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TAXING BANKING FIRMS: A CONCEPTUAL FRAMEWORK

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Taxing Banking Firms: A Conceptual Framework[1]

Public finance theory has relegated the analysis of taxation of firms' activity almost exclusively to non-financial firms. The explanation is, to some extent, obvious: economic disciplines have often regarded taxation and its effects mainly in connection with the forces driving or hindering growth potential and wealth. The central role of industry in the development of modern economies somehow imprinted the direction of scholars' research. Although financial intermediation has been recognised as fundamental in supporting the performance of economic activity, its role has always been more complex to include in the picture. Some perception of potential differences in the impact of taxation on financial firms' activity can be traced in the literature, but a systematic stream of analysis has not arisen yet.

The objective of this paper is to present a description of the state of the art in the analysis of the effects of taxation on financial firms (FFs) activity, with particular emphasis on banking. More specifically, the aim is to assess whether taxation of financial intermediaries may result in effects on their decisions that significantly differ from those expected in the "standard case" of non-financial firms (NFFs). After considering the differences already envisaged by the economic theory and by the institutional arrangements, the analysis focuses on those peculiar features of FFs that make their business structurally different from the others and that may possibly imply a formally identical tax regime to produce a distinct incidence process when applied to FFs.

The paper is organised as follows: paragraph 1 reviews the literature on banking and the literature on taxation to find possible integrations; paragraph 2 highlights the peculiarity of FFs, and of banks in particular; in paragraph 3 we assess these peculiarities to identify the aspects that are relevant to the way taxation affects banks' decisions; paragraph 4 considers the issue of cost of capital in the context of banking activity; paragraph 5 reconsiders the traditional effective tax rates approach in order to better adopt it to the special case of banks; finally, paragraph 6 gives preliminary conclusions, mainly suggesting strategies for integrating the different approaches from banking literature and taxation literature, analysed in the paper.

1. Banking vs. Taxation Literature

Literature on banking regards financial intermediation as a peculiar production process under several respects. The relevance of this issue is due to the important role that banking firms play, acting as financial intermediaries among the other economic agents, ensuring the link between saving and investment in the economies, and directing capital towards the most efficient uses. By providing, not only households, but also the other

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firms with financial services that are instrumental to their business, banks can affect their decisions.

The debate about the role of banking firms has taken place for a long time.[2] It has been very rich and has pointed to the uniqueness of banks' activity, stressing different aspects and reasons.[3] In the last decades, the development of new markets and new intermediaries, with their implications for the supervisory regulation, drew the economists' attention to issues like financial systems and financial stability, raising again the question of the role of banking. Meanwhile, banking theory took advantage from the simultaneous progress in information, game, and finance theories. This process resulted in a body of literature on banking that, focussing on the microeconomic aspects, explored the implications of banking firms' behaviour for macro aspects like financial market structure, instability risk of banking systems, banking regulation, monetary policy transmission channels. In doing so it allowed to overcome the unsatisfactory features of the previous approach that had been looking at these aspects separately, by simply assuming the existence of the banking firms without explicit justification.[4] The microeconomics of the banking firms highlights the peculiarities of their production technology and of the context in which they perform their activity. The recognition of such peculiarities is testified also by the analysis of the institutional arrangement of banking systems in all developed countries, since they all prescribe specific regulatory constraints on banking firms. Banking literature looks at these constraints as an extra-burden on financial intermediaries, defining it as "quasi taxation".

The recognition of the peculiarity of banking activity does not seem to be equally acquired by taxation literature.[5]

Generally speaking the characteristics of any production process (with its peculiarities), inevitably shape the structure of firms' balance sheets and have implications for their ability to adjust to, and possibly shift, the burden imposed by taxation. Although this phenomenon is always present when comparing the reaction to taxation by firms operating in different economic sectors, it certainly plays a major role in the case of banking firms. For instance, the high degree of substitutability among the financial instruments implies bigger and more immediate opportunities for tax shifting, both from the supply side, by the savers, and from the demand side, by investors. The final economic effect of the same change in the tax rate applying to both financial and non-financial firms could than be more widespread and rapid in the first case.

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2 For one of the first attempts to elaborate a general theory of the bank see, for example, De Viti de Marco (1898, 1934).

3 The specific role of banking firms has been attributed by the economic literature to the monetary and credit functions they perform, by providing the economy with liquidity, supplying credit, and integrating these two functions through maturity and liquidity transformation (alternatively stressing any of these aspects). An extensive analysis of this literature is not the object of this paper, so we refer directly, for example, to the very useful reviews in Santomero (1984, 1992) and Bossone (2000). Seminal papers on this subject are Fama (1985), Goodhart (1986, 1987), Diamond and Dybvig (1983), Diamond (1984), Gale and Hellwig (1985).

4 See, for example, Marotta and Pittaluga (1993).

5 The issue has received more attention only recently. In 2003 the World Bank completed a research project on "Taxation of financial intermediation" (edited by Honohan), which is probably the most complete contribution on the subject. With respect to our analysis, the focus is more on financial intermediation than on financial intermediaries. See also Huizinga (2004).

Under a theoretical viewpoint, the attention of scholars in taxation field has been captured by issues related to taxation of *financial instruments* rather than of *FFs' activity* itself (more to *indirect* than to *direct* taxation).

Within the framework of *indirect taxation*, literature has focused on the conceptual aspects involved in the optimality of exempting financial instruments, given that financial services may be considered intermediate inputs for NNFs. Policy prescriptions from the different models, indeed, usually depend on the assumed role of money i.e. whether it is regarded as consumption or intermediate good. Theory did not reach definite conclusions about the opportunity to treat FFs and NFFs homogenously, by taxing products and services of both. Under the institutional viewpoint, however, most of the OECD countries made the choice of exempting financial services from VAT. This decision depends mainly on the difficulties arising from the VAT tax base definition in case of the traditional banking intermediation services (deposit collection and lending). Exemption of financial services from VAT implies that banking firms, contrary to those in other sectors, end up by representing the final consumer for the (intermediate) goods they acquire. Therefore, they pay for the corresponding VAT and are subject to VAT on investment input.

Regarding *direct taxation*, with only little exception,[6] no specific concern arises from taxing financial firms per se. The main issue traceable in taxation literature relates to the optimality of zero-taxation of capital income in all its forms, in order to avoid double taxation of consumption.[7] However, this is obviously a much more general issue involving taxation of firms without distinctions among financial or non-financial sectors. Several arguments may be opposed to the view supporting zero-taxation of capital, specifically as far as corporate tax is concerned: corporate tax has to respond, not only to efficiency criteria, but also to equity ones (by taxing corporations shareholders do not delay taxations on their income; corporations are recognised an ability to pay separate from the shareholders'; corporations benefit from public expenditure on infrastructures so they have to contribute by some benefit principle; etc.) or to revenue goals;[8] and these other goals are apparently relevant enough to prevail in the institutional arrangement of actual tax systems.

There seems to be broad consensus among taxation scholars and practitioners about applying corporate taxes based on the same principles, both to FFs and NFFs[9]. Although special rules are typically devised by the tax systems to take care of specific aspects of FFs' activity, they are perceived simply as minor adjustments that are necessary to ensure *neutrality*.[10] These "corrections" to the general criteria usually concern the tax treatment of

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6 For example, Caminal (2004).

7 See, on the topic, Boadway and Keen (2003) and Caminal (2003).

8 Corporate tax is often justified on the grounds that it allows to tax profit rents; it turns out that in actual tax systems it usually taxes also the component of profit remunerating own capital.

9 As far as we could conclude from a review of taxation literature, there are very few contributions explicitly recognising the need to consider banks peculiarities. Most of them simply focus on the special treatment provided by the existing tax systems, giving ex-post explanations for the rational behind these normative choices. "*In principle, the income of financial institutions should be measured the same way as the income of other business. Although financial institutions are subject to the usual corporate income tax, their income often receives special treatment in several respects.*" (Stotsky, 1995).

10 It is revealing, for instance, that Honohan (1999) addresses these features (and the "quasi taxation" associated with financial regulation) as forms of *corrective taxation* aimed at amending pre-existing distortions: "*An important practical issue for corrective taxation is the treatment of loan loss reserves. Many tax authorities have tended to err on the side of refusing to accept loan loss reserves as deductions from a bank's taxable*

loan loss reserves and credit loss devaluation. However, actual tax systems have been sometimes in a position of confronting problems arising exactly from the differentiated impact expected on FFs by specific forms of business taxation. They usually resorted to either tax rates diversification or specific prescriptions in the tax bases rules. One enlightening example is the IRAP case in Italy.[11]

To understand *how the peculiarity of financial firms may affect the mechanisms by which taxation works out its effects*, it is necessary to re-examine the meaning of the main variables underlying the decisions of production, investment and finance. In other terms, the relevant question is how output, input, accumulation, value added, financing sources, and so on, can be defined for a FFs and in what these concepts differ from the same economic concepts as applied to the non-financial sector.[12] Such a conceptual framework allows to "map out" where and how taxation and quasi-taxation enter in the FFs' decisions and to focus on the differences with respect to the NFFs.

Form such an exercise, a revision of the economic meaning of the tax indicators most commonly used in tax policy analysis presumably derives as well. Indeed, it is questionable whether the ordinary tools to assess the distortionary effects of taxation on firms decisions, developed from NFF models, may be appropriate when applied to FFs and in particular to banks. This problem is obviously more severe in case of indicators explicitly based on some underlying model of the firm's behaviour (like the so-called marginal or average "effective tax rates").

In some cases the issues turn out to be more of an empirical nature, simply relating to the quantitative relevance of a channel of transmission of the tax effect; in others, for example the impact of taxation on the financing decisions, the issues have deeper theoretical implications.

2. What is different in banks' decisions?

Firm's decisions concern real aspects, like *production* and *investment*, and financial aspects, like investment *financing*.

The current state of the art fundamentally draws from the contribution of *finance theory* by Modigliani and Miller (M&M) and its aftermath.[13] M&M theorem states that *corporate investment and finance choices are independent*. The firm's final objective is the maximisation of the market value of the corporate equity, representing the shareholders wealth. In a frictionless world – i.e. with complete market, perfect information, and no taxes – the value of a firm is independent of its financial structure, due to arbitrage:[14] an increase in financial leverage would increase financial risk and the cost of risk capital accordingly, restoring the equilibrium. In such a context, the cost of capital is given by the

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income, fearing that they will be used to excess as an unverifiable way of deferring tax. Experience, however, suggests that banks are naturally too slow to recognise the risk of loan losses and to provision for them. A liberal tax policy in this regard would be corrective by restoring the tax incentive to make adequate advance provision for losses (Escolano 1997)." (p. 4; our underlining).

11 This issue is analysed in details in Farabullini, Maurizi, Monacelli and Pazienza (2005).

12 See on this matter the paper by Gobbi and Zotteri (2005), which is part of this research.

13 Modigliani and Miller (1958, 1963), Miller (1977), DeAngelo and Masulis (1980), just to remember some.

14 This is known as M&M *Proposition I*

capitalisation rate of a pure equity stream from the same class of investment. From the development of the Capital Asset Pricing Model (CAPM) in finance literature, a better treatment of the role of risk in investment decisions descended, which could be easily incorporated in the cost of capital from M&M framework, by adjusting the relevant capitalisation rate for risk.[15] The basic M&M model was progressively enriched in several directions, to ensure more realistic features. The first step was the introduction of corporate and personal taxes and bankruptcy costs, which allowed the determination of an optimal financial structure for the firm, by generating revenue and cost associated to debt finance. Other developments focused on the removal of some of the restrictive hypotheses of the original M&M version.

Public finance literature instilled into this approach by elaborating on the cost of capital concept to disentangle the tax component. From such process, a well-established branch of tax literature originated, from Jorgenson's contribution on user cost of capital (1963) to King and Fullerton' development of the marginal effective tax rates (1984).[16] This conceptual framework proved extremely powerful for taxation analysis: it was flexible enough to allow a very detailed modelling of all the most relevant features of the actual tax systems and offered significant advantages in terms of international or inter-temporal comparisons.

The use of such tools, however, may prove troublesome when applied to banks. Once their activity is examined more in detail, indeed, it is clear that the underlying theoretical models are hardly capable of satisfactorily describing how banking firms operate. The efficient market hypothesis, retained in the subsequent derivations of the original M&M model, is particularly troublesome. Strictly speaking, the role of banks as intermediary institutions would be redundant in a world where, like in the original M&M model, all the economic agents have access to the same information at the same time: under these hypotheses, finance should not matter because the private agents who are in surplus could directly finance those who are in deficit without any intermediation.

The features of banking activity which seem in contrast with the model underlying M&M theory are well captured by another stream of literature, which was developing meanwhile within the industrial organisation discipline (IO).[17] According to this approach, the existence itself of financial intermediaries is justified by market imperfections.

In the following paragraphs we discuss what, in our opinion, should be regarded as the more relevant aspects emerging from IO literature on banking that should dissuade from using M&M-derived models in case of banking firms. They can be summarised as follows:

1. the *peculiarities of the production process* (the particular nature of output; the different relevance of inputs, the intrinsic role of financial risk, the stricter intervolving among asset/liability composition and production);
2. the anomalous role of debt and the *peculiarity of financing decisions*;

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15 Hamada (1969), Rubinstein (1973).

16 The discussion of these indicators is presented in chapter 5.

17 See Freixas and Rochet (1997). Financial markets are affected by informational asymmetries, so that economic agents have to bear costs (transaction, monitoring, etc.) that specialised agents, like banks, may more efficiently face due to informational advantages by intermediating investors and savers. Banks sell these services; to do so they simultaneously buy and sell financial instruments (i.e. sell financial contracts).

3. the presence of *banking supervision*.

2.1 Production process

Most of the peculiarity in banking production process depends on the nature of its *ouput*. According to modern banking theory, banks are firms that supply *financial services* ("production approach"). This approach differs from a somewhat more traditional one that stresses the "intermediation process"[18] among deposits and loans. A relevant consequence is that deposits are seen as output, contrary to the intermediation approach that treats them as inputs for the provision of loans.[19] For our purposes we find it useful to follow the production approach.

The supply of *financial services* is embedded in specific *financial instruments*: loans and deposits, but also other financial products (the supply of which has progressively increased, as the composition of interest margins vs. fees and charges testifies). Production of the inbuilt-financial-services is usually assumed equivalent to the production of the financial instruments themselves. We claim that, although the distinction made here may seem captious and redundant, it actually helps in better identifying the process generating revenue and cost items.

Bank's production is multi-product and is characterised by a high degree of jointness.[20] A good example of these characteristics is given by the intermediation between deposits and loans.

The fact that the financial services provision is embedded into financial instruments generates a much stricter link between production decisions and balance sheet items. Indeed, most of output provision directly reflects into changes in the stock variables of the bank's balance sheet.[21] For instance, loan supply increases the assets, while deposit supply increases the liabilities. This feature is not straightforward to rationalise in the economic terms traditionally used when considering NFFs. For instance, the acquisition by the bank of bonds for its own account, that increases assets, can be regarded as *output*, while in the usual NNFs analytical framework, the increase in the asset would be considered *investment*. It is, indeed, by following this very same logic that in 2001 the EU Report on

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[18] Sealey and Lindley (1977).

[19] In banking literature, deposits are sometimes treated as input to loans, sometime considered as output, sometimes both based on empirical results (Hanckock, 1985). As Fixler (1993) points out: "*The principal concern in identifying inputs and outputs is how to classify demand deposit related financial services. Since demand deposits are used in the production of loans it is argued that they are input. The problem with such a classification is that demand deposit services, which are final services, are then not counted as part of the bank's output but rather as part of the payment for inputs.*" (p. 983).

[20] Onado (1996), for instance, in describing the operational aspects that distinguish the production process of banks from other industries, underlines the "*multi-product characteristic of banking activity*" by emphasising that "*the peculiarity of the bank is in the fact that the supply of multiple products is characterised by elements of jointness and productive intertwining much more intense with respect to other firms*" (p. 37; our translation). To sustain his argument he gives the example of the supply of deposits, which simultaneously represent an input for the supply of loans.

[21] This phenomenon characterizes, in particular, the core function of the banks, as *money suppliers*, who issue claims on themselves accepted as money by the public, and *credit suppliers*, who lend claims on their own debt. As far as the supply of other services leaving the stock variables, and the balance sheet, unaffected it must be reminded that their share has increased over time with the diversification of banking activity (see Gobbi and Zotteri, 2005).

Company Taxation introduced the "Financial Assets" item among the alternative investment destination of firms' capital. Although such a treatment could be correct in case of NNFs, it certainly raises problems in case of FFs, and banking firms in particular: it is questionable, at least in our opinion, whether it is legitimate to consider this action as investment rather than as pure production, giving rise to revenue rather than to costs.

In other words, production of a bank may be seen as asset/liability management, so that the composition of the bank's balance sheet reflect output decisions rather than financing decisions as it would be for a NFF: any increase in the leverage, would reflect a decision to supply deposit rather than a decision to resort to debt in order to finance an investment. If it is so, *an increase in liabilities in case of a banking firm is associated to higher production that generates revenue, not to higher investment financing that generates costs*. This issue has obviously relevant implication for the cost of capital definition. It gives rise to a major difference between FFs and NFFs, which make it very hard to apply a common economic framework in the analysis of the firms' decisions.

As for the *input side*, we assume a production process where banks use the same inputs as other firms (capital, labour, intermediate goods or services). Factor intensity is the typical one characterising the FFs: among capital inputs, physical capital plays a marginal role; on the other hand, investment in buildings and accumulation of intangible capital (development of software, etc.) may be extremely relevant; production is very labour intensive. A specific aspect to consider is a higher share of labour costs devoted to training, which seems to signal more significant investment in human capital. In terms of the effects induced by the tax treatment of corporate income, the implications of this factor intensity are high labour taxation and property taxes, and lower deductions from physical capital.[22] Summarising, from the input side the difference between banks and other firms, particularly NFFs, is mainly a *relative intensity issue* related to factor composition.

Sketching the production process in a very simplified way,[23] we may assume that a bank produces a bunch of financial services Y, embedded in some mix of financial products like loans Ln, deposits D and other products OP, linked by a relationship g

[1] $Y \equiv g\,(Ln, D, OP)$

by using a production technology f with physical capital K, labour force L, and intermediate goods X as inputs

[2] $Y = f\,(K, L, X)$

subject to a very simplified asset/liability constraint equalising, as the most important items, deposits D and equity E, on the liability side, to loans Ln and securities B, on the asset side:[24]

[3] $D+E = Ln+B$

When output changes - due to the supply of new loans or deposits that directly affect the outstanding stocks of Ln or D, or due to the provision of the other products OP that affect for instance B or E stocks on bank's behalf - the composition of the balance sheet is modified consistently. Even in a static context, this link would impose a consistency

22 Consequently, the weight of the tax incentives to physical capital accumulation tends to be lower as well.

23 For a more formalised analysis see Monacelli and Pazienza (2005).

24 A more realistic constraint would include at least securities issues on the liability side and equity acquired on the asset side.

relationship, which is actually complicated by the regulatory constraints on capital ratios. To say it differently, *the output choice for banking firms*, as mentioned before, *looks more like a choice of the asset/liability composition*.

Finally, an element of differentiation of the production process with respect to NNFs stems from the role played by risk. Risk characterises any production activity, but in case of FFs it has stronger implications. Indeed, financial instruments, that are the object of the production activity, are means to defer purchasing power over time and therefore represent a way to manage risk. As a result, financial intermediation involves risk management by definition. The relevant implication for our analysis is that in the evaluation of profits and of the company value, risk plays a role that should not be neglected.

2.2 Finance decisions

The complex relationship between output and composition of asset and liability points to a more substantial criticism against the mere extension to FFs of models developed within the M&M approach in the theory of finance.

Whether financial liabilities represent a source of finance for capital accumulation or simply output (or both) is crucial for the identification of an appropriate theoretical framework for assessing the consistency with the usual tax indicators. Deposits represent the most relevant share of banks' liabilities. In a "production model" like ours, they contribute the supply of financial services exactly as loans do, and therefore they are to be considered output. Revenue from deposits stems from the banks applying a lower interest rate to depositors, with respect to the rate they would pay if raising the same liabilities in the inter-bank market for their own financing purposes. The difference between the two rates is the price charged by the bank for the service it offers the clients in terms of custody and immediate disposal of the money cash deposited.

This peculiar aspect of banking activity has implications for the cost of capital determination. For NFFs, in a M&M framework, any increase in debt would generate financial distress costs raising the financial risk of the firm, and hence the cost of equity capital. In case of a bank the links become more complex. An increase in deposits by raising output may also increase revenue. The cost of capital therefore reflects both the higher financial risk associated to the higher leverage and the quality of the financial services supplied by means of the new deposits. Under these circumstances the arbitrage conditions ensuring separability between the firm's real and financial choices could not work.

If for a bank debt generates revenue from the supply of the associated financial services, and not only costs, it seems reasonable to assume that banks have an intrinsic incentive to extend their "leverage" beyond what NFFs would do. In particular, due to their ability to earn revenues on debt issuance, banks may not necessarily face rising *net* costs from increasing debt, so that in principle they may find convenient to increase debt finance without limit (or at least within much lower limits than NFFs).[25] Moreover,

[25] According to Diamond and Rajan (2000) "*in a world of certainty, the bank maximizes the amount of credit it can offer by financing with a rigid and fragile all-deposit capital structure*".

banking systems benefit from monopoly power in collecting deposit. Such power is recognised by laws and regulations and it is usually associated with legal restrictions, synthetically described in the next paragraph.

The peculiar nature of debt and the related regulatory requirements lead to the conclusion that banks determine their optimal financial structure by a very different decision process from the one characterising NFFs. Strictly speaking, their financial structure represents more the counterpart of output decisions rather than of financing ones. Therefore, risk capital should be regarded as the major marginal source of finance: banks employ debt as much as they can and use risk capital according to the more binding between two exogenous constraints: the "regulatory" requirements and "market" requirements (bankruptcy costs and reputation, bank's governance and asymmetric information between bank and investor).[26] Their decisions about the optimal financial structure mainly reflect external constraints, rather than the typical determinants of the choice carried out by NFFs.

2.3 Banking regulation

Banks and, to a lesser extent, other financial institutions, have been traditionally subject to regulations that do not apply to NFFs. The rationale of these rules refers to banks' specificity, as expressed by the collection of liquid liabilities and the contemporaneous granting of illiquid loans. This peculiarity of the balance sheet is associated to legal restrictions, because only banks can issue liabilities that are repayable on demand. This feature has been considered at the origin of banking runs and crises that historically contributed to the creation of Central Banks, like the Federal reserve in 1914, or to the introduction of supervisory regulations, such as the banking laws approved in many European countries in the Thirties. Still today the different forms of banking regulations are justified by the need to ensure the nominal value of banks' deposits, the correct functioning of the payment system, the normal financing conditions of the economy.[27]

Even if more extreme positions in favor of free banking must be taken in account,[28] it is generally agreed that a sound and safe banking system is the result of the mutual combination of capital requirements and other supervisory actions, on one side, and market discipline, on the other side. Countries differ in the weights they assign to supervision and market discipline to ensure banking stability. This paragraph describes

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[26] See, on this topic, Berger, Herring and Szego (1995).

[27] See, for instance, Goodhart (1985) as a seminal reference. We may refer to different strands of the literature such as: the classical bank run models (Diamond and Dybvig, 1983); the interaction between banking crises and currency crises, whose analysis has been reinforced by the economic difficulties of the Asian economies in the second half of the Nineties; the new analysis of the old subject of bank contagion (see De Bandt and Hartmann, 2000, for a survey).

[28] Many critiques have been raised towards bank regulation. The theory of public choice underlined that civil servants and legislators are not only motivated by the pursuing of the public interest but also by their private goals. Stigler was the first to claim that government agencies may act not in the interests of society but may be captured by the interests of the subject who are regulated. Historical reexamination of free banking periods shows that the quantitative importance of banking crises may have been exaggerated (Kaufman, 1996). These views are summarized by the idea that "*leaving monetary and banking arrangements to the market would have produced a more satisfactory outcome than was actually achieved through governmental involvement*" (Friedman and Schwartz, 1986).

the main forms of supervision in Europe and other countries. Bank regulation and supervision have been seen as having quasi-fiscal implications,[29] as they may introduce distortions in banking business. Similarly to the approach of the financial repression literature - which emphasized that credit ceilings, controls of interest rates, high reserve requirement ratios and other regulatory measures have been often responsible for low levels of financial intermediation - we will not deal here with credit ceilings and controls of interest rates, because these measures have been abolished in rich countries and attenuated in poorer ones.[30]

The reserve requirement was certainly in the past a form of quasi-taxation. Banks were required to put a high percentage of their deposits, in terms of stocks or flows, in central banks' accounts, which were remunerated at lower rates than market ones. Originally introduced as a prudential supervision instrument, the reserve requirement evolved as a tool to control the multiplicative mechanism of deposits and loans. At the same time the reserve ratios decreased in many countries while the remuneration of the banks' funds in the accounts with the Central banks increased.

In the euro area the reserve ratio is now 2 per cent of the outstanding stock and the reserve is remunerated at a market rate. In the Eurosystem the functions of the minimum reserve system are the stabilization of money market interest rates and the enlargement of the structural liquidity shortage of the banking system. Reserve ratios also decreased outside the euro area countries and are now less onerous than in the past. However, there is still concern for high reserve ratios in some countries, mainly the less developed ones.[31]

Capital ratios are probably the most frequent measure of prudential supervision in the world. This was mainly due to the *Basle agreement* of 1988 that introduced the idea that international banks had to maintain a ratio equal to 8 per cent of capital to risk-adjusted assets. Capital is split into two types: Tier1 and Tier2. Tier1 includes capital, reserves, funds for general banking risks, and innovative instruments such as preferred shares. Tier2 includes revaluation reserves, hybrid instruments, subordinated debt, general provisions, unrealized gains on equity. Tier1 must be at least 50 per cent of the overall capital.

Formally,

$$[4] \qquad Tier1 + Tier2 \;=\; 0.08 \sum_{i=1}^{n} RW_i \; A_i \qquad \text{s.t} \qquad Tier1 \geq 0.5\left(Tier1 + Tier2\right)$$

where A_i represents the asset i and RW_i the associated risk weight according to the banking regulation.

The capital ratio was introduced to ensure a "level playing field" for large international credit institutions active in the same markets. Subsequently, the agreement was introduced in many countries and often extended to all the national credit institutions. The capital ratio is often conceived as a buffer stock that banks must maintain to cover credit losses, even if it is arguable that a capital ratio of 8 per cent would be sufficient if a hard bank crisis takes place. We prefer to stress the other justification of the

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29 See, for instance, Huizinga (2004).

30 For administrative measures in UK and Italy see Goodhart (1991) and Passacantando (1996). See Yelek (1996) on financial repression in Mediterranean countries.

31 See, for example, Caminal (2004).

capital ratio, i.e. the idea that it is an incentive compatible rule to reduce moral hazard of banks' shareholders.[32] Shareholders may limit their risk propensity if they are forced to provide a minimum amount of capital. Many countries in the world introduced the requirements of *Basel 1* and plan to implement the new accord of *Basel 2*, which was endorsed in June 2004.

Banks often have a capital ratio higher than 8 per cent. This evidence probably derives from the reputation effect of higher capital adequacy and by the idea of supervisors that 8 per cent is only the minimum level of capital.

Here we remember the four key principles for the supervisory review process of the second pillar of the *Basel 2 agreement*:

a) Banks should have a process for assessing their overall capital adequacy in relation to their risk profile and a strategy for maintaining their capital levels;
b) Supervisors should review and evaluate banks' internal capital adequacy assessment and strategies, as well as their ability to monitor and ensure their compliance with regulatory capital ratios;
c) Supervisors should expect banks to operate above the minimum regulatory capital ratios and should have the ability to require banks to hold capital in excess of the minimum;
d) Supervisors should seek to intervene at an early stage to prevent capital from falling below the minimum levels required to support the risk characteristics of a particular bank, and they should require remedial action if capital in not maintained or restored.

Finally, even if they often influence the composition of banks' assets and liabilities, we will not deal with the forms of banks supervision used differently all over world. We may refer to measures as barriers to entry, competition regulatory variables, restrictions on banking business, separation between banking and commerce, deposit insurance, official supervisory action variables.[33]

3. What implication for the appraisal of taxation influence?

The analysis carried out in the previous chapter confirms that the question addressed in this paper is of some relevance. Banks' business is peculiar and differs from NFFs' activity under many respects. The next step is to investigate whether and how the specific aspects that distinguish banking from other firms' business may, indeed, bear consequences in terms of the ways taxation influence firms' decisions. A re-interpretation of the instruments generally used in taxation literature to assess the impact of taxes seems useful.

Among the issues traditionally considered by literature on the effects of taxation[34] the most relevant are represented by the influence of taxes on decisions about: *(1)* labour employment; *(2)* capital investment; finance; *(3)* profit distribution; *(4)* international allocation of capital (and the tax competition implications); *(5)* corporate governance.

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[32] See Santos (2001) for a review of the literature.
[33] See Barth, Caprio and Levine (2001) for a survey.
[34] See Mintz (1995), for example.

All of these issues may be touched by the peculiarities of the financial intermediation process. The analysis carried out so far, for example, showed that banking activity differs from other firms' one for at least the first three issues in the above list.

As far as *labour employment decisions* are concerned, the higher labour intensity in FFs leads to a more significant weight of taxes on labour. These are usually levied both at the employer's and at the employee's level and may take different forms according to the tax systems of the specific countries. Payroll taxes, social security contributions, personal income taxes may have different forward and backward shifting possibilities. During the last decades European countries have experienced a relative high weight of labour income taxation with respect to capital income taxation. This is due to the increasing economic integration, enhancing the role of taxation especially for the more mobile production factors like capital. The combination of fiscal rules to ensure sustainability of public finances, from one side, and greater impact of tax differentials, from the other, led in most countries to a progressive decrease of taxation which regarded capital in the first place, labour income being less subject to tax competition. Less capital intensive and more labour intensive firms, like FFs, may have been penalised by this process. A second aspect to consider, which could play in the opposite direction, is the higher role of human capital within FFs production process. Actual tax systems impose virtually no depreciation of this capital component, so that they implicitly allow for immediate deduction of the related costs.[35] Sometimes anti-avoidance constraints to these deductions are prescribed by tax laws, reducing the potential advantage. A similar conclusion may apply to the larger use of intermediate goods.

Investment decisions are also an important source of difference between banks and NFFs. For banking firms the role of direct taxation on physical capital investment (depreciation allowances, tax incentives, and corporate tax rates) may be less relevant. This is the case for machinery and inventories, due to the limited use of these factors in financial intermediation. It is less so, for the investment in buildings and intangibles inputs. As a result, differences in the treatment provided by tax rules among capital inputs may contribute generating a very different tax burdens with respect to the NFFs. One important element of diversification when considering the overall tax burden from capital acquisitions is the need to include for banking firms also the VAT implicitly levied on investment due to the financial services exemption (since banks purchases represent the final stage of the VAT chain). The same issue concerns intermediate goods.

The issues addressed above point to differences in the tax burden that reflect differences in the relative weight of otherwise common determinants of tax levies, in particular in the production factors intensity. This more easily allows to conciliate the assessment of the tax effects for a banking firm with the use of a framework still impinging on the traditional approach in taxation literature. In paragraph 5 we make an attempt in this direction.

On the other hand, the mechanisms through which taxation affect *financial decisions* of a banking firm may be more difficult to reconcile with the traditional approaches used by taxation theory. Such an attempt collides with the deep differences in the determination

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[35] The drawback of this treatment is that non-depreciable input cannot benefit from possible tax advantages from investment incentives. These issues are more extensively illustrated in Monacelli and Pazienza (2005).

of an "optimal financial structure", due to the peculiar nature of debt for banks and to the related regulatory requirements. In our opinion a promising way to approach these issues is by looking for integration between a more realistic model of the financial choices of the bank, which is able to capture the output aspect of these choices, and the articulated models available from traditional taxation literature. The main obstacle is the need to ensure consistency among the underlying assumptions of the two approaches.

The next paragraph focuses mainly on this last issue by exploring how to define the cost of capital for a bank and by making a first attempt to include taxation within this different framework. As we will see, the proposed solution is more satisfactory as far as the representation of the bank's decision process is concerned, but it is less so as far as the detail allowed in modelling taxation, especially compared to the M&M-derived models.

4. Cost of capital

Cost of capital can be defined as *the net expected return that capital suppliers require on the firm's uncertain future cash flow*; contrary to NFFs, for which the cost of capital depends on the financial structure, for banks the cost of capital mainly refers to *equity capital*. The emphasis on equity capital as the *true decision variable* can be traced in banking literature mainly in connection with the internal capital allocation decision and with international comparisons of cost of capital.[36]

As a very rough simplification, we can classify cost of capital models, in the framework of finance theory, into two broad categories: the first one focuses on dividends as a relevant proxy for expected returns; the second one focuses on the excess return with respect to the average market return[37].

a) according to the *Dividend Valuation Model* the cost of capital is the discount rate c that makes the share price equal to the stream of discounted future dividends:[38]

[5] $$P = \sum_{t=1}^{\infty} \frac{D_t}{(1+c)^t} \ .$$

Assuming, for the sake of simplicity, that dividends grows at a constant rate g, we can obtain the classical Gordon growth model for price and the cost of capital as dividend yield increased by dividend's rate of growth:

[6] $$c = \frac{D_0(1+g)}{P} + g$$

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[36] Differences in the cost of capital across countries may arise from persistent or temporary causes. Temporary differences can be linked to disequilibrium in markets and differences in share prices and fundamental values; long-run differences can be ascribed, among others, to differences in bank regulation policies, taxes, capitalizations of banks, and macroeconomic policies mix.

[37] For a more detailed classification, see Sironi (1996).

[38] The main problems with this theory concern the evaluation of the future stream of dividends and the price of shares for banks not quoted on Stock Exchange. Moreover, financial institutions show a preference for a constant stream of dividends, irrespective of the value of the firm on the markets. This could lead to an increase in cost of capital that depends only on speculative movement in stock markets.

Slightly different is the earnings-price ratio. Under the assumption that actual earnings are good proxies for future return expected by shareholders, and earnings are fully distributed as dividend, cost of capital is

[7] $$c = D_n / P .$$

b) According to *Risk Valuation Models*, the risk premium in excess of the risk free rate (R_f) can be used as a proxy for the rate of return that shareholders expect. Under the assumption that actual risk premium R_p will not change in the future (historical approach), cost of capital can be sketched as $c=R_f+R_p$. In this framework, the *Capital Asset Pricing Model* (CAPM) considers cost of capital as the sum of the risk free return and the systemic risk premium (or cost). A well-know characteristic of the CAPM is the identification of the *β coefficient*, measuring the volatility of the return of the single share, relative to the volatility of the market (or asset class).[39] In this context, the cost of capital is $c=R_f+\beta(R_m-R_f)$ where R_f is the return on a risk free investment and R_m is the market return.[40]

In the case of banking firms, the valuation of cost of capital is complicated by banking regulation that implicitly influences the valuation measures discussed above. An approach that, within the *Dividend Valuation Models*, explicitly takes into account capital regulation, with the different impact implied for the cost of capital by the various compositions of output, can be traced in Zimmer and McCauley's model.[41]

The authors refer the cost of capital of a bank to equity only and define it as "… *the required spread or fee that a financial product must generate in order to increase the value of the bank. Because banks are compelled by Basle Accord rules to hold capital against assets, bank cost of capital is largely determined by the requirement profit rate on the market value of the firm's equity, and, to a lesser extent, by the risk premium paid on its subordinated debt*".[42] More in details referring to the production of a loan, the authors specify that the cost of capital is "*the net (after expenses) spread required to generate the required equity return*"[43] and therefore constitutes only a share of the total spread. Following the dividend valuation class of models, McC&Z define the equity return as net profit divided by market value of equity.[44]

Besides stressing that high leverage is not a result of an optimal decision but is broadly affected by regulations, McCauley and Zimmer (McC&Z) ascribe the marginal role of debt in evaluating cost of capital also to the competition that flattens inter-bank and

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[39] More in details β is the ratio of the covariance between share *i*'s return and the market return to the variance of the market return.

[40] It is worthwhile to stress that the CAPM relies on several strong assumption, some of which particularly troublesome for a bank model: asset markets are perfect, frictionless and the information is costless and simultaneously available to all agents; there are no imperfections such as taxes and regulations; there exist a risk free asset that investor can borrow or lend in unlimited amount and at a constant rate. Moreover, the model considers debt as a pure financial instruments while, as previously discussed, debt is a also component of the bank's production function.

[41] See McCauley and Zimmer (2989, 1990, 1991). For a discussion of the promising features of this model in assessing the role of taxation see Di Majo (1999).

[42] McCauley and Zimmer (1990) p. 536.

[43] McCauley and Zimmer (1990) p. 538.

[44] Clearly, profit rate must be depurated by temporary factors (as business cycle) and must reflect the long-run earnings potentialities of the financial firm.

deposit rates.[45] Moreover, in case of the so-called "funded products" (i.e. outputs that need funds to be produced), interest rates on debt instruments (deposits or bonds) may affect the interest rates on loans, but according to the authors these changes would be substantially irrelevant in terms of the interest margins. Since the relevant variable determining the cost of capital is the spread, the level of interest rates on debt does not directly influence the required return from a financial project. This is even less so in case of "unfunded products" (i.e. financial products dissociated from fund raising problem), for which the cost of debt financing is clearly irrelevant.

The cost of capital in McC&Z framework is therefore different from the concept usually considered by the in traditional taxation literature.

In the traditional approach the cost of capital is referred to *capital input* (usually tangibles) and is given by the so-called "*user cost*" (economic depreciation plus financial cost of purchasing the capital input). By comparing it with the *marginal revenue from the capital input*, the *decision whether to invest* is taken, under the assumption that in equilibrium firms equalise marginal cost and revenue of the investment.

On the other hand, in McC&Z framework the cost of capital refers to the *equity only* and is given by the *remuneration that the bank's shareholders expect* for it; it corresponds to the *profitability of the bank's activity (net of all the production costs and of taxes)* and determines the *convenience for the bank's shareholders to "put their money" into the bank*. In other words, the price of the financial products supplied by the bank, for instance the spread from a loan, must generate a return wide enough to repay at least the *overall costs* from inputs (labour, capital and material costs), plus the risk premium on expected losses (in case of loans) and taxes.[46] If the bank sets the spread or the fees below its cost of capital, it causes a loss for its shareholders. More precisely, the return has to be wide enough to keep the value of the bank's shares at least constant.[47] The expected return will be determined by the market conditions: it will be exogenous to the bank in perfectly competitive markets; it can reflect the imposition of a mark-up over the cost, depending on the degree of imperfection of the market.[48]

To simplify extremely, while the concept of cost of capital in the banking framework refers to the *outstanding equity* and is given by the remuneration that shareholders expect for it, in the traditional framework, able to better describe NFFs activity, it refers to the cost of acquiring physical capital and for the financial component to the *issuing new equity* or *resorting to debt finance*. Therefore, for the bank the relevant variable must be the net

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[45] "*The cost of capital as defined does not include the cost of debt financing (except in the case of using subordinated debt for tier 2 capital), despite the fact that banks are highly leveraged. The first reason for this exclusion is that banks competing in the same market pay much the same interest rates at the margin. In addition, the level of interest rates does not bear directly on the required return from a financial project.*" McCauley and Zimmer (1990), p. 538.

[46] According to some empirical literature, shareholders of financial firm compete for *net* returns. Demirguc-Kunt and Huizinga (1999) found that "*The corporate income tax appears to be passed fully to bank customers … bank stock investors require net-of-company-tax returns independent of the level of company taxation.*" p. 31. For a more recent study, see Albertazzi and Gambacorta (2005).

[47] "*In order to raise or keep constant the value of the bank, the profit rate on the new equity must be at least as great as the profit rate on existing equity.*" McCauley and Zimmer (1990), p. 538.

[48] For instance Moshirian (2001), who adopts this definition of cost of capital to identify FDI determinants in banking, observes: "*Assuming that the spread is set in such a way that it satisfies the required equity cost, one may use the spread as a proxy for the cost of capital for banks. Thus, the larger the spread required by banks in order to cover their cost of capital, the less competitive is their position in the international banking market.*"

return from the overall production, while for the NFF it is simply the minimum return savers ask in order to direct their financial resources to the firm's investment.

The presence of banking regulation complicates matters. Since Basle Accord rules require banks to hold different quantity (and quality) of capital against assets that are linked with output choices, the *cost of capital* of a financial firm *depends on the output mix*. Therefore, in computing the cost of capital (and the effective marginal tax rates) we should not so much distinguish among different types of investment and different types of financial sources, as it is usually done, but rather among different types of output services.

For each product, the cost of capital is "*the spread or fee that allows the required regulatory capital to earn the rate of return demanded by the market*",[49] and therefore able to maintain at least the same value of shares. More specifically, prudential capital ratios ask for 8 per cent of Tier1 (core capital) and Tier2 (supplementary capital) capital against risk activities, prescribing that contribution of Tier1 capital must not be less than half of the overall ratio. A higher cost is associated to Tier1 capital financing, i.e new share issue, than to Tier2 capital, i.e. other shares and various forms of subordinated debt, so that this would be favoured as a financial source. Therefore, if the constraint is binding, at the margin any increase in output would imply an equal increase in both Tier1 and Tier2 capital. The cost of capital associated to a specific financial product, that reflects in an increase of asset "i" in the balance sheet must satisfy:

$$Ai\ R_i\ (1-\tau) = RW_i\ A_i\ \ 0.04\ CT_1 + RW_i\ A_i\ 0.04\ CT_2$$

where

A_i = asset i
R_i = return *(spread or fee)* from the asset i (net of production costs)
τ = corporation tax rate
RW_i = risk weight of asset i (ranging from 0 to 150%)
CT_1 = cost of Tier1 (shareholders equity) capital
CT_2 = cost of Tier2 (other equity and subordinated debt) capital.

Normalising for Ai and reorganising terms:

[8] $$R_i\ (1-\tau) = RW_i\ \ 0.04\ (CT_1 + CT_2)$$

From which an expression for the cost of capital cc may be obtained:

[9] $$cc = \ R_i = [RW_i\ 0.04\ (CT_1+CT_2)]\ /\ (1-\tau)$$

The approach by McC&Z may provide several specification of the general model [8], in connection with the "funding requisite" of the instrument that is supplied and, as far as taxation impact is concerned, the specific marginal source of Tier2 capital.

If a product is "funded" (as a loan) by a simultaneous increase in deposits the return is given by two components: the return on the asset that is supplied and the return on the required capital, which depends on the type of capital chosen to satisfy the constraint imposed by the capital ratios. Different values of the spread necessary to cover the cost of

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[49] See McC&Z (1991).

capital may be obtained: if for example a new loan is supplied to which a 100 per cent funding by deposits corresponds, than the overall return will be given by the spread from the entire loan plus the return from investing the required 8 per cent capital increase on a risk free asset. If, on the other hand, only the 92 per cent of the loan is funded by deposits and the residual part is covered by the resources from the required capital increase, the return will depend on the marginal source of Tier2 capital chosen by the bank. If this is represented by shares (like preferred shares), than the return will be given by: the spread between the interest on borrowing and lending, only on 92 per cent of the loan; the difference between the interest rate on loans and that on a risk free asset, on the remaining 8 per cent. If the 4 per cent of the required Tier2 capital is represented by subordinated debt, the interest spread component will apply to 96 per cent of the new loan and the differential with respect of the free asset rate only for 4 per cent of the loan. If, on the other hand, the product is "not funded", it will simply give rise to the earning from the applied fee and from the alternative use of the collected capital. The return (i.e. the cost of capital) will also depend on the products that are supplied, since they are characterised by *different risk weights* for the capital ratios purposes.

These returns will have to be considered net of tax, which may differ according to the chosen financial instruments. Indeed, the Tier1 capital components do not give rise to tax deductions,[50] while in case of Tier2 capital some components, like subordinated debt, do.

Some expressions for the cost of capital in [8] are summarised in Table 1, where different hypotheses are assumed, according to the composition of output and the marginal source of Tier2 capital. Taxation enters these expressions by reducing the return from the assets and by introducing a tax saving from the deductible costs.

Table 1 – Cost of capital under capital ratio constraints

Funded *(loan/deposit)*			
Funded by 100% deposits			
Tier2 capital = preferred shares	$S(1-\tau)$	$+ 0.08\, r^*(1-\tau)$	$= Rw_i\ 0.04\ (CTier1 + CPS)$
Tier2 capital = subordinated debt	$S(1-\tau)$	$+ 0.08\, r^*(1-\tau)$	$= Rw_i\ 0.04\ [CTier1 + CSD(1-\tau)]$
Funded by 92% deposits + 4% Tier1 capital + 4% Tier2 capital			
Tier2 capital = preferred shares	$0.92\, S(1-\tau)$	$+ 0.08\,(r_L - r^*)(1-\tau)$	$= Rw_i\ 0.04\ (CTier1 + CPS)$
Tier2 capital = subordinated debt	$0.96\, S(1-\tau)$	$+ 0.04\,(r_L - r^*)(1-\tau)$	$= Rw_i\ 0.04\ [CTier1 + CSD(1-\tau)]$
Unfunded *(swaps, etc.)*			
Tier2 capital = preferred shares	$F(1-\tau)$	$+ 0.08\, r^*(1-\tau)$	$= Rw_i\ 0.04\ (CTier1 + CPS)$
Tier2 capital = subordinated debt	$F(1-\tau)$	$+ 0.08\, r^*(1-\tau)$	$= Rw_i\ 0.04\ [CTier1 + CSD(1-\tau)]$

S=interest spread on "funded" products, net of production costs. - *F*=fee on "unfunded" products, net of production costs. – r^*=interest rate on a risk-free asset. - *CTier1*=cost of Tier1 capital. – *CTier2*=cost of Tier2 capital. – *CPS*=cost of Tier2 capital when privileged shares. – *CSD*=cost of Tier2 capital when subordinated debt. - RW_i=risk weight associated to asset *i*. - τ=corporate tax rate.

[50] However, part of Tier1 capital is represented by reserves, for which the tax treatment may be different from the equity component. This issue is not considered here.

This model implies a very simple treatment of taxation and regulatory constraints. Corporate taxation reduces the return from the assets and hence increases, by this channel, the cost of capital. This increase is partly compensated by the tax saving from the allowed deductions in case of a corresponding increase in the Tier2 capital in the form of subordinated debt. The size of this compensatory effect depends on the risk weight associated to the acquired asset.

To contrast the increase in the cost of capital determined by the tax the banking firms may have different opportunity of tax shifting, according to the prevailing market conditions. Their shifting behaviour therefore could affect consumers' and NFFs' decisions. In the McC&Z formulation, however, a full tax shifting behaviour is presumed.

Although this approach has the advantage of highlighting in a very direct way the link going from corporate taxation to bank's cost of capital, and hence potentially to the financial products' prices, it is not satisfactory enough as far as the modelling of taxation and tax shifting is concerned. Indeed, the aspects taken into consideration are not the only ones by which taxes would actually influence the expressions of the cost of capital. Among the other relevant aspects, for instance, there are depreciation allowances and loan losses deductions for tax purposes, that would reduce the cost of capital but that, as we stressed before, may have a very different influence on banking firms with respect to NFFs. To integrate the analysis of the cost of capital in the direction of better modelling the role of taxation, some hints may come from literature on the marginal effective tax rates.

5. Tax indicators: Do we need to be compute them differently for banks?

The tools traditionally proposed by public finance literature to measure the general impact and the distortionary role of taxation are tax rates of some kind. There is an extensive literature on the identification of the best tax indicators, the choice of the most suitable ones obviously depending on the economic questions to which a particular measure might provide the answer. Without going into details,[51] it's worthwhile to recall the main lines of research on the issue of tax measurement.

The three main families of tax rates are represented by *statutory* tax rates, *backward-looking effective* rates and *forward-looking effective* rates. The first ones are widely used in comparing corporate taxation systems, but do not give information about the actual tax burden, which is obviously influenced by the definition of the tax base. The second family of indicators looks at the ratio between taxes actually paid and a reference economic aggregate for the tax base (e.g. profits, operating surplus, etc.); it measures the effects of all the factors determining the tax burden, both the statutory and the exogenous ones (for instance, the economic cycle). The third one is the most popular. It measures the theoretical incidence from the application of tax laws (statutory tax rates, depreciation rates and other ways in which taxable income is defined) to the perspective return of a specific capital investment project; it is given by the ratio between the tax wedge (i.e. difference between gross and net-of-tax return) and the gross-of-tax return from the

[51] For extensive discussions on this issue see Nicodéme (2001), OECD (2000), Martinez-Mongay (2000) and Devereux (2004). For an analysis of the problem related to financial firms see also Monacelli (2004).

investment. This approach usually refers to a marginal investment, i.e. not producing extra-profits, and gives rise to the so-called marginal effective tax rates (METR).[52] It therefore measures the share of gross return necessary to repay taxes, at the margin, if the firm were to invest in a specific capital input, typically identified by machinery, inventories, or industrial buildings.

When dealing with banks, all these families of indicators raise problematic issues.[53] However, it is clear that the forward looking approach asks for some more structural modification. Traditional METRs, indeed, focus on the investment decision to buy tangible assets, and hence do not seem particularly adequate in case of banking firms, where tangibles represent only a low share of total assets and are of minor importance in the production function.

Even less satisfactory, from our perspective, is the equivalence between the investment decision of the FF and the acquisition of financial assets as its counterpart. Financial assets acquisition, in a framework like ours, is to be considered as output, not as input accumulation. The cost would be a cost of overall production rather than a cost of capital. Moreover, the *cost of capital expression should be distinguished according to the different output*, in order to take into consideration the effects of capital ratios: the increase in the risk capital necessary to finance 1 unit of investment varies according to the risk profile of output that is generated.

Since the role of capital investment, at least in the traditional terms, seems hardly significant for a financial firm, while it can be considered a labour-intensive firm, it seems more accurate to consider a method that aggregates taxes, or METRs, on the different inputs and to switch from an input-investment decision to a production decision perspective. On this line of research the synthetic measure proposed by McKenzie, Mintz and Scharf (1997) can be employed to obtain a "*summary statistic*" of how taxes impose upon "*the cost of doing business*".[54]

5.1 A model without taxation

Starting from the basic representation of the production function for a financial firm, previously introduced by equations [1] and [2], the bank's costs, from depreciation of capital, labour and intermediate goods, can be represented as

$$[9] \qquad C = p_c K(\delta) + w L + p_x X$$

Drawing from McKenzie, Mintz and Scharf's methodology and from McKenzie's application to banks,[55] we focus on the loan production function in a world without taxes. In this framework,[56] the cost function to be minimized can be simplified as:

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[52] The METR were originally proposed by King and Fullerton (1984). Devereux e Griffith (1998) also developed this approach with reference to infra-marginal investments, calculating the so-called effective average marginal tax rates (EAMTR). The "average" derives from the fact that these indicators are obtained as the average of taxes due on hypothetical investments with different profitability levels.

[53] See Monacelli (2004).

[54] McKenzie, Mintz and Scharf (1997), p. 339.

[55] McKenzie (2000) proposes a model of perfect competition that may not be appropriate for the banking sector but has many suitable characteristics for a tax analysis.

[10] $C\ (L_n; Z_L, Z_X, Z_K)$

where Z_i are the user cost of inputs.[57] The marginal intermediation cost function, MC, can be derived on the basis of the cost function, presuming a positive relation between marginal cost and user costs of inputs. As usual, user cost of labour and materials corresponds to the unit "price" of inputs, while the user cost of capital must include the opportunity cost of finance ρ, the depreciation rate δ and the inflation rate (here assumed to be zero), in addition to the price of capital goods p_c.

Under the profit maximization framework, in a world without taxes, the optimum quantity of loans will satisfy the equivalence between marginal revenue (r_L-r^*) [58] and marginal cost from intermediating (producing) an extra unit of loan *MC*.

However, the marginal intermediation cost *MC*, stemming from the inputs, must be corrected to take into account that "*banks are typically corporations, which are owned by shareholders who require a minimum (expected) rate of return of their investment in the bank in order to hold the bank shares*" (i.e. the opportunity cost of finance ρ) and for "*the fact that a certain fraction of the loan made by the bank will go bad, due to default*" so that "*the marginal loan must also generate a rate of return high enough to cover these loan losses*"[59] or, in other terms, the opportunity cost of finance must be adjusted for the default risk ζ. The result of such a correction is the marginal cost of issuing an extra unit of loan. The equilibrium condition is:[60]

[11] $(r_L\text{-}r^*) = MC\ (L_n; Z_L, Z_X, Z_K)\ (\rho+\zeta)$,

where r_L is the interest rate on loans and r^* is the return on an alternative risk free asset, or

[12] $$r_L^n = \frac{\left(r_L - r^*\right)}{MC} - \zeta = \rho$$

which shows that the net-of-loan-losses rate of return required by the financial market ρ is equal to the return to the loan divided by the cost of producing it.

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56 The model can be rigorously developed starting from expressions [1] [2] [10] by formulating a general inter-temporal maximization problem, where the financial firm chooses the levels of activity and minimizes costs in order to obtain the maximum profit. See Appendix 1.

57 In other terms, economies of scope in the loan and deposit production are not considered, i.e. cross derivatives are zero.

58 The return on a unit of loan is given by the difference between the interest rates applied on the loan r_L and an alternative return r^* from a risk-asset (for instance, in the inter-bank market). See Appendix 2.

59 McKenzie (2000) p. 8. Although recognising the central role of equity finance, the author actually does not exclude deposit as an alternative source and, in the spirit of M&M approach, identifies the opportunity cost of finance as the usual weighted average between debt and equity expressing ρ as a function of return on equity and interest on deposits and of the weights exogenously taken. It is interesting to note how McKenzie consider his own approach as reversing the "*traditional IO approach to modelling banks*", which "*invokes a simple balance sheet relationship that effectively specifies that loans must equal deposits less reserve requirements*" so that "*deposits are the only source of funds for the bank*" and "*the opportunity cost of finance is simply the interest rate on deposits* r_D".

60 The specification of the model presented here is modified with respect to the original McKenzie's one in order to *treat both loans and deposits as output*. In particular, we split up the interest spread into the margin on loans over the return r^* on an alternative risk-free asset, and the margin on deposits given by the difference between the alternative return and the (lower) interest paid to depositors. In such a way we are able to maintain a positive marginal revenue to deposits by using an identical specification for both products.

5.2 Introducing taxation

Introducing taxes leads to consider a new formulation of the marginal cost

[13] $MC\ (\ L_n;\ Z_L(1+\tau_L),\ Z_X(1+\tau_X),\ Z_K(1+\tau_K)\ )$,

where τ_i are the "traditional" METRs on inputs.[61] Expression [13] can be rearranged to obtain a single measure of the impact of the tax system on marginal cost (the marginal effective tax rate on <u>intermediation</u> costs T), by aggregating the various expression for METR.

[14] $MC(\ L_n;\ Z_L(1+\tau_{mL}),\ Z_X(1+\tau_{mX}),\ Z_K(1+\tau_{mK})\ ) = (1+T_L)\ MC(L_n;\ Z_L,\ Z_X,\ Z_K)$

The T_L tax rate thus solves the expression:

[15] $$T_L = \frac{MC_{AT} - MC_{BT}}{MC_{BT}}$$

where MC_{AT} and MC_{BT} represent the marginal intermediation costs after and before taxes, respectively.

The T_L rate can be obtained as a weighted average of the METRs on input costs, where factors shares, s_i, are the weights.[62] More in detail, under the assumption of a zero elasticity of substitution between factors (as in a Leontief's function), the METR on intermediation costs T_L is a simple arithmetic average of METRS of the inputs τ_i:

[16] $T_L = (1+\tau_{mL})\ s_L + (1+\tau_{mX})\ s_X + (1+\tau_{mK})\ s_K - 1$

Going back to the equilibrium condition [11] we may now introduce taxation on both sides of the equality. For the revenue side, by subtracting the corporate tax on loan's return and adding up the corporation tax saved on the fractions of loans γ that are deductible for risk provision, we get the expression for the *net return of <u>issuing</u> an extra unit of loan*:

[17] $(r_L - r^*)\ (1-\tau_c) + \tau_c\ \gamma\ \zeta$

The identity between marginal benefit and marginal cost becomes:

[18] $(r_L - r^*)\ (1-\tau_c) + \tau_c\ \gamma\ \zeta = (1+T_L)\ MC(L_n;\ Z_L,\ Z_X,\ Z_K)\ (\rho+\zeta)$

that can be reformulated as:

[19] $$r_L^g = \frac{\left(r_L - r^*\right)}{MC} - \zeta = \frac{\left(r_L - r^*\right)(1+T_L)(\rho+\zeta)}{\left(r_L - r^*\right)(1-\tau_c) + \tau_c\gamma\zeta} - \zeta$$

to obtain the net-of-loan-losses and gross of tax rate of return on a marginal loan r_L^g.

Finally, under the traditional METR methodology, an <u>overall</u> marginal tax rate on issuing a loan (an hypothetical tax rate that can transform a gross rate into a net rate of return) can be defined as

[20] $$\tau^* = \frac{r_L^g - r_L^n}{r_L^n}$$

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61 METR on inputs will be discussed in Appendix 2.

62 The specific averaging method depends on the assumption about the form of the production function.

solving $r_L^n (1+\tau^*) = r_L^g$.[63]

The same methodology can be applied to the issuing of a marginal unit of deposit. The gross of tax rate of return will be

[21] $$r_D^g = \frac{\left(r^* - r_D\right)}{MC_D} = \frac{\left(r^* - r_D\right)(1+T_D)\rho}{\left(r^* - r_D\right)(1-\tau_c)}$$

where MC_D obviously refer to the marginal cost of intermediating an additional unit of deposit and T_D to the METR on the marginal cost of producing an incremental unit of deposit.

6. Some preliminary conclusions

From the analysis of banks' business we identified several peculiarities capable of affecting the mechanisms by which taxation works out its effects. The first one has to do with the optimal financial structure; for banking firms this is actually the counterpart of the production process and has much less to do with the financing of real capital accumulation, as for NFFs. A second aspect, related to the first one, has to do with the definition of cost of capital, which is generally referred by banking literature to equity only and is defined as the net price of financial product able to generate a minimum return to shareholders, high enough to guarantee that the market value of their shares does not decrease.

Any attempt to analyse the role of taxation in a banking context has to face these two peculiarities. Public finance literature offers a well-established conceptual framework that proved extremely powerful for taxation analysis. However, the underlying theoretical models are hardly capable of satisfactorily describing how banking firms operate.

We reviewed in paragraph 5 a model for cost of capital determination applied to banking firms and in paragraph 6 a particular variant of the marginal effective tax rates model. With respect to the traditional approaches derived from M&M models, mainly focusing on physical capital, both these models look at the production process rather than at the investment decision and its financing. By doing so, they offer common grounds for analysing the effects of taxation on the bank's decision process more satisfactorily.

The cost of capital model is able to capture the jointness of the production process (especially the simultaneousness of the loan and deposits supply implied by the traditional intermediation activity); it also accounts for the anomaly in determination of the optimal financial structure and explicitly takes into account the regulatory constraints on the capital ratios. The expression of the cost of capital is not connected with the "use" of capital, as in standard cost of capital literature referring to NFFs, but it has more the nature of a mark-up over the overall return from output. The presence of regulatory constraints, applying in different ways to different products, differentiates the cost of capital according to kind of marginal output we refer to (similarly to what happens when

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[63] Alternatively, the marginal tax rate can be defined as $\tau^* = \frac{r_L^g - r_L^n}{r_L^n}$, with τ^* solving the $r_L^n = (1+\tau^*)\, r_L^g$.

computing NFFs cost of capital, for different marginal sources of finance or different kind of investment).

On the other side, the METR approach, in the version presented here, looks at the impact of the overall taxation on production, so that it better fits the bank's framework and its intertwining between investment and production. Furthermore, it distinguishes inside the cost of capital the "user" component, stemming from the economic depreciation and the price embedded in the marginal cost expression, from the capital remuneration. The latter one, rather than being modelled as the simple cost to repay investors in financial markets (typically given, in NFFs models, by the interest rates on debt finance or the opportunity cost for own capital, or an average of the two), is more properly considered as a mark-up applied to the overall return from the production of a marginal unit of financial services. In case of loans an extra component for loans losses is also considered.

Both models consider the cost of capital as a more general cost concept than it usually is for NFFs. It is the return on the bank's activity wide enough to cover the costs stemming from the overall inputs (labour, capital and material costs), from the expected losses in case of loans supply, and from taxes.

The integration between these two approaches is complex but seems promising; it will continue be the objective of our research. Taxation can be modelled more specifically by the METR approach exploiting the equivalence between the overall METR and the average of the METRs on the single inputs. Regulatory restrictions may be modelled by following the McC&Z approach, diversifying the expressions for the cost of capital and the effective tax rates, not only among types of investment and sources of finance (as it is usually done), but also among different output mixes.

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APPENDIX 1: The model

Starting from a perfect competition model,[64] the profit function of the bank can be sketched as:

[A1] $\Pi = r_L Ln - r^* IB - r_D D + OP - C(D, Ln, OP)$

where Ln, D, OP are loans, deposits and other financial products, IB is the inter bank position and r_L, r_D, r^* are loan, deposit and interbank rates.
Considering that $IB=D-Ln$ and $OP=f\ NO$, where f are fees and NO number of operations, the profit function can be rearranged as:

[A2] $\Pi = (r_L-r)Ln + (r^*-r_D)D + f\ NO - C(D, Ln, OP)$,

leading to a maximization problem with usual first order condition, where marginal revenues equal marginal costs:

[A3]
$$\frac{\partial \Pi}{\partial Ln} = (r_L - r^*) - \frac{\partial C}{\partial L} = 0$$
$$\frac{\partial \Pi}{\partial D} = (r^* - r_D) - \frac{\partial C}{\partial D} = 0$$
$$\frac{\partial \Pi}{\partial NO} = f - \frac{\partial C}{\partial NO} = 0$$

In a multi-period perspective, the bank's value maximization problem may be expressed as:

[A4] $$\text{Max} \int_0^{\infty} e^{-\rho t}\left[(r_L - r^*)L_n + (r^* - r_D)D + OP - wL - p_c I - T_L - T_c\right] dt$$

where w is wage, L is the amount of labour, I is investment, p_c is the prize of capital product and T_L and T_C are respectively, taxes on labour and the corporation tax.
Labour and capital are allocated among different outputs and so:

[A5] $L = L_{Ln}+L_D+L_{OP}$

$I = I_{Ln}+I_D+I_{OP}$

Moreover, taxes on labour and capital are given by

[A6] $T_L = \tau_L\, wL$

$T_C = \tau_c\,[(r_L-r^*)Ln + \gamma\zeta\, Ln + (r^*-r_D)D + f\ NO - w(1+\tau_L)L - p_c I - \alpha K]$

and the bank's problem becomes

[A7] $$\text{Max} \int_0^{\infty} e^{-\rho t}\left[(r_L - r^*)L_n(1-\tau_c) + \tau_c y\zeta Ln + (r^* - r_D)D(1-\tau_c) + OP(1-\tau_c) - w(1+\tau_L)L(1-\tau_c) - p_C I + \tau_c \alpha K\right] dt$$

64 See, for example, Freixas and Rochet (1997).

under 3 equations of motion:

[A8] $\dot{K} = I - \delta K$

$\dot{L} = l(K,N) - \zeta L$

$\dot{D} = d(K,N)$

This problem can be solved by first choosing the amount of inputs, given an amount of outputs, that minimize costs and then by choosing the level of output in order to maximize profits.
The cost minimization problem is:

[A9] Min $\int_0^{\infty} e^{-\rho t}\left[w(1+\tau_L)L(1-\tau_c) + p_C I - \tau_c \alpha K_C\right] dt$

under the equations of motion [A8].

The resolution of this problem gives the conditional input demand function for inputs and, correspondingly, the cost of producing a given amount of output (loan, deposit or other product), expressed as a function of METR on inputs.

[A10] $C_i = C\,[i, w(1+\tau_L), p_c\,(\rho+\delta)\,(1+\tau_k)]$ with $i = Ln, D, OP$

The bank's present value maximization problem is

[A11] Max $\int_0^{\infty} e^{-\rho t}\left[(r_L - r^*)L_n(1-\tau_c) + \tau_c y\zeta Ln + (r^* - r_D)D(1-\tau_c) + OP(1-\tau_c) - C_L - C_D - C_{OP}\right] dt$

subject to:

[A12] $\dot{L}n = l(K,L) - \zeta Ln$

$\dot{D} = d(K,L)$

Therefore, the current –value Hamiltonian is

[A13] $H = [(r_L - r^*)Ln(1-\tau_c) + \tau_c\gamma\zeta\, Ln + (r^* - r_D)D(1-\tau_c) + f\,NO(1-t_c) - C_{Ln} - C_D - C_{OP}] + \lambda\,(1-\zeta Ln) + \mu\, d$

that, after some manipulations, gives

[A14] $r_L^g = \dfrac{(r_L - r^*)}{MC_{Ln}} - \zeta = \dfrac{(r_L - r^*)(1+T_L)(\rho+\zeta)}{(r_L - r^*)(1-\tau_c) + \tau_c\gamma\zeta} - \zeta$

and

[A15] $r_D^g = \dfrac{(r^* - r_D)}{MC_D} = \dfrac{(r^* - r_D)(1+T_D)\rho}{(r^* - r_D)(1-\tau_c)}$

where MC_{Ln} and MC_D refer to the marginal cost of intermediating an additional unit of loan and deposit, and T_L and T_D the corresponding METR.

Appendix 2: METRs on inputs

METR on labour

The marginal effective tax rate on labour incorporates social contributions and, if necessary, other taxes on value added, as IRAP in the Italian case. Social contribution rates are differentiated with category of worker and, in order to calculate a representative measure, could be necessary to refer to a "typical" worker. In general term the before tax rate of return of labour is

[A16] $r^n = w$

Then, adding social contributions, we have

[A17] $r^g = w(1+\tau_L)$

where r^g is the after tax rate of return of labour[65] and τ_L is the social contribution rate. The METR is

[A18] $$t_{mL} = \frac{r^g - r^n}{r^n} = \frac{w(1+\tau_L) - w}{w} = \tau_L$$

METR on capital

Tangible capital

In the traditional analysis of investment, the fundamental concept for quantifying the effects of tax is the user cost of capital, a concept introduced by Jorgenson (1963) and developed by several authors. This concept is based on the equivalence between renting and owning a piece of durable capital. In its simplest form, the user cost of capital (r^n_k) is the financial cost of capital or the opportunity cost of funds, as measured by the weighted average (α is the debt asset ratio) of the nominal interest rate (r) and opportunity cost of equity (ρ) less the expected rate of inflation (π).

[A19] $r^n_k = \alpha r + (1-\alpha)\rho - \pi$

The definition of r^n_k needs to be broadened to incorporate economic depreciation, relative prices, and taxes. In the standard user cost formula, capital is assumed to depreciate geometrically at rate δ. As with any microeconomic price variable, the user cost must be defined as a relative price. The numerator is the price of new investment goods (q), and the denominator depends on an additional assumption about the benefit to the firm from the new unit of capital. For a profit-maximizing firm, the relevant benefit is the incremental output, and the price of output appears in the denominator.
A variety of taxes can be reflected in the user cost formula: the purchase price is deducted as a business expense gradually over the life of the asset. The present value of this stream of current and future tax depreciation deductions (ζ) is multiplied by the rate of income

[65] The expression for r^g results from the usual maximization condition. If the net of taxes marginal productivity of labour is equivalent to the marginal cost $w(1+\tau_L)$, which is deductible for corporation tax purposes, we obtain: $MPL(1-\tau_c) = w(1+\tau_L)(1-\tau_c)$ and $MPL = r^g = w(1+\tau_L)$

taxation (τ_c), and the combined expression enters the user cost formula as an adjustment to the purchase price. Income taxes also enter the model by lowering the price of output in the denominator and perhaps the financial cost of capital if nominal interest payments are tax deductible. Lastly, investment tax credits (k) on the purchase of new capital goods can be considered; these credits are reductions in tax liabilities determined as a percentage of the price of a purchased asset.
More in details, the user cost of capital *ucc* can be written as

[A20] $$ucc = (r^f + \delta - \pi)\, q\, (1 - k - \tau_c \zeta) / (1 - \tau_c) - \delta$$

with $r^f = \alpha\, r\, (1 - \tau_c) + (1-\alpha)\, \rho$

where α is, again, the share of debt in total assets. Normalizing the price of capital goods and considering the net-of-depreciation marginal productivity (that under the maximization assumption is equal to the user cost), we have

[A21] $$r^g_k = (r^f + \delta - \pi)\, (1 - k - \tau_c \zeta) / (1 - \tau_c) - \delta$$

that is the gross of tax rate and net-of-depreciation rate of return of marginal unit of capital.
As previously discussed, the share of debt capital can be considered zero in the case of a financial firm where risk capital is adequate for purchasing tangible assets (i.e. α=0). At the same time, financial services are exempt from VAT and, as a consequence, banks cannot deduct from their VAT liability the amount of tax they paid on purchases of capital goods as NFFs do.

[A22] $$r^g_k = [1 + \tau_{vat}\, (1 - \alpha_{PR})]\, (\rho + \delta - \pi)\, (1 - k - \tau_c \zeta) / (1 - \tau_c) - \delta$$

where τ_{vat} is the VAT rate and α_{PR} is the pro-rata coefficient[66].
In case of buildings, however, there isn't any VAT to be computed.

Intangible capital

In order to calculate METRs on research and development activity, which can result in intangible assets or human capital accumulation, labour inputs and capital inputs, must be split up. Differences from previous expression may arise with regard to specific tax credits and amortization period embedded in tax legislation.
As usual, the METR can be computed as:

[A23] $$t_{mL} = \frac{r^g - r^n}{r^n}$$

[66] As the output of a financial firm consists of both exempt and taxable supplies of services, where only the taxable operations qualifies for VAT deductions, the problem of apportioning the taxes paid on purchased inputs between taxable and exempt output arises. The Pro-Rata rule is a method for dealing with this problem. Deductible input taxes can be obtained by applying the ratio between taxable output and total output to the total input tax paid.