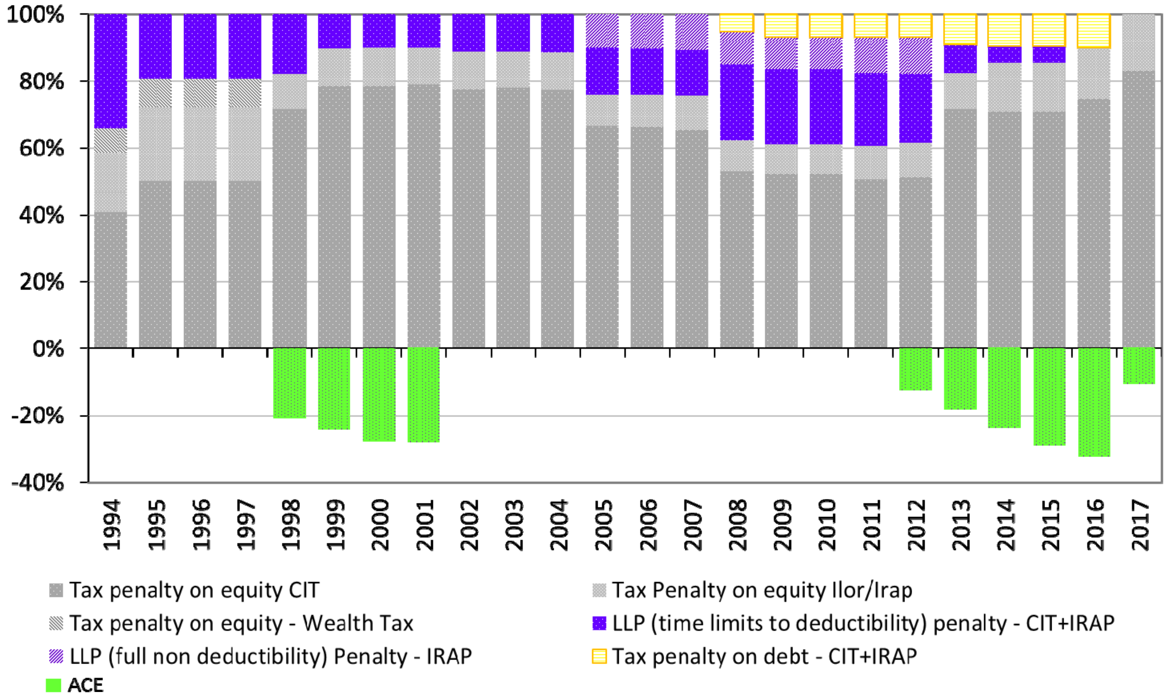
[45] Note that this result depends on the assumption of average (50%-50%) debt and equity funding of DTAs; for Basel III (since 2014) we have assumed funding with $\alpha$ (approximately 10%) equity and (1- $\alpha$) debt, resulting in a decrease in the tax spread component due to LLP tax rules. Conversely, if we had considered the case of all-debt-funded DTAs, the contribution of this component would have been positive (from 100% to (1- $\alpha$)% debt funding).

[46] The computation for 2017 is based on the overall statutory rate given by the CIT rate (24%) plus surcharge (3.5%). This surtax prevented a strong devaluation of the considerable amount of DTAs recorded in the banks' balance sheets.

The situation reverses somewhat in the years 2015-2016, since the higher ACE notional rates (4.5% and 4.75%) have obviously pushed ACE contributions to values of about 29% and 33% of the tax spread respectively, overtaking even the impact of DIT. The substantial cut in the notional rate in 2017, therefore, brings the ACE impact on tax spread to levels even below those of the beginning of the period.

**Figure 4.** Components of the tax spread, 1994-2017




**Notes**: Authors' calculations. In 1999-2013 lending spreads are computed as the average over the two scenarios of debt-funded and equity-funded DTAs. Computations based on average parameters (see Table 6).

In principle, the ACE should eliminate the spread due to the non-deductibility of the cost of equity and to the CIT tax rules regarding LLPs. However, as can be seen in Figure 4, the effect is much smaller and this allowance is far from achieving 'neutrality' for three main reasons: (i) the ACE allowance is only against the CIT base, while the tax penalty on equity for banks also depends on IRAP; (ii) there is a  gap between the ACE notional rate and the estimated cost of equity; and iii) the ACE base is computed as book equity rather than tax equity. For instance, for 2012 these three factors count for about 12%, 63% and 25% of the overall spread due to the tax penalty on equity and the CIT tax penalty on LLPs[47].

As regards the relationship between the ACE notional rate and market interest rates, in the literature it has been argued that the estimated cost of equity may be a too high reference point for the ACE to achieve neutrality. The average yield on long-term bonds issued by banks is another possible choice.[48] Figure 5 compares the tax penalty on equity and the DIT/ACE corrective factor (with a positive sign) using this yield as a reference for the ACE notional rate. Overall, in this case the

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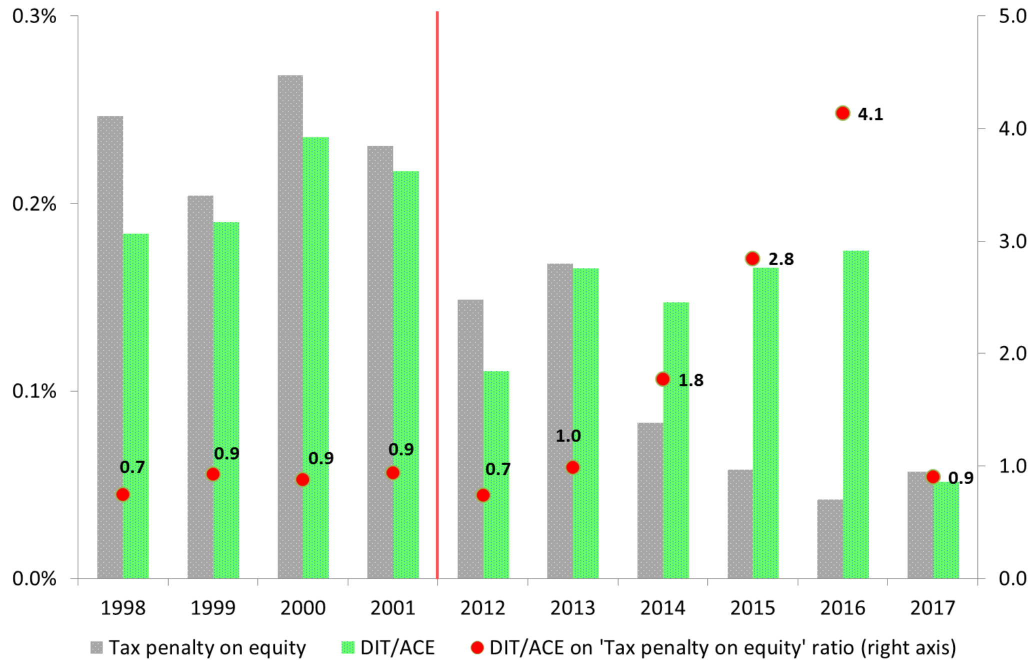
[47] In 2012 the tax spread - computed with average economic parameters (Table 6) and assuming DTAs funded equally by debt and equity – was 72 basis points, composed of: tax penalty on equity, 50 bp (42 bp CIT and 8 bp IRAP); tax penalty on debt, 6 bp; IRAP penalty on LLPs due to full non-deductibility, 9 bp; CIT penalty on LLPs due to time limits to deductibility, 17 bp; ACE, -10 bp.

[48] See the discussion in Griffith et al. (2010).

DIT/ACE regimes correct a larger share of the tax penalty on equity than in the case where the estimated cost of equity is used as a reference. As in the other computations, on average DIT appears more favourable than – or at least as favourable as – the ACE in the initial years. Interestingly, Figure 5 shows an over-incentive to equity funding in the period 2014-2016. The 2017 reduction of the ACE notional rate appears to have aligned the value of the two components.

**Figure 5**. Tax penalty on equity and tax spread reducing effect of DIT/ACE computed using the average yield on long-term banking bonds as reference for the DIT/ACE notional rate



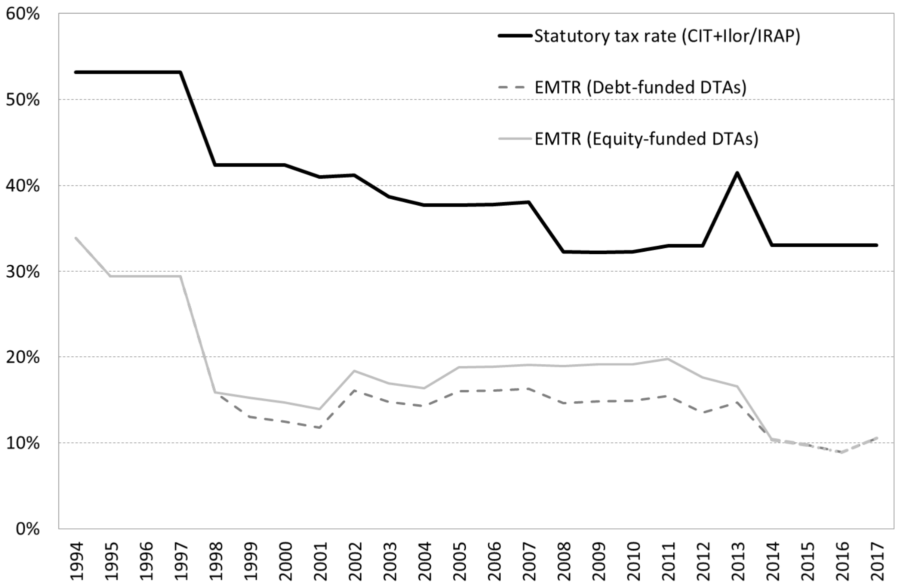

**Notes**: Authors' calculations. Computations are based on average economic parameters (see Table 6). (For the yield on long-term banking bonds, the data source is Banca d'Italia, 'Base dati statistica. Banche e Moneta - serie nazionali. Statistiche bancarie: Bilanci ed altre informazioni'. Banks: Average rate on bonds issued by banks with a maturity of more than one year).

### *5.2 The EMTR*

From the spread over the cost of capital in the absence of taxes it is possible to compute the Effective Marginal Tax Rate (EMTR). As discussed in Section 3.3, the EMTR measures the effective taxation on the marginal investment; in our model, it is an indicator of the tax effects on loan pricing. One of the main advantages of this indicator is that it can be compared with the statutory tax rate. Figure 6 plots the EMTR computed with average economic parameters and compares it with the statutory tax rate.

Broadly speaking, from 1994 to 2001, the development of the EMTR follows a pattern similar to the tax rate, with a fall from about 33.8% to 12.8% (for the average of debt-funded and equity-funded DTAs). However, compared with the statutory tax rate, a more pronounced decline is recorded over the 1998-2001 period as a result of the DIT allowance, which significantly reduced effective taxation. From 2002 to 2011, the explicit rules to broaden the tax base have therefore compensated for the noticeable fall in the statutory tax rates[49]. Indeed, despite an 8 percentage point drop in the tax rate, the EMTR remained substantially stable (around an average of 17%), largely due to limits on the deductibility of LLPs that became more stringent. Starting from 2012, against a nominal rate almost unchanged (with the exception of the additional IRES of 2013), the marked decline in EMTR was mainly caused by the lower constraints on the deductibility of adjustments to loans and the change in the tax treatment of the equity required by the ACE.

**Figure 6**. EMTR and statutory tax rate, 1994-2017




**Notes**: Authors' calculations. Computations based on average economic parameters (see Table 6).

The limits on the deductibility of the adjustments to loans, in force until 2015, represented a significant component of the tax spread: in the period 1998-2012 they increased on average the EMTR by about 3 percentage points. Starting from 2013, the contribution to the tax spread of this component has gradually decreased, to the point of being canceled; this resulted in a reduction of approximately 15 basis points in the overall interest rate borne by bank debtors and the consequent elimination of an anomaly in the Italian tax system. In the 2012-2017 period, ACE reduced on average the EMTR by an average of about 3 percentage points, contributing to a decrease in interest rates paid by debtors of around 12 basis points[50] [51].

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49 The EMTR with yearly based parameters (not shown) is very close to the 'only-policy-EMTR' (based on average economic parameters).

50 Sensitivity analyses show that changes in the tax spread are not very sensitive to the hypotheses on the financial cost of the loan. For instance, using a cost of debt 1 percentage point lower compared to the one in the baseline scenario (2.2% vs 3.2%), the LLPs effect would amount to 13 basis points, while the ACE effect would be 11 basis points; with a cost of debt equal to 1.2 (2 points lower than the baseline one) the effects would be 12 basis points and 10 basis points for LLPs and ACE respectively. The effects on EMTR are more volatile by construction, since the tax spread is divided by a lower cost of credit.

51 A further confirm on the effects of ACE/DIT and provisioning rules comes from the simulation of a counterfactual scenario with no distortive provisions (i.e. limits to the deductibility of write-downs and passive interests) or corrective provisions (i.e. ACE, which removes the asymmetry of favorable tax treatment of the debt), which constitute "peculiarities" of the Italian system. We have compared the EMTR of Figure 6 with the counterfactual one in which the tax spread is due only to the non-deductibility of the cost of equity. The former is higher up to 1998 and in the period 2002-2013, with a peak in the period 2008-2012 (between 6 and 8 pp); this effect is essentially due to the treatment of loan loss provisions. Conversely, the higher counterfactual EMTR in the periods 1998-2001 and

In Figure 6, in the period 1999-2013, we also explicitly distinguish the EMTR for the cases of debt-funded and equity-funded DTAs. As already mentioned, the possibility of funding DTAs with debt reduces the burden stemming from the distortion of the tax rules on provisioning. According to our computations, the impact of this financial channel may have allowed effective taxation to be reduced by 3 percentage points on average in the period 1999-2013 (between 2 and 4 percentage points), corresponding to a reduction of about 20% of the EMTR; in terms of the spread, the average reduction is 18 basis points (between 10 and 25 basis points).

### *5.3 The EATR*

In this section, the EATR is used to evaluate the potential tax incentives to reporting choices and loan sales for the banking sector in Italy. As discussed in Section 3.3, the EATR is more appropriate than the EMTR when choices are discrete.

#### *5.3.1 Tax incentives to reporting choices*

As described more in detail in Sections 2.2.1 and 2.2.2, in Italy, for a long period of time, the corporate tax system provided disincentives to set aside LLPs and write-off bad loans[52]. This is considered one of the institutional reasons for the growth of Non-Performing-Loans (NPL) in the banks' balance sheets, the low provisioning ratio and the slow pace of NPL resolution after the financial crisis (Jassaud and Kang, 2015, p. 13). In what follows, the focus is on tax incentives to the level of provisioning since 1995 and to the choice between provisioning and write-off.

As regards the tax incentives to the level of provisioning, Figure 7 shows the present discounted value (PDV) of LLP deduction in the period 1995-2017. The PDV incorporates the effects of the statutory tax rate and the tax rules for deductibility, as well as the asymmetric treatment between CIT and IRAP in the period 1998-2012. The PDV is scaled by the provisioning rate ($\delta$) so that it can be compared directly with the overall statutory tax rate that represents its upper limit. Figure 7 also shows the overall statutory tax rate at which LLPs could potentially have been deducted, as well as the difference between the two variables. When the PDV and statutory tax rate are equal, all the LLPs are deductible in the year they are recognized in the financial statement; this is the case when the tax system does not disincentive provisioning.

Figure 7 documents the disincentive effect on provisioning of the tax deductibility rules in force until 2015. Until 2004, the difference between the statutory tax rate and the PDV was on average about 2 percentage points. The disincentive effect increased in 2005 when LLPs became non-deductible against the IRAP tax base, and it increased further in the period 2008-2012 along with the more stringent tax rules, with the difference between the statutory tax rate and the PDV reaching a peak of 9.7 percentage points. In the period 2013-2015, the difference decreased thanks to the alignment between IRAP and CIT and the less stringent rules on deductibility. As of 2016 the PDV and the overall statutory tax rate coincide and the corporate tax system does not provide disincentives to the provisioning level.

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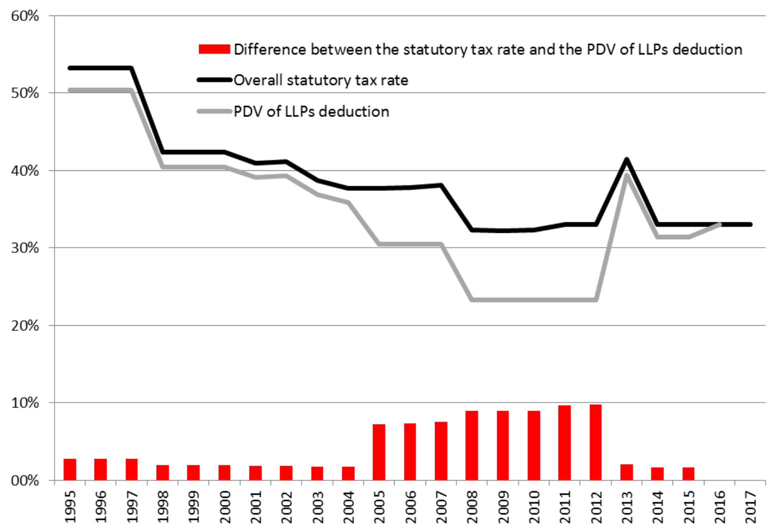
2012-2016 is due to the DIT and the ACE, which reduced the EMTR by 2-3 pp. compared to the case in which they had not been in force.

52 The point is made, among others, in De Vincenzo and Ricotti (2014), IMF (2015), Jassaud and Kang (2015) and European Parliament (2016).

With regard to the potential effect of the tax system on the choice between provisioning and write-off, in principle the bank will choose based on the highest post-tax present value and therefore – given the discussion in Section 3.3 – the correct measure of the tax incentive is the EATR that depends on the rate of return on the investment. Note that the EMTR would produce the same ranking between the two accounting options, but it would provide a biased measure of the tax incentive. Rather than providing a quantitative assessment for all the period 1994-2017, an illustrative and meaningful case is considered, focusing on the year 2012; indeed, 2012 is the last year with a potentially very strong asymmetry between provisioning and write-off.

The following EATR computations consider the case of loan restructuring since it can be more easily adapted to the model. Let us assume that the accounting value of an outstanding loan is $L_t^A$ while the market value is $L_t$, with $L_t^A > L_t$. The bank is evaluating whether to restructure the loan. It is as if the bank were evaluating whether to grant a new loan for an amount $L_t$. The loss incurred ($L_t^A$ - $L_t$) has not yet been recognized in the financial statement. To keep it simple, let us also assume that resources were already set aside to absorb the loss by increasing retained earnings and reserves in the previous period, so that the pricing of the restructured loan is not directly affected by the loss. With respect to the base model, there is now a cost equal to ($L_t^A$ - $L_t$) attached to the new loan $L_t$ and the value of the possible tax deduction of this cost has to be considered in the computations. This value depends on the accounting choice.

**Figure 7**. Present discounted value (PDV) of the Loan Loss Provision (LLP) deduction vs. statutory tax rate



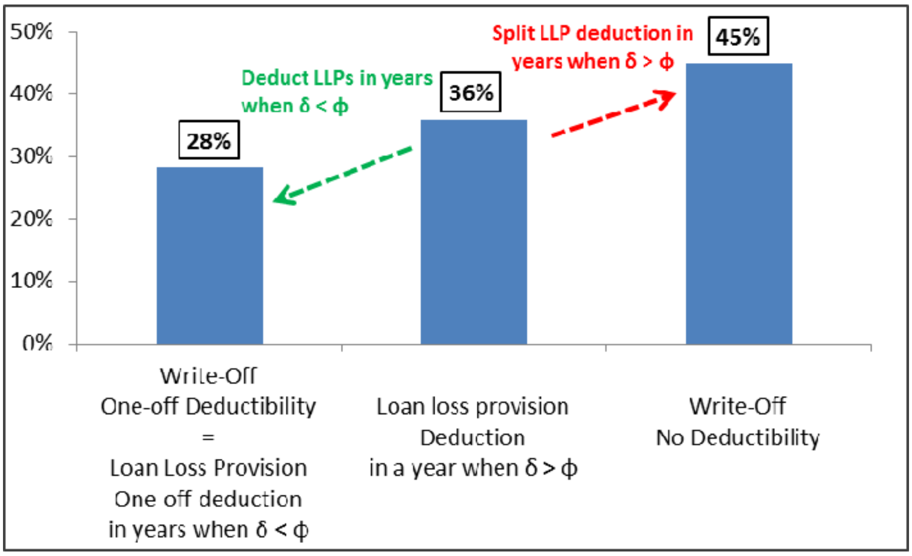

**Notes**: average economic parameters (see Table 6)

In the case of a write-off, from a tax point of view it can be either deductible or non-deductible. In the first case, the value of the deduction is given by $\tau_{cit}(L_t^A - L_t)$; in the second case the value is zero. When there is uncertainty regarding the deduction, the value will be lower than $\tau_{cit}(L_t^A - L_t)$ because with a certain probability the deduction will be challenged by the tax administration; the value will also be lower than $\tau_{cit}(L_t^A - L_t)$ when the write-off non-deductibility is only temporary.

In the case of provisioning, the value of the deduction depends not only on the tax rules, but also on the timing pattern of provisioning. The value of the deduction will be equal to $\tau_{cit}$ ($L_t^A$ - $L_t$) only if the provision is made entirely in one year and in this year the overall LLPs are lower than the tax threshold ($\delta < \phi$); in all the other cases, it will be strictly lower than $\tau_{cit}$ ($L_t^A$ - $L_t$). Take as a base scenario the case in which the entire value of the LLP is recognized in the financial statement in one year and in this year the tax threshold $\phi$ is binding ($\delta > \phi$). The alternative scenario is that of a gradual provisioning of the same amount ($L_t^A$ - $L_t$) over several years. Note that a gradual provisioning would have made it less likely for the tax administration to dispute that the LLP was in reality a write-off for whose deductibility *elementi certi e precisi* were required. With respect to the base scenario, the value of the LLP deduction increases, if at least a part of the overall provisions ($L_t^A$ - $L_t$) is recognized in years when $\delta < \phi$; it decreases, if at least a part of the overall provisions ($L_t^A$ - $L_t$) is recognized in years where $\delta > \phi$.

Figure 8 compares the EATRs computed using equations [22]-[23] for the year 2012 under different assumptions regarding the tax treatment of the pricing gap. We assume a pricing gap of 10% and a rate of return on the investment of 20%. Considering that the conditions for the deductibility of write-offs were very stringent (see Section 2.2.2), Figure 8 shows clearly the tax incentive in favour of provisioning until 2012. Indeed, the difference between the EATRs for write-off and provisioning could reach up to 17 percentage points in the extreme scenario of non-deductible write-off and one-off LLP deduction in a year when $\delta < \phi$. Even under less extreme assumptions, the difference between the EATRs is still large: for instance, in the case of non-deductible write-off and one-off LLP deduction in a year when $\delta > \phi$, the difference is equal to 9 percentage points. Note that the lower the rate of return on the investment, the greater the difference between the options.

**Figure 8**. Loan restructuring (10% pricing gap): EATR under different accounting choices and timing of deduction, 2012 tax parameters




**Notes:** average economic parameters (see Table 6). Rate of return on investment (p) = 20%.

*5.3.2. EATR and loan sales/securitization*

Figure 8 also provides an example of the tax incentives to loan sales/securitization due to the tax rules applying to write-offs, write-downs and capital losses.

As described in Section 2.2.2, until 2012 there were stringent conditions for the deductibility of capital losses in the case of loan sales. Indeed, since 2013 capital losses became fully deductible. This implies that from a tax point of view it was preferable to keep a loan and deduct the pricing gap (the difference between book value and market value) as LLP, rather than to sell the loan without the possibility of deducting the capital loss[53]. For instance, for 2012, with a pricing gap of 10% and a rate of return on the investment of 20%, the EATR corresponding to the choice of keeping the loan and deducting the pricing gap as LLP in a year when the tax threshold is binding is equal to 36%; and the EATR in the case of a loan sale with no deduction of the capital loss is equal to 45%.

Interestingly, in the period 2013-2015 the scenario was somewhat reversed thanks to the possibility of deducting the capital loss without the conditions that applied previously. For instance, in 2014 for the same case considered above, the EATR in the case of a loan sale with deduction of the capital loss is equal to 28%, while the EATR corresponding to keeping the loan and deducting the pricing gap as LLP is equal to 36%.

Since 2016, given the symmetric tax treatment of write-downs, write-offs and capital losses, the tax system does not provide incentives to accounting policies and loan sales/securitization choices.

### *5.4 A focus on the tax rules on provisioning*

As seen in Section 5.1, the limits on the deductibility of loan loss provisions (LLPs) play a non-negligible role in shaping the dynamics and in determining the level of the tax spread. Given the importance of this issue, it is interesting to focus on the actual impact of these limits, keeping all the economic parameters constant except the LLP rate. This more in-depth analysis also makes it possible to differentiate the effect of the rules on LLPs across economic sectors and geographical areas featuring different provisioning rates.

#### *5.4.1 The effect of LLP rules over the business cycle*

In order to explore the sensitivity of lending spreads to different LLP rates, Figure 9 shows estimates of the tax spread due to LLP rules as a function of the LLP rate. This also highlights the pro-cyclical mechanism built into the LLP rules, considering the negative correlation between the economy growth rate and the LLP rate. The analysis refers to 2012 – which is the last year with the most penalizing tax regime (0.3% threshold and the excess deducted in 18 years) – since the effect is more visible. More specifically, the tax spread is computed assuming LLP rates ranging from a value exactly equal to the tax threshold (i.e. 0.3%, which we call the ‘neutral case’) to a value of 2.5%.

As can be seen, for low LLP rates the effect of the CIT tax rules on provisioning on lending spreads is small, especially if the bank activates the debt-equity arbitrage channel to mitigate the distortions. For higher LLP rates, instead, the effects on the lending spread can be substantial: for instance, with respect to the ‘neutral’ scenario, for a loan with an LLP rate equal to 2.5%, the loan price would increase by approximately 78 basis points due to the CIT penalty, plus 21 points due to the IRAP penalty if the bank does not (or cannot) activate the debt channel for the DTA. Even if the bank were able to reduce the distortions through a change in its financial structure, the overall effect of the tax rules on provisioning could still be non-negligible: in this case the lending spread due to the tax rules on provisioning would amount to 37 basis points (16 due to the CIT penalty plus 21 for the IRAP penalty).

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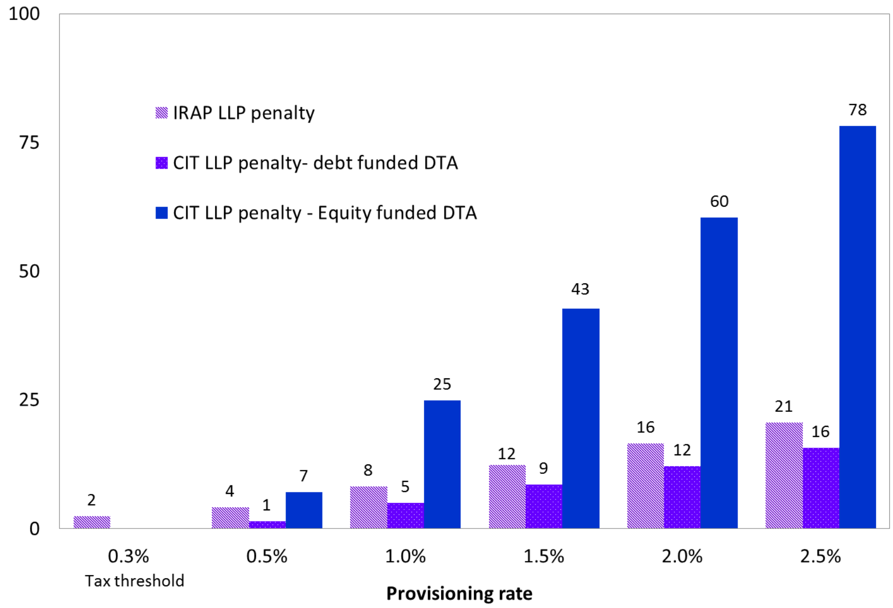
[53] These computations do not consider the possibility to deduct, in addition to the capital loss, also the previously un-deducted write-downs against the IRAP tax base, for the period 2009-2012 (see par. 2.2.2).

**Figure 9.** The effect of tax rules on provisioning on lending spreads as a function of the LLP rate (basis points)




**Notes**: Authors' calculations. Computations based on average economic parameters (see Table 6). The tax parameters are those for 2012.

### *5.4.2 The effects of LLP rules across economic sectors and geographical areas*

Another downside effect of the rules limiting the deductibility of LLPs was to create an additional channel through which the LLP rate could affect loan pricing. Indeed, note that only if LLP are fully and immediately deductible, will the loan rate over and above the loan loss provisioning rate not depend on the latter variable. This tax channel could distort loan prices at the sectoral and geographical level if the LLP rates vary at sectoral and geographical level.

Panel (a) of Figure 10 shows the estimated LLP rates for different economic sectors and geographical areas in the period 2006-2015. As can be seen, there are significant differences: at the sectoral level, it can be noted an increasing dispersion over the period, with an average minimum-maximum difference in LLP rates equal to 2.3 percentage points; at the geographical level, on average the LLP rate in the South is larger by 0.6 percentage points, with a max difference equal to 1.2 percentage points in 2014.

Panel (b) of Figure 10 shows the tax spread due to the LLP rules across economic sectors and geographical areas[54]; at the sectoral level, on average the difference between the minimum and maximum effect is 19 basis points, with a peak of 46 points in 2012 between the construction sector and the household sector. Considering only the production sector, on average the difference between the minimum and maximum effect is 12 basis points, with a peak of 29 basis points in 2012 between the construction and the service sector. At the geographical level, on average the tax spread due to LLP rules is 8 basis points higher in the South, with a maximum of 16 basis points in 2012.

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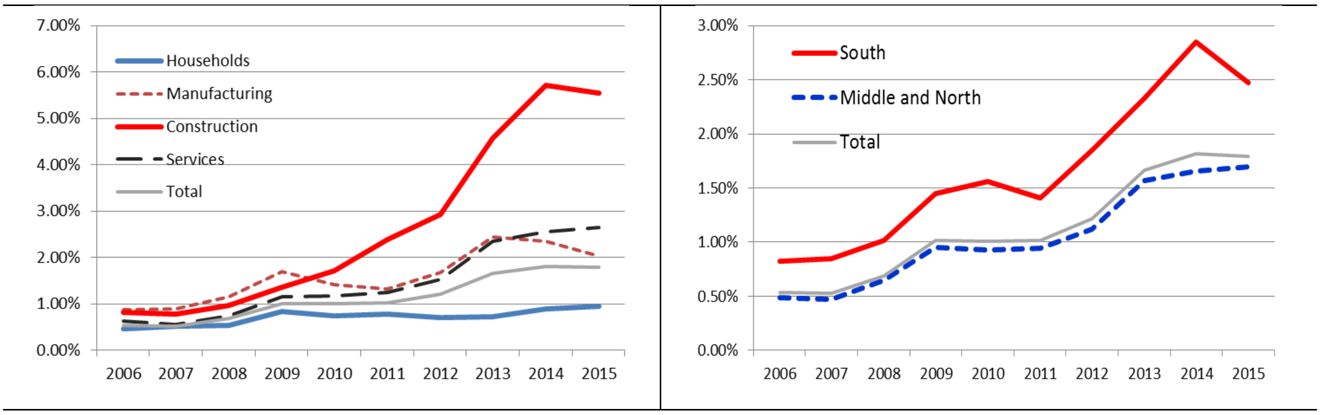
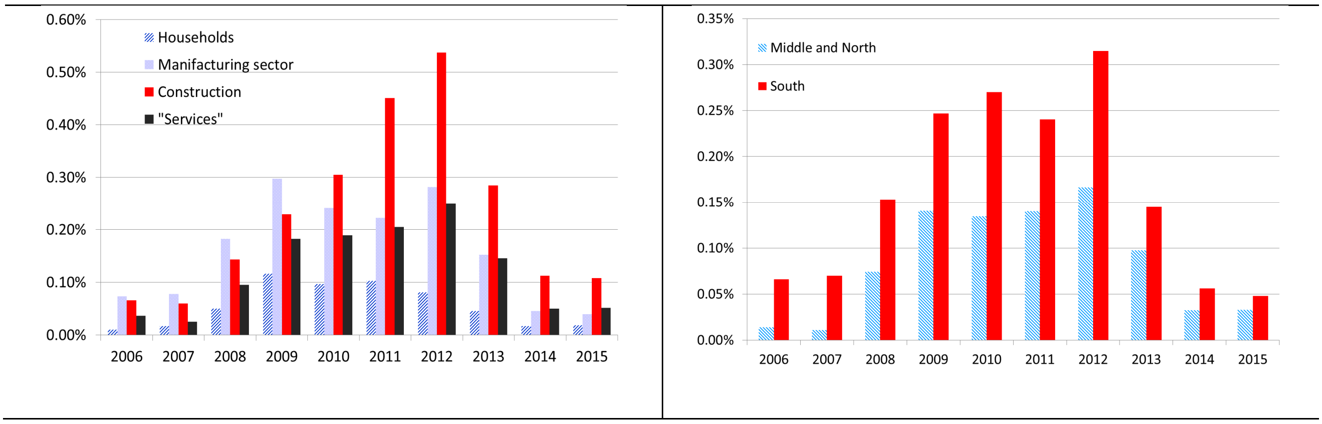
[54] In order to carry out this exercise, we have simply recomputed the tax spread using sector and area-specific LLP rates drawn from Banca d'Italia, Annual Reports, several years, other parameters being equal.

**Figure 10**. Tax spreads at the sectoral and geographical level, 2006-2016

***Panel a**: LLP rates at the sectoral and geographical level*




***Panel b**: Tax spread due to LLP rules at the sectoral and geographical level*




**Notes**: The loan loss provisioning (LLP) rate is computed as the product of the probability of default (PD) (estimated, at the sectoral and geographical level, as the flow of new adjusted bad debts in *t* (*nuove sofferenze rettificate*) over the outstanding loans at the end of *t-1*; source: Banca d'Italia, Annual Reports, several years) and the Loss-Given-Default (LDG) rate (Source: national averages from Ciocchetta et al., 2017).

## 6. Conclusions

The paper extends to the banking sector the Boadway-Bruce-Mintz framework used to compute the cost of capital and forward-looking effective tax rates for non-financial firms. The extended set-up is interpreted as a model of loan pricing. The model enables the role of different tax provisions on loan pricing to be disentangled, and it considers the interaction between regulatory, accounting and taxation frameworks following the Nordic view of corporation tax. The model also allows the role of Deferred Tax Assets (DTAs) in the tax spread to be highlighted. The loan price is translated into measures of effective taxation at the margin (Effective Marginal Tax Rate, EMTR) – which can be compared with the statutory tax rate and thus give an account of the impact of rules affecting the tax base – as well as into measures of effective average taxation (Effective Average Tax Rate, EATR), which can be used to analyse the impact of taxation on discrete choices regarding, for instance, accounting policies and loan sales.

The model applied to the Italian banking sector offers several interesting insights.

The tax spread has significantly changed over time, with a steeply decreasing trend in the first part of the period; after a period of stability, a new declining pattern is observed in recent years.

The EMTR does not follow the pattern of the statutory tax rate over the whole period. Most notably, from 2002 to 2011, despite the 8 percentage point decrease in the nominal tax rate, no downward trend is recorded for the EMTR, implying that the provisions broadening the tax base offset the marked fall in the statutory tax rate.

Both the DIT in force in the period 1998-2001 and the ACE – introduced in 2011 – are shown to have played a significant role in the decrease in effective tax rates.

Besides the issue of the gap between the ACE notional rate and the cost of equity, it is shown that ACE cannot fully offset the tax penalty on equity because they are only against the CIT tax base, while the penalty on equity for banks also depends on the regional tax on production activities (IRAP). If the average yield on long-term corporate bonds issued by banks is taken as reference for the ACE notional rate, rather than the cost of equity estimated with the CAPM, the analysis of the debt bias suggests that the ACE seems to have incentivized equity over debt in the period 2014-2016, returning to a scenario closer to neutrality in 2017.

For most of the period, the rules limiting LLP deductibility generated distorting effects on lending rates. These rules may have caused an increase in the cost of capital for loans compared with other bank investments that could potentially have distorted the allocation of funds among different uses. They also discriminated against borrowers, economic sectors and geographical areas with a larger degree of risk - reflected in larger loan loss provisioning rates - potentially interfering with the assignment of credit. They contained a pernicious pro-cyclical mechanism increasing the cost of credit for the economy in downturns, magnifying in this way the negative effects on firms' investment and households durable consumption. And they may also have provided disincentives to the timely setting aside of sufficient provisions for non-performing loans.

Notably, the ACE did not reduce the distortions stemming from the time limits on LLP deductibility since – differently from the textbook ACE – the Italian ACE base is computed as accounting equity rather than as tax equity. However, since 1999 the negative effects of the time limits on LLP deductibility have probably been downsized by recording the related DTAs in the balance sheet: as the regulatory and legal constraints on financial policy are expressed in terms of accounting variables, the latter accounting change may have increased banks' financial flexibility allowing them to fund DTAs with debt. According to our computations, over the period 1999-2013 this financial channel may have reduced the EMTR by about 2-4 percentage points, corresponding on average to a 20% decrease in taxation at the margin.

The analysis of the asymmetric tax treatment between write-downs, write-offs and loan capital losses based on the computation of the EATRs shows the potential distortive effects of the tax system on accounting choices and loan sale policies.

Focusing on the most recent period, our analysis suggests that there has been a marked decrease in the tax spread on loans, with a favourable impact on loan pricing and therefore on the cost of credit to households and firms. A crucial role in this development has been played by the introduction of the ACE in 2011, which significantly reduced the tax penalty on equity. Importantly, this could have facilitated the banking sector's recapitalization to comply with the new Basel III capital requirements. The abolition of the deductibility limits on loan loss provisioning since 2016 also contributed to the decrease in the tax spread, and removed an important anomaly of the taxation system for the banking sector.

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**Annex A.** Definitions of variables

**Model variables**

| | |
|---|---|
| $E_t$ | Market/accounting/regulatory value of equity of the bank at the end of period of period *t* |
| $D_t$ | Cash dividends paid by the bank at the end of period *t* |
| $N_t$ | New equity issued by the bank at the end of period *t* |
| $L_t$ | Stock of loans at the end of period *t* |
| $L_t^A$ | Accounting value of loans at the end of period *t* |
| $I_t$ | Additional loans in period t (the bank 'investment') |
| $B_t$ | Stock of debt at the end of period *t* |
| $S_t$ | One-period debt issued in period *t* |
| $E_t^{tax}$ | ACE and DIT base |
| $E_t^{wt}$ | Base of the wealth tax |
| $E_t^*$ | ACE base in a textbook ACE (tax equity) |
| $T_t$ | Accrual-based definition of taxes |
| $T_t^{cash}$ | Corporate tax bill |
| $DTA_t$ | Deferred tax assets at the end of period *t* |
| DTA* | Present value of the additional deferred tax assets generated by the tax rules on provisioning |
| $dta_t$ | Stock of DTAs over the stock of loans at the end of period *t* |

| | |
|---|---|
| $dta_{LR}$ | Stock of DTAs over the stock of loans in the long-run |
| $X_t$ | Cash flow of the bank gross of the components relating to the cost of finance, at the end of period *t* |
| $R_t$ | Net present value generated by additional loans in period *t* in the presence of tax |
| $R_t^*$ | Net present value generated by additional loans in period *t* in the absence of tax |
| EMTR | Effective Marginal Tax Rate |
| EATR | Effective Average Tax Rate |
| $\Omega_t^{llp}$ | Cash flow at the end of period *t* due to the tax rules on loan loss provisions |
| $\Psi_t^{debt}$ | Cash flow at the end of period *t* due to the tax rules on debt |
| $\Psi_t^{equity}$ | Cash flow at the end of period *t* due to the tax rules on equity |
| p | Pre-tax rate of return on the loan investment |
| p^ | Cost of capital |
| $\delta_t$ | Loan loss provisioning rate (write-off rate/capital loss rate) in time *t* |
| $(p+\delta_t)$ | Gross revenues due to the loan investment |
| r | Post-tax nominal discount factor (Weighted Average Cost of Capital – WACC) |
| r* | Pre-tax nominal discount factor = pre-tax cost of capital |
| **Economic parameters** | |
| $i_d$ | Cost of debt |
| $i_k$ | Cost of equity |
| $\alpha$ | Percentage of equity funding (regulatory capital requirement) |
| **Tax parameters** | |
| $\tau_{cit}$ | Statutory corporate tax rate |
| $\tau_{ilor}$ | Statutory ILOR tax rate |
| $\tau_{irap}$ | Statutory IRAP tax rate |
| $i_{ace}$ | Notional ACE return |
| $i_{dit}$ | Notional DIT return |
| $\phi$ | Tax threshold on the deductibility of loan loss provisions |
| n | Number of years to deduct the excess of loan loss provisions over the limit $\phi$ |
| $\vartheta$ | Straight limit on the deductibility of loan loss provisions |
| $\delta^*$ | Loan loss provisioning rate strictly larger than $\phi$ (for simulation of the effects of the tax rules on provisioning on the accumulation of deferred tax assets) |
| $\eta$ | Growth rate of loans (for simulation of the effects of the tax rules on provisioning on the accumulation of deferred tax assets) |
| $\xi$ | Value of the tax deductions for the cost of finance |
| $\tau^*$ | Upper bound of the EATR that considers the value of the tax deductions for the cost of finance |

**Annex B**. The wealth tax and the DIT regime

This Annex provides some details on the modelling of the wealth tax and the DIT regime.

Wealth Tax. During the period 1993-1997, a wealth tax on net worth was levied at tax rate $\tau_w$ equal to 0.5%. This tax was applied to all firms and it translated into a cash flow due to equity funding, $\Psi_t^{equity}$, equal to:

$$\Psi_t^{equity} = - \tau_w E^{wt}_{t-1} \qquad [B1]$$

where $E^{wt}_{t-1}$ is the net worth at the beginning of time $t$. The latter basically evolved as book equity $E_t$:

$$E_t = E_{t-1} + (p + \delta_t)L_{t-1} - i_d B_{t-1} - \delta_t L_{t-1} - T_t^{cash} + N_t \qquad [B2]$$

where $N_t$ is the new equity contributed to the bank. Note that in equation [B2] the corporate tax bill is used, since in the period when the wealth tax was in force the accounting for corporate taxes was cash-based.

DIT. The DIT regime was introduced in 1997 and it was in force until 2003. The regime allows the deduction against the CIT base of a notional return on equity that was then taxed at a lower rate than the CIT rate (19% vs. 37% in 1997-2000, 36% in 2001-2002, and 34% in 2003). Since this notional return on equity was not totally exempt, this regime can be referred to as a 'partial' ACE scheme.

The notional return on equity was computed multiplying a notional DIT rate by a DIT base that was computed as the equity accumulated from 1997 (called 'incremental' ACE).[55] The notional DIT rate was equal to 7% in 1997-2000, 6% in 2001-2002, and 5.7% in 2003. In the DIT regime, the overall resulting average tax rate could not be less than a given threshold (27%), eliminated in 2001.[56] Moreover, the incremental equity was magnified by a multiplier (20% in 2000, 40% in 2001).

Although the DIT regime was applied until 2003, starting from 2001 it was progressively watered down by freezing at 30 June 2001 the equity increase used to compute the allowance, abolishing the multiplier and lowering the notional rate. For the banking sector, the DIT regime applied from 2000 to 2003, taking into account the equity increases during the period 1997-1999 as well. The latter feature was already known when the law introducing the DIT was passed in December 1997.

The DIT treatment of the notional return on equity allowed a tax saving equal to:

$$\Psi_t^{equity} = (\tau_{cit} - \tau_{notional})\, i_{dit}\, \lambda\, E^{tax}_{t-1} \qquad [B3]$$

where $\tau_{cit}$ is the CIT rate, $\tau_{notional}$ is the rate at which the notional return on equity was taxed, $i_{dit}$ is the notional DIT rate, $\lambda$ is the DIT multiplier, and $E^{tax}_{t-1}$ is the DIT base at the beginning of time $t$. For the purpose of the model, it is possible to neglect the 'incremental' feature and express the DIT base as the book equity $E_t$ (see equation [4] in the main text).

**Annex C**. Some details on the derivation of the loan price

The loan price is derived by solving the model described in Sections 3.1-3.2. By substituting into the capital market arbitrage condition [10] the equation of dividends [11], the corporate tax bill $T_t^{cash}$ [9], the cash flows equations relating to the cost of debt [2] and the cost of equity (collapsing

---

[55] The maximum amount of the deduction in a given tax year was the taxable income; however, a carry forward regime was available without time limits. We do not consider this detail for the DIT, or for the current ACE regime.

[56] We do not consider this provision in our computations.

over time equations [3], [5] and [7]), imposing $E_t^{tax} = E_t$, and using $S_{t+1}=\Delta B_{t+1}$ (with $B_t$ expressed in terms of $E_t$ and $DTA_t$, considering the different assumptions on DTAs funding[57]), it yields a very general equilibrium condition for all the period under analysis:

$$\left\{\alpha\left[i_k\left(1-\lambda(\tau_{cit}-\tau_{notional})\frac{i_{ace/dit}}{i_k}\right)+\tau_w\right]+(1-\alpha)\left[i_d\left(1-\beta\tau_{cit+ilor/irap}\right)\right]\right\}E_t=\left[E_{t+1}-E_t\right]+\alpha X_{t+1} \qquad [C1]$$

where the overall cash-flow unrelated (but for the DTA dynamics) to the cost of finance, $X_{t+1}$, is equal to:

$$X_{t+1}=\left(1-\tau_{cit+ilor/irap}\right)\left(p+\delta_{t+1}\right)L_t-L_{t+1}+\left(1-\delta_{t+1}\right)L_t+\Omega_{t+1}^{LLP}+$$
$$-\psi\left[DTA_{t+1}i_d\left(1-\beta\tau_{cit+ilor/irap}\right)+\left(DTA_{t+1}-DTA_t\right)\right] \qquad [C2]$$

$\Omega_{t+1}^{LLP}$ is the cash flow relating to the tax rules on provisioning (see Section 2.2.1) and $\psi\in\{-(1-\alpha)/\alpha;\ 1;\ 0\}$ depending whether DTAs are assumed to be all-equity-funded, all-debt-funded, or funded as loans, respectively (as discussed in Section 3.1)

Equations [C1]-[C2] encompass the system since 2016, imposing $DTA_{t+1} = DTA_t = 0$; after the discussion of the financial constraints in the pre-1999 period, they also represent the system in this period, imposing $\psi=-(1-\alpha)/\alpha$, namely that the 'DTA-related' cash flows were funded out of retained earnings.

Solving equation [C1] for $E_t$ yields:

$$E_t=\sum_{i=0}^{\infty}\left(\frac{1}{1+r}\right)^i\alpha X_{t+i} \qquad [C3]$$

where the discount factor, $r$, is:

$$r=\alpha\left[i_k\left(1-\lambda(\tau_{cit}-\tau_{notional})\frac{i_{ace/dit}}{i_k}\right)+\tau_w\right]+(1-\alpha)\left[i_d\left(1-\beta\tau_{cit+irap}\right)\right] \qquad [C4]$$

with weights equal to the proportions of equity and debt funding the assets.[58] [59]

Since α is a constant, maximizing [C3] with respect to $L_t$ is equivalent to maximizing the stream of cash flows $X_{t+i}$ discounted at rate $r$. By differentiating the stream of discounted cash flows $X_{t+i}$ with respect to $L_t$, one gets the post-tax net present value of the economic rent generated by the investment, $R_t$. Setting $R_t = 0$ and solving for the rate of return over the LLP rate, it yields the bank gross-of-tax rate of return $p$^.

For the current tax system, the discount rate $r$ is equal to $\alpha\, i_k\left(1-\tau_{cit}\frac{i_{ace}}{i_k}\right)+(1-\alpha)i_d\left(1-\tau_{cit+irap}\right)$.

**The components of the tax spread**. Table C1 shows the components of the spread on which the computations are based. Given its relevance in this work, let us briefly analyse the Term [1] which

57 For instance, in the period 1999-2013 for the case of debt-funded DTAs, $B_t=[(1-\alpha)/\alpha]E_t+DTA_t$.

58 Equation [C3] is the equivalent in discrete time of equation [11] in Boadway (1987: p. 66) in the case of no personal taxation on dividends and capital gains (in Boadway notation, $\theta = c = 0$ and $b = (1-\alpha)/\alpha$).

59 The discount factor corresponds to the familiar concept of Weighted Average Cost of Capital (WACC) of the corporate finance literature.

measures the effect on the spread of the time limits on the deductibility of LLPs over the period 1995-2015. Apart from the statutory tax rates, this effect depends on the present value of the bank's temporary exposure due to the tax rules on LLPs (which we define as *DTA**) and the financial cost of this exposure. Until 1998, since DTAs were not recorded in the financial statement, the negative temporary cash flow generated by the postponement of LLP deductibility had to be funded out of retained earnings. The financial cost was then equal to the cost of retained earnings: in 1994-1997, the cost of equity plus the wealth tax ($i_k + t_w$); in 1998, the sole cost of equity ($i_k$). Since 1999, DTAs are recorded in the balance sheet. The financial cost of the tax rules on LLPs depended on how DTAs were funded. For instance, for the period 1999-2013, let us assume that debt was the marginal source of funding once the regulatory constraint was satisfied. Then, the financial cost was $i_d(1-\beta\tau_{cit+irap})$. Since 2014, with the new Basel III rules on DTAs, the financial cost becomes equal to a weighted average of the post-tax cost of debt and equity, with weights equal to the debt and equity proportions funding DTAs. By assuming the same weights used for loans, the financial cost is then $\alpha[i_d(1-\beta\tau_{cit+irap})] + (1-\alpha)\,[i_k(1-\tau_{cit}i_{ace}/i_k)]$.

**Table C1**. The tax components of the lending spread, 1994-2017

| | Tax provision | Period | Effect on the spread |
|---|---|---|---|
| 1 | Loan loss provisions: time limits on deductibility ( $\delta > \phi$ )<br>• 2014-2015: same regulatory weight for DTAs and loans;<br>• $\text{DTA*} = \tau(\delta-\phi)\sum_{i=1}^{n}\left[\frac{1}{(1+r)^i}\left(\frac{n+1-i}{n}\right)\right]$<br>where $\tau = \tau_{cit+ilor}$ in the period 1995-1997, $\tau=\tau_{cit}$ in the period 1998-2012 and $\tau = \tau_{cit+irap}$ in the period 2013-2015. | 1995-1997 | $+\left(i_k+\tau_w\right)\cdot\frac{DTA*}{\left(1-\tau_{cit+ilor}\right)}$ |
| | | 1998 | $+\ i_k\cdot\frac{DTA*}{\left(1-\tau_{cit+irap}\right)}$ |
| | | 1999-2013 | Debt-funded DTAs<br>$+\ i_D\left(1-\beta\,\tau_{cit+irap}\right)\cdot\frac{DTA*}{\left(1-\tau_{cit+irap}\right)}$ |
| | | | Equity-funded DTAs<br>$+\left[i_K\left(1-\lambda\left(\tau_{cit}-\tau_{notional}\right)\frac{i_{ace/dit}}{i_K}\right)\right]\cdot\frac{DTA*}{\left(1-\tau_{cit+irap}\right)}$ |
| | | 2014-2015 | $+\left[\alpha\,i_K\left(1-\frac{i_{ace}}{i_k}\tau_{cit}\right)+(1-\alpha)i_D\left(1-\beta\,\tau_{cit+irap}\right)\right]\cdot\frac{DTA*}{\left(1-\tau_{cit+irap}\right)}$ |

| | | | |
|---|---|---|---|
| 2 | <u>Loan loss provisions</u>: straight limits on deductibility ( $\delta > \vartheta$ )<br>• 1994: $\vartheta = 0.5$; $\tau = \tau_{cit+ilor}$; $\tau^* = \tau_{cit+ilor}$.<br>In 1994, $\vartheta$ was the yearly deductibility limit for loan loss provisioning, equal to 0.5% of the total value of loans. Deductibility was allowed only if the total amount of past provisioning, net of used amounts, was lower than 5% of the total value of loans. Otherwise, all the additional provisioning was not deductible.<br>• 2005-2012: $\vartheta = 0.0$; $\tau = \tau_{cit+irap}$; $\tau^* = \tau_{irap}$ | 1994<br>2005-2012 | $+\frac{\tau^*}{(1-\tau)}(\delta-\vartheta)$ |
| 3 | <u>Debt</u>: non-deductibility of a part of interest costs (1-β) | 2008-2015 | $+\frac{(1-\alpha)(1-\beta)\,i_D\,\tau_{cit+irap}}{(1-\tau_{cit+irap})}$ |
| 4 | <u>Equity</u>: non-deductibility of the cost of equity<br>($\tau = \tau_{cit+ilor}$ in 1994-1997; $\tau = \tau_{cit+irap}$ in 1998-2017) | 1994-2017 | $+\frac{\alpha\,\tau\,i_k}{(1-\tau)}$ |
| 5 | <u>Equity</u>: ACE deduction | 2012- | $-\frac{\alpha\,\tau_{cit}\,i_{ace}}{(1-\tau_{cit+irap})}$ |
| 6 | <u>Equity</u>: DIT deduction<br>($\lambda$ is the DIT multiplier applied in 2000-2001, $i_{dit}$ is the notional return to equity; $\tau_{notional}$ is the tax rate on the notional return to equity) | 2000-2003 | $-\frac{\tau_{cit}\alpha\lambda i_{dit}}{(1-\tau_{cit+irap})}+\tau_{notional}\frac{\alpha\lambda i_{dit}}{(1-\tau_{cit+irap})}$ |
| 7 | <u>Equity</u>: Wealth tax<br>($\tau_w$ on net worth) | 1994-1997 | $+\frac{\alpha\tau_w}{(1-\tau_{cit+ilor})}$ |

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