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Bancassurance in Europe: what are the efficiency gains?

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Introduction and motivations

During the last 20 years, financial services industry has experimented a general trend of integration and consolidation: in Europe the combination between the banking and the insurance activities, named "bancassurance", has become particularly successful, catching the attention of managers and academia.

As outlined in Chen *et al*. (2008), most studies dealing with bancassurance have only been descriptive in nature, providing a broad insight into economic rationales, advantages and drawbacks for all the institutions involved. Only few authors have provided quantitative findings, focussing on the potential risk diversification benefits associated with bank expansion into the insurance industry (e.g. Boyd *et al*., 1993; Genetay and Molyneux, 1998; Laderman, 2000; Estrella, 2001; Chen *et al*., 2006). Nevertheless risk reduction is not universally recognised as a valid economic rationale for diversification: one may note that shareholders can always reduce their risk by holding a diversified portfolio of non diversified firms, gaining the risk-reduction advantages of diversification without incurring in the cost of managing a large organisation (see for example Klein and Saidenberg, 2000). Thus diversification would be worth only if it provides some kind of cost or revenues economies, improving the operational efficiency of financial firms. Despite the relevance of this argument we can find only few empirical analyses dealing with efficiency issues and adequately focussed on bancassurance: it is more frequent, indeed, to investigate all types of banking diversification in other financial or non financial sectors, comparing traditional commercial banks against financial conglomerates or universal banks. The thesis aims to provide an exclusive focus on the combination between the banking and the life insurance activities, as accurate as possible[1]. In addition to this we believe that in order to offer a complete view of the phenomenon we cannot limit the analysis to the banking point of view, but we have to explore also the insurance side: at our knowledge there is only one study adopting a two side approach (Verweire, 1999). Furthermore, as we are aware, there are no empirical analyses assessing performance differences among alternative structures

[1] Even if we can find some examples of cooperation also in the non life business, most of the bancassurance experiences regard combinations between banking and life insurance, able to exploit more considerable complementaries and similarities.

of bancassurance (e.g. captives *vs.* joint ventures), even if this is probably a relevant research question, especially for practitioners.

For all the above mentioned reasons, we believe that it is worth conducting further investigations on the bancassurance phenomenon, from both the banking and the insurance sides.

Consistently, the aim of this thesis is to assess if the combination between the banking and the insurance activities results in efficiency gains from both the cost and the profit sides.

This objective can be disentangled in the following research questions:

1. Are banks engaged in the insurance business more cost and profit efficient than their competitors specialised in traditional and investment banking?
2. Are bancassurance companies more cost and profit efficient than independent companies operating in the life business?
3. Which model of bancassurance reaches the best performance?

The remainder of the thesis is organised as follows.
Chapter 1 provides a theoretical introduction to the investigated phenomenon, defining the concept of bancassurance and resuming its historical development in Europe. We also describe all possible organisational forms realising the combination between the banking and the insurance activities, implying different degrees of integration (from the less integrated structures – i.e. simple distribution agreements - to the more integrated ones – e.g. pure financial conglomerates). Then we present a literature review of studies dealing with the bancassurance phenomenon. Consistently with the aim of this work, we pay more attention to empirical analyses that we classify with reference to the alternative economic rationales identified (and tested) to explain the integration between banks and insurance companies.

Chapter 2 introduces the concept of efficiency and describes different frontier methodologies used in order to measure firm performance on the cost and the profit sides. Regardless the chosen approach, comparisons based on a common frontier require the assumption that all the analysed firms share the same production technology and similar environmental conditions, while in case of strong heterogeneity in the sample efficiency

scores can be strongly biased. To overcome this limitation it is necessary to include in the model some firm specific factors or environmental variables taking into consideration main differences among the firms. Generally speaking we can refer to these variables as exogenous factors that are supposed to be out of the management control in the short run but able to influence efficiency.

Chapter 3 presents the empirical analysis conducted in order to answer the first research question, comparing banks active into the life insurance business with banks specialised in commercial and investment banking. We first refer to a cross country sample of banking institutions operating in the EU-15 area; in the attempt to extend the analysis to the insurance side we experimented some strong difficulties due to the lack of available data: for example on a cross country base it was not possible to collect detailed information on the relevance of the bancassurance distribution channel for every life insurance company. For these reasons, in order to have a complete view of the bancassurance phenomenon from both the banking and the insurance sides, we were forced to restrict our analysis to the Italian case, replicating our study for the banking side on a national base. Consistently with this choice, Chapter 3 reports both the wider study conducted for Europe and the analysis focussed on Italian banks.

Chapter 4 presents the empirical analysis realised to answer the second and the third research questions, comparing alternative structures of bancassurance companies with independent insurance firms operating into the life business. In order to obtain results based on detailed and reliable data, we conduct the analysis on a national base. The domestic market is strongly representative for our study being Italy one of the European countries in which the bancassurance phenomenon is more common and developed.

Main findings, considerations about the limits of this study and possible further developments are finally presented in Concluding Remarks.

Chapter 1: Literature Review

1.1 Introduction

The aim of this chapter is to shed some light on the main characters of bancassurance and review both theoretical and empirical studies dealing with this phenomenon. The remainder has the following structure:

- Section 1.2 summarises the historical development of bancassurance, discussing economic rationales for bank diversification into the life insurance business and explaining different features of alternative organisational models;
- Section 1.3 reviews empirical studies testing the risk diversification hypothesis (i.e. the opportunity to improve the risk-return profile of assets by the combination between the banking and the insurance activities);
- Section 1.4 analyses previous literature dealing with the efficiency/scope economies hypothesis (i.e. the opportunity to exploit cost and revenue synergies deriving from the joint production of different financial services);
- Section 1.5 concludes motivating the objective of the thesis and its innovative contribution to the existing literature.

1.2 The development of bancassurance in Europe

For the first time, the term "bancassurance" has been used in France, where cooperation between banks and insurance companies started earlier than in other European countries. This world was originally coined to indicate simple distribution of insurance products by bank branches, while at present it is used to describe all kinds of relationship between the banking and the insurance industries (Quagliarello, 2004). Along with the development of the phenomenon, bancassurance definitions are becoming more and more general, as in the following examples:

«Bancassurance is basically the provision of and selling of banking and insurance products by the same organisation under the same roof» (Elkington, 1993).

«Bancassurance can be described as a strategy adopted by banks or insurance companies aiming to operate the financial market in a more or less integrated manner» (Swiss RE, 1994).

The convergence between different sectors of financial intermediation (conglomeration) has been encouraged by the deregulation process started at the end of the Eighties. In Europe the 1989 Second Banking Directive allowed universal banking and unlimited reciprocal participations with investment and insurance firms. In USA regulatory hedges between financial institutions have been removed later, by the 1999 Gramm-Leach-Bliley Act: nowadays financial conglomerates are present in all developed countries. We cannot find a unique and strict definition of financial conglomerates in economic literature: for example in Vander Vennet (2002, p.254) they are defined as «*financial institutions that offer the entire range of financial services*». In general, from an economic perspective, a financial conglomerate is an institution engaged in more than one of the following businesses: traditional (commercial) banking, investment banking and insurance. Recently the concept has been fairly delimited by EU regulation: the Directive 87/2002/CE classifies a group as a financial conglomerate if engaged in both the banking and the insurance activities in a significant way (with reference to total assets or capital requirements), while the mix of commercial and investment banking is not identified as a conglomerate. As a result, it is possible to affirm that regulators are more concerned about financial conglomeration when assuming the form of bancassurance.

Bancassurance, however, cannot be view simply as a result of the deregulation process: as pointed out by Locatelli *et al.* (2003), changes in financial services needs have been particularly determinant. Household saving has moved from deposits to more remunerative investments determining a dramatic drop in traditional banking profitability. Banks have tried to compensate the decrease in their interest margin by diversification in investment banking or insurance. Life business has appeared as a particularly interesting opportunity for the following reasons:

- the progressive ageing of population in all developed countries;
- the decrease in welfare state protection offered by governments;
- the existence of some similarities and complementaries between the banking and the insurance activities, especially for life products.

The cooperation between banks and insurance companies, initially limited to the distribution of life products through bank branches, has gradually become a more strict relationship aiming to operate the financial market in a more integrated way. Daniel[2] (1995) distinguishes three different stages of bancassurance evolution:

- in a first stage, up to 1980, banks provide only insurance products strictly linked to their traditional activity, for example related to consumer credit or mortgages;
- the second stage starts in the early Eighties, when banks begin to offer life insurance products with an high financial content (e.g. annuity policies);
- the third stage begins at the end of the Eighties with a real boom in the Nineties: banks can offer a wider range of insurance products, more complex than the previous ones, as index or unit linked policies.

These stages are referred especially to the French market; despite the existence of some differences between countries, it is possible to sustain that simple distribution agreements during the Seventies and the Eighties became a mix of partnerships and share exchanges in the early Nineties (Molyneux, 2002).

The appearance of more complex and integrated models has not determined the disappearance of the previous ones: we can currently observe several forms of bancassurance, more or less successful depending on institutional and economic framework, type of business mix and objectives of the firms involved. Following existing literature (Hoschka, 1994; Van der Berghe and Verweire, 2001; Voutilainen, 2005; Staikouras, 2006) we can distinguish between several models:

- ***cross selling agreements***: thanks to a simple partnership, banks sell insurance products through their branches, on behalf of a single company or several companies. This kind of agreement has many advantages: it is simple and reversible, not implying any change in the ownership structure or in the organisational model of the firms involved, that remain absolutely independent. On the other hand, we have to consider the existence of some drawbacks: for example, conflicts of interest between banking and insurance products sharing the same distribution channel are more likely in absence of coordination between two different managements. It is also important to notice that banks can only offer simple and standardised insurance products, not requiring

[2] For a detailed analysis of the bancassurance historical development see also Elkington, 1993; Hoschka, 1994; Genetay and Molyneux, 1998; Locatelli *et al.*, 2003.

consulting services by highly specialised resources. These days simple cross selling agreements are generally signed by banks that approach the insurance business for the first time or by small size institutions without the necessary resources and know how to develop bancassurance stand alone.

- ***cooperation between two independent partners***, realised through strategic alliances (often reinforced by cross ownerships in the form of minority stakes) or joint ventures. Surely, a joint venture is a stronger form of cooperation, aiming to exploit in the best way the skills of every participant, enforcing their specialisations: generally insurance companies take care of product design, while banks realise distribution. These alliances can reach significant synergies concerning know how, human capital, cross selling and scope economies, but it is necessary that the two partners share the same strategy and the same engagement in resources.
- ***control by ownership***: the banking and the insurance activities are managed as completely integrated, under the direction of the same ultimate owner. It is possible to distinguish two cases:
    - the bank establishes a subsidiary completely dedicated to the insurance business, or buy an insurance company already operating on the market. This "captive" model allows the bank to use information at its disposal, designing products suitable for well known customers' needs and avoiding the danger of "cannibalization" (Berghendal, 1995).
    - the same holding company controls the banks and the insurance companies, subject to a unique strategic design.

It is worth noticing that stronger forms of cooperation (e.g. joint ventures, strategic alliances or control by ownership) require a greater effort in coordination than simple distribution agreements, a more stable relationship and changes in the ownership structure or in the organisational model of firms involved. On the other hand they permit to better exploit the skills of each subject enforcing its specialisation, raising up the opportunity to realise cost and revenue synergies.

Some studies focus on the identification of the most performing alternative structure for bancassurance combinations, adopting a managerial point of view. Voutilainen (2005) reports evidence from interviews with some Finland experts discussing nine different criteria to compare the performance of alternative bancassurance models: maximise the

efficiency of product development; implement the one door principle; compromise possibly conflicting earnings logics as well as possible; maximise the efficiency of customer relationship management; optimise cost and revenue synergies; minimise channel conflicts; optimise required solvency capital; maximise investor power; maximise the efficiency of sales management. Results show that, from a managerial point of view, the most important criteria are those related to cost/revenue synergies and channel conflicts: control by ownership and financial conglomerates seem to be the preferred models while joint ventures, not common in Nordic countries like Finland, are not taken into consideration.

Staikouras (2006) lists different drivers of success, such as flexibility in accepting and adopting each other's culture, proper corporate governance model, management initiative, corporate brand values, customer relationship management and technology. Similar criteria are also identified in the study of Lin *et al*. (2009) dealing with bancassurance in Taiwan.

While we can find a large number of theoretical studies dealing with organisational and management issues, there are only few empirical analyses dealing with bancassurance and providing quantitative findings on the potential wealth gains. These studies test different economic rationales in order to explain the bancassurance success, generally adopting the banking point of view. We can distinguish among several hypotheses:

- ***the information hypothesis***: banks' deep knowledge of customers' financial situation, and their attitude to risk, can represent an important competitive advantage in providing life insurance products;
- ***the scale economies hypothesis***: banks try to grow in dimension for different reasons: to exploit scale economies, to protect themselves from acquisitions, and so on;
- ***the risk diversification hypothesis***: banks enter into the insurance business in order to increase profitability and reduce risk;
- ***the efficiency/scope economies hypothesis***: banks' diversification in the insurance sector can be explained also by the pursuit of an higher level of efficiency, exploiting cost and revenues synergies.

The last two hypotheses have been tested by several empirical analyses, reviewed in the following two sections.

1.3 Bancassurance: the risk diversification hypothesis

Many analysts (Boyd *et al*., 1993; Genetay and Molyneux, 1998; Laderman, 2000; Estrella, 2001; Fields *et al.*, 2005, 2007; Chen *et al*., 2006; Nurullah and Staikouras, 2008) have suggested that bancassurance phenomenon can be explained by the opportunity of improving the risk return profile of bank's portfolio activities.

«Insurers' liabilities and assets are mainly long term, while banks predominantly carry medium-term assets financed by short term liabilities. Pooling may therefore result in risk reduction….There is also a consensus that long term insurance is less risky than lending activities» (Genetay and Molyneux, 1998, p. 136).

This risk reduction hypothesis has been tested by several empirical analyses; given that bancassurance is a relatively recent phenomenon, most studies have been based on simulated M&A between banks and other financial intermediaries.

Boyd *et al*. (1993) simulate M&A between banks and different categories of financial firms in the US market, finding that mergers with insurance companies decrease risk (measured as the volatility of ROA) and probability of failure; on the opposite combinations with securities and real estate firms increase volatility of returns. Their results are confirmed by Laderman (2000), using a very similar methodology.

Other authors (e.g. Genetay and Molyneux, 1998) find a sensitive decrease in the risk of failure, but not in the volatility of returns, measured by ROE.

Estrella (2001) points out the existence of a trade off regarding bank diversification in other financial activities: from a management perspective, mixing disparate firms may be more difficult, but may offer more significant gains from diversification than matching similar firms. Even if we can find some similarities between banking and life insurance, bancassurance may results in diversification gains.

«[...] diversification potential between banks and insurance companies still exists because of differences in the way the basic factors are combined and because the insurance sectors are themselves well-diversified». (Estrella, 2001, p. 1).

While in the past the lack of available data has been a major drawback for empirical studies dealing with M&A between banks and insurance companies, more recently we can find analyses based on real operations.

Fields *et al*. (2005) select a sample of 135 bancassurance M&A operations during the period 1997-2002 and find significant increases in shareholders' wealth for both bidders and targets: further analyses reveal that scope economies and lower systematic risk are important factors in determining bidder abnormal returns. In their opinion this result, in contrast with previous literature on M&A, is consistent with the hypothesis that "*bancassurance is special*". In a more recent study (Fields *et al.*, 2007), they confirm the potential for scope economies between the banking and the insurance industries, suggesting that it would be interesting to observe also the long term effects of bancassurance mergers, namely the ability to exploit cost or revenue synergies in the long run.

Chen *et al*. (2006) conduct a study on the risk and wealth effects of bancassurance M&A with a particular focus on European countries, between 1986 and 2004. Their empirical results show that bancassurance mergers have a minimal effect on total risk (measured by the ratio between the variance of the firm's returns and the variance of three indexes: the world market index, the home market index and the home banking index) also if acquirers experience a reduction of beta risk in relation to the home banking index.

We can also cite the study of Nurullah and Staikouras (2008) focusing on a sample of European banks, life insurance companies, non life insurance firms and insurance brokers with available accounting data between 1990 and 1999. Analysing their pre-merger and post-merger structure, the authors conclude that the best candidate to merge with banks is the insurance broking, allowing an increase in profitability without relevant changes in risk and creditworthiness. Combinations with both life and non life insurance result in a significant increase in volatility of returns and probability of bankruptcy; in the latter case the higher risk in not compensated by a greater profitability.

Other studies have tested the existence of benefits from diversification observing variations in stock prices relative to the insurance and the banking sectors, after the liberalisation of bancassurance, but results are not always consistent with each other: for instance, Carow (2001a) finds that the Citicorp-Travelers Group merger increased stock prices in both sectors (in the US market), but in a second paper (Carow, 2001b) he observes a reduction in insurance companies stock prices.

Testing the diversification hypothesis existing studies show a quite wide range of results: in addition to this, risk reduction is not universally recognised as a valid economic rationale for diversification.

«Risk reduction is not a satisfactory efficiency rationale for diversification. At least in the case of publicly traded banks, shareholders can always reduce their risk by holding a diversified portfolio of non diversified banks, gaining the risk-reduction advantages of diversification without incurring the costs of managing a large organization. For this reason, diversification would be beneficial only if it provides some kind of economies of scope» (Klein and Saidenberg, 2000, p. 5).

This consideration leads us to investigate other fields of research, dealing with scope economies and efficiency.

1.4 Bancassurance: the efficiency/scope economies hypothesis

Scope economies occur when it is more economical to produce two (or more) products jointly in a single firm than in separated specialised units (Berger *et al*., 1987). The earlier definition of scope economies is referred to the cost side; an efficient indicator of scope economies is the following ratio (Berger *et al*., 1987):

$$SCOPE_{Eff} = \frac{TC(Y_1,0) + TC(0,Y_2) - TC(Y_1,Y_2)}{TC(Y_1,Y_2)} \quad (1)$$

where

$TC(Y_1,0)$ is total cost of the firm specialised in producing Y_1;

$TC(0,Y_2)$ is total cost of the firm specialised in producing Y_2;

$TC(Y_1+Y_2)$ is total cost of the joint production.

If $SCOPE_{Eff} > 0$ we have scope economies; on the opposite if $SCOPE_{Eff} < 0$ we have scope diseconomies.

Cost scope economies can arise from spreading fixed cost on a wider range of products or from cost complementaries. Cost complementaries between Y_1 and Y_2 occur when the marginal cost of Y_1 (or Y_2) decreases by increasing the production of Y_2 (or Y_1); cost complementaries between all product combinations are a sufficient, but not necessary, condition for the existence of scope economies. From a theoretical point of view, it is very simple to understand how similar synergies can be realised in bancassurance combinations or in other diversified financial firms. From the cost side, we can think to the opportunity of (see for example Berger, 2001):

- sharing physical inputs (like offices or computers), staff costs and distribution net;
- employing common information systems, investment departments, account service centres;
- reusing managerial expertise or information;
- obtaining capital with larger issue size.

Berger *et al*. (1994) point out as scope economies can arise also from the revenue side. The idea is that consumer could be willing to pay higher prices for one stop banking, because of reductions in user transaction and search cost associated with consuming different financial services offered by the same provider, often at the same location. But in their empirical analysis, they do not find evidence of revenue scope economies between deposits and loans, over 1978-1990, for both small and large banks. In their opinion *«this result for the provision of current banking services, where benefits are most likely to occur if they occur at all, is suggestive of similarly small synergies from an expansion of banking powers into new service areas»* (Berger *et al*., 1994, p. 22).

The difficulty in detecting scope economies is not a peculiarity of bancassurance, but a problem concerning all financial industries: various studies find evidence of scope economies (Murray and White, 1983; Kim, 1986; Pulley and Humprhey, 1993), while others are not able to detect significant synergies (Berger *et al*., 1987; Mester, 1987; Hunter *et al*., 1990; Berger et *al*., 2000). Verweire (1999) observes that these results could depend on study fragmentation: most findings are taken from analyses dealing with scope economies within a single product category (Berger, 2001), as deposits and loans for banks, or life and P&C for insurance companies. In this case a major problem is to find real firms fully specialised, that have zero output for the other product(s), e.g. banks that produce only deposits or loans in a mutually exclusive way. Studies dealing with scope economies in

different product categories, as in bancassurance combinations, do not meet this problem; anywhere there are several econometric difficulties to solve. Parametric methods for the measurement of efficiency[3] often use a translog specification for the cost function: being multiplicative in outputs, it has the unfortunate property of having predicted cost of zero for each of the specialised firms, i.e. $C(Y_1,0)=C(0,Y_2)=0$ (Berger and Humphrey, 1994). So economies of scope cannot be easily calculated. As observed in Hughes and Mester (1993), replacing a null output with a small quantity arbitrarily chosen involves potentially excessive extrapolation outside the sample. A frequently applied solution is the definition of *within the sample* scope economies, in which the zero level of output is substituted with the minimum observed in the sample (Y_i^m). In the case of two outputs, we have (e.g. Hughes and Mester, 1993):

$$SCOPE_{Eff} = \frac{TC\left(Y_1 - Y_1^m, Y_2^m\right) + TC\left(Y_1^m, Y_2 - Y_2^m\right) - TC\left(Y_1, Y_2\right)}{TC\left(Y_1, Y_2\right)} \quad (2)$$

In this way, we measure the increase (or decrease) in cost of dividing up the outputs into relatively specialised banks, "*but none more specialised than the most specialised bank in the sample*" (Mester 1996, p. 1032).

Some authors underlined as this strategy is not a complete solution *«since any finding of scope economies can be summarily eliminated by setting the* Y_i^m *sufficiently close to zero»* (Berger and Humphrey, 1994, p. 11) that it is exactly what could happen in the case of a real specialised firm.

Being aware of these difficulties, Fields *et al*. (2005) decide to measure cost synergies in a direct way, considering bancassurance M&A and calculating scope economies as:

$$SCOPE_{Eff} = \frac{\left(FIRM1 + FIRM2\right) - COMBINED}{COMBINED} \quad (3)$$

[3] See Chapter 2.

where FIRM1 and FIRM2 are pre-merger values of cost and COMBINED is the after-merger value (a similar method can be applied for revenues and profits). This method presents many advantages because it is very simple, fast and based on real data, but there is a strong limitation: it cannot take into account changes in prices, scale or mix of production and other conditions during (and after) the merger implementation.

In addition, some empirical analyses demonstrate that scale and scope inefficiencies have a lower weight than technical or allocative inefficiencies in financial firms (Berger and Humphrey 1994, 1997). In the light of these considerations we can better understand the current trend, observable in more recent studies, moving to the wider concept of X-efficiency, intended as managerial ability in combining production factors. For example, in a study comparing financial conglomerates, universal banks and commercial banks it has been stated that:

«Scale and scope economies, however, only refer to the static effect of size and activity mix on costs. Faced with a rapidly changing competitive and regulatory environment, the improvement of operational or X-efficiency may be even more important to ensure the competitive viability of banks…» (Vander Vennet, 2002, p. 257).

Furthermore the level of operational efficiency can be used to investigate cost and revenue synergies. In their analysis of the insurance sector, Cummins *et al*. (2003) distinguish diversified companies (i.e. firms offering both life-health and P&C insurance) from specialised ones; even if this study is outside the object of this thesis we can outline as the measure of efficiency is considered as an indirect evidence of the existence of scope economies:

«…If specialised and diversified firms are equally efficient the implication is that neither cost nor revenue scope economies are present…if the two groups are not equally efficient, then either cost or revenue scope economies may be present» (Cummins *et al*., 2003, pp. 10-11).

We can conclude that the estimation of scope economies remains a problematic issue in financial literature; this lead us to focus our attention to overall efficiency, following the most recent studies.

Potential efficiency gains from bancassurance combinations are still a poorly investigated issue, even if cost and revenue synergies are commonly recognised as the most valid rationale for banking diversification into other sectors of financial intermediation. We are aware of a single empirical study (Verweire, 1999) investigating performance consequences

of bancassurance from both the banking and the insurance sides. The author compares financial conglomerates on one hand against specialised competitors, both banks or insurers, on the other. Following this approach, performance can be measured only with conventional ratios such as ROE or ROA. As the author underlined:

"It makes no sense to compute [...] efficiency measures because these measures would be distorted by the different reporting and valuation methods used in the banking and the insurance industry" (Verweire, 1999, p. 197).

Even if all comparative analyses have been traditionally conducted through conventional ratios such as the ROE and the ROA, over the last decade frontier techniques have strongly emerged:

"With the rapid evolution of frontier efficiency methodologies, the conventional methods are rapidly becoming obsolete. Frontier methodologies measure firm performance relative to "best practice" frontiers consisting of other firms in the industry. In the future, tests of economic hypotheses …. about such matters as organizational form, distribution systems, economies of scale and scope, and the effects of mergers and acquisitions will not be convincing unless they involve the use of one or more frontier-based performance measures".(Cummins and Weiss, 1998, p. 1).

With reference to the bancassurance phenomenon, existing studies using frontier efficiency methodologies have adopted the banking or the insurance points of view in a mutually exclusive way.

From the banking side we find only a handful of studies dealing specifically with efficiency gains from diversification. Allen and Rai (1996) examine cost efficiency of banks during the period 1988-1992, for a sample of 15 different countries. They examine two groups of countries: universal banking countries that allow the integration between traditional and investment banking and separated banking countries that do not. The authors also account for size effects, finding that large banks in separated banking countries have the largest measure of input inefficiency.

Vander Vennet (2002) uses a parametric methodology in order to measure cost and profit efficiency in European banks in 1995-1996: his results show that financial conglomerates[4]

[4] The author defines a bank being a financial conglomerate when:

- it is engaged in insurance or investment banking through a subsidiary or an in-house department, and
- the ratio of non interest income to total revenues exceeds 20%.

are more revenue efficient than specialised banks and that universal banks[5] are more efficient on both the cost and revenue sides.

Casu and Girardone (2004) use both statistical and mathematical approaches to measure the efficiency of Italian financial conglomerates between 1996 and 1999 and find evidence of an increase in profit efficiency.

It is important to underline that all these studies adopt a definition of banking diversification different from the concept of bancassurance: Allen and Rai (1996) study universal banking intended as combination between traditional and investment banking; Vander Vennet (2002) analyses financial conglomerates defined as combinations between traditional and investment banking or insurance; Casu and Girardone (2004) consider as financial conglomerates all Italian banking groups, following the idea that they generally experienced a trend towards conglomeration during the observed period.

Also from the insurance side, despite the existence of a quite extensive efficiency literature, we can find only few studies using frontier methodologies and dealing with the bancassurance phenomenon (Hwang and Gao, 2005; Barros *et al*., 2006).

Hwang and Gao (2005) analyse life insurance companies operating in the Irish market, measuring cost efficiency during the period 1991-2000 with a stochastic frontier approach. The obtained efficiency scores are then regressed on a set of covariates in order to detect main drivers of performance. The authors conclude that size, market share and a dummy indicating bancassurance companies are all positively related to cost efficiency, in a statistically significant way. The adopted operational definition of bancassurance is "*the distribution of insurance products by banks*": consequently bancassurance firms are those "*centred on selling insurance through the established distribution channels of their associated banks*". The criterion used appears only related to the distribution system, while banks' presence in the ownership structure of insurance companies is not explicitly considered.

Barros *et al*. (2006) use a stochastic frontier approach in order to measure cost efficiency in the Portuguese life insurance industry, during the period 1995-2003. Instead of following a

[5] A bank is classified as universal when:

- equity stakes in non financial companies are more than 1% of total assets, and
- the ratio of non interest income to total revenues is higher than 5%.

two stage approach[6], two dummies are directly included into the deterministic kernel of the frontier: by this way the authors distinguish between foreign and Portugal owned companies and between companies belonging to banking groups or not bank-owned. Results show the bancassurance dummy being positively related to cost efficiency, even if not statistically significant. In this case bancassurance phenomenon is considered only by an ownership perspective, even if insurance companies do not need to be bank participated to distribute their products through bank branches.

It is possible to find other recent studies dealing with the relationship between life insurance efficiency and the use of different distribution systems, but bancassurance is completely ignored (e.g. Klumpes, 2004) or considered as a possible, marginal alternative for insurance companies using different channels (e.g. Trigo-Gamarra, 2007). This is probably due to the fact that these studies deal with UK and Germany, countries in which bancassurance is not as common as in France or Italy (see CEA, 2008).

As we are aware, there are no comprehensive studies analysing bancassurance from the insurance side and considering the phenomenon from both an ownership and a distributional perspectives: we believe that, in order to give a complete view of the bancassurance phenomenon it is crucial to consider that also life insurance companies not significantly participated by banks can distribute their products through bank branches.

1.5 Conclusions

From the review of existing empirical literature, we can conclude that even if improving efficiency through cost and revenue synergies is probably the most valid rationale for banking diversification into the insurance industry, potential efficiency gains in bancassurance are still less explored than other topics, like risk reduction benefits. So it could be interesting to provide new evidence on this key issue, with a particular focus on European countries.

In order to have a complete view of the bancassurance phenomenon, a comprehensive study should adopt both the banking and the insurance points of view, but differences in

[6] Limitations presented by the two stage approach are later explained in Chapter 2.

the type of business and financial reporting models may cause problems of comparability. A possible solution to account for these differences and still assess bancassurance efficiency gains from both sides is to conduct two separated analyses, one in the banking sector and one in the insurance sector, answering the following research questions:

RQ1 (Banking side): Are banks engaged in the insurance business more cost and profit efficient than their competitors specialised in traditional and investment banking?

RQ2 (Insurance side): Are bancassurance companies more cost and profit efficient than independent companies operating in the life business?

Our first empirical analysis aims to compare banks diversificating into the insurance business with banks engaged only in traditional and investment banking. The underlying idea is that the mean level of cost or profit efficiency can be an indirect proof for the existence of significant synergies. So finding that banks operating in the life business over perform their less diversified competitors indicates the validity of a bancassurance strategy and vice versa. In order to give an advance to the existing literature we adopt a more restricted focus on bancassurance, as combination between traditional banking and life insurance, while we do not consider as financial conglomerates the combinations between traditional and investment banking.

Our second empirical analysis aims to compare insurance companies controlled by banks or deriving from a joint venture between a bank and an insurance partner with other independent firms operating in the life business. In this case we want to assess if bancassurance companies are able to produce the same output with a lower cost, exploiting synergies with banks, and if insurance products sold through bank branches can benefit from the one stop shopping effect. In order to give an advance to the existing literature we deal with the bancassurance phenomenon from both the ownership and the distributional points of view: so we consider banks participations in insurance capital and the use of bank branches for the distribution of insurance policies.

In addition to this, analysing previous studies dealing with efficiency in bancassurance, we can observe that there are no empirical comparisons of different organisational models: so we do not know, for example, if a captive is more efficient than a joint venture, providing

more opportunities to exploit cost and revenue synergies. In order to give an advance to the existing literature we investigate a third research question:

RQ3 (Alternative structures comparison): Which model of bancassurance reaches the best performance?

To answer this question we conduct our second empirical analysis distinguishing between bancassurance companies wholly controlled by banks (i.e. captives) and bancassurance companies deriving from a joint venture.

Chapter 2: Methodology

2.1 Introduction

This chapter aims to define a common methodological framework adopted for both empirical analyses regarding the banking and the insurance sides. The structure of the chapter is the following:

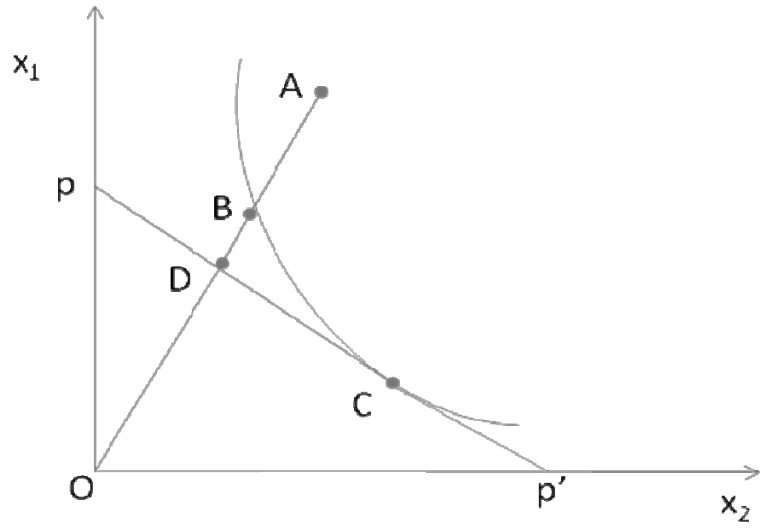
- Section 2.2 provides a brief introduction to the concept of efficiency as a distance from the best practice company;
- Section 2.3 describes the adopted Stochastic Frontier Analysis, dealing also with the problem of possible sample heterogeneity (Section 2.3.1);
- Section 2.4 concludes underlying how a methodological enhance is realised with respect to previous literature.

2.2 Measuring efficiency with a frontier approach

The concept of efficiency as a distance from best practice companies was first introduced by Farrel in 1957. Cost efficiency can be defined as the ability to minimise costs to produce a given quantity of output: inefficiency can derive from excess in the use of inputs (*technical inefficiency*) or from using the wrong mix of production factors, given their relative prices (*allocative inefficiency*).

We can make an example of a firm producing a single output *y* using two different inputs x_1 and x_2.

Figure 1 – Technical and allocative efficiency



Source: Author's own

The isoquant represents all possible combinations of x_1 and x_2 obtaining the same quantity of output y_0, using the best technology at disposal; the isocost line pp' represents input combinations at the same cost, defined by relative prices w_1 and w_2. The only full efficient firm is C, corresponding to the point of tangency between the isoquant and the isocost line. The point A is technically inefficient because it produces y_0, using higher input quantities than firms lying on the isoquant (e.g. point B). Technical efficiency can be calculated along the line through the origin as the ratio TE = OB/OA, taking value between zero and one. If TE = 1, the firm is fully technical efficient, while if TE < 1 the firm presents some inefficiency; 1-TE represents the proportion by which all inputs need to be reduced to achieve an efficient production. Firms operating in point A and B are both allocatively inefficient, presenting a mix of inputs different from the most economical, lying on the isocost line. Allocative inefficiency can be calculated along the line through the origin as AE = OD/OB, assuming values between zero and one[7]. Total economic efficiency (EE) is given by the product of technical and allocative efficiency; for the firm operating in point A, we have:

$$EE = TE \times AE = OB/OA \times OD/OB = OD/OA \quad (4)$$

[7] Point D represents a combination with the same (minimum) cost as point C.

More generally, cost efficiency can be measured as the ratio between total cost of the best practice firm and total cost of the i-th firm, producing the same output bundle, under the same prices and technology conditions.

$$Cost_{Eff} = C_{\min} / C_i \tag{5}$$

We can measure revenue or profit efficiency in a similar way. In order to obtain an efficiency score taking value between zero and one, as in the cost case, we calculate the ratio between revenues (or profits) of the i-th firm and those obtained by the best practice, under the same conditions:

$$Rv_{Eff} = R_i / R_{\max} \qquad or \qquad \pi_{Eff} = \pi_i / \pi_{\max} \tag{6}$$

In empirical analyses efficiency scores are calculated as distances from a best practice frontier, obtained starting from sample data. The resulting efficiency score is then a relative measure strongly dependent on the selected sample.

Two main approaches can be applied to obtain an efficient frontier (see for example Berger and Humphrey, 1997): parametric and non parametric methodologies. Every approach presents some advantages and drawbacks: parametric methods are able to disentangle the distance from the best practice in two components: the firm inefficiency and the random error effect. The main problem is that they impose to assume specific hypotheses on cost (revenue or profit) functional form, taking the risk to bias efficiency measures by a wrong specification. On the opposite, non parametric methods do not require ex ante assumptions on cost (revenue or profit) functional form, but they interpret every gap from the frontier as inefficiency, without taking into consideration random error. We prefer a parametric methodology that, through hypothesis testing, allows us to choose which model gives the best fit to the data. The most common parametric methodology used in empirical

studies dealing with financial firms is the Stochastic Frontier Analysis proposed by Aigner *et al*. (1977).

2.3 Measuring efficiency with the Stochastic Frontier Analysis

We estimate efficiency using the parametric Stochastic Frontier Analysis (SFA, originally proposed by Aigner *et al*., 1977) as such:

$$\ln TC_i = x_i\beta + \varepsilon_i \qquad \varepsilon_i = v_i + u_i \qquad i = 1,\ldots,N \tag{7}$$

where TC_i is the production cost for the i-th firm;

x_i is a vector of (transformations of the) input prices and output quantities;

β is a vector of unknown parameters to be estimated;

ε_i is disentangled in two main components: the first is the random error term (v_i), accounting for measurement errors, bad luck and other factors unspecified in the cost function. It is generally assumed as an i.i.d. normal random variable with mean zero and constant variance σ_v^2. The second term is a non negative cost inefficiency term (u_i), added to the cost frontier representing minimum cost (instead of being subtracted as in the production frontier, representing the maximum output). It is generally assumed to have an half normal or a truncated normal distribution[8], with variance equal to σ_u^2. This term provides a Farrel (1957) type measure of efficiency, calculated as the ratio of frontier minimum cost (the ideal best practice for which u_i=0) to observed cost; the resulting scores take values between zero and one (i.e. the most efficient firm).

[8] Assuming an half-normal distribution with mean zero implies that most banks are closely located to the frontier and with small level of inefficiency. Another possibility is to relax this *a priori* assumption and estimate the mean of the inefficiency component directly from the data.

In the case of panel data[9], the model can be expressed as:

$$\ln TC_{it} = x_{it}\beta + \varepsilon_{it} \qquad \varepsilon_{it} = v_{it} + u_{it} \qquad i = 1,...N \quad t = 1,...T \tag{8}$$

where all variables are as defined earlier and firm inefficiency effects can vary with time, as

$$u_{it} = \left(u_i \exp\left(-\eta\left(t - T\right)\right)\right) \tag{9}$$

where η is a parameter to be estimated and u_i are assumed to be i.i.d. truncations at zero of a normal distribution, with variance equal to σ_u^2. If we restrict η to be zero we suppose that inefficiency among sample firms is time invariant.

The parameters of the stochastic frontier function are estimated using the maximum likelihood method and adopting the Battese and Corra (1977) parameterisation, which expresses the likelihood function in terms of the two variance parameters $\sigma_S^2 = \sigma_v^2 + \sigma_u^2$ and $\gamma = \sigma_u^2/\sigma_S^2$. The γ parameter takes value between zero and one: a value of zero means that all the deviations from the frontier are due to random error: in this case the stochastic frontier model is not significantly different from an OLS regression. A value of one indicates that all deviations are due to inefficiency. Even when the βs are estimated we can only observe $\varepsilon_{it}=u_{it}+v_{it}$. The best predictor for u_{it} is :

$$CE_{it} = E\left[\exp\left(-u_{it}\right)\middle|\varepsilon_{it}\right] \tag{10}$$

We also estimate profit efficiency in order to account for possible synergies on both the cost and the revenue sides. The profit efficiency concept is a more meaningful concept than cost efficiency as noted by Berger and Mester (1997, p. 9): «*it's based on the more accepted*

[9] The panel of data need not to be complete (i.e. unbalanced panel data).

goal of profit maximization, which requires that the same amount of attention is paid to raising a marginal dollar of revenues as to reducing a marginal dollar of costs». We estimate the alternative profit efficiency, which specifies profits given the level of outputs, rather than the output prices. As outlined in Berger and Mester (1997), this last method can provide useful information when one or more of the following conditions hold:

- outputs market are not perfectly competitive, so that some firms have a market power greater than the others;
- the quality of products and services is not homogeneous between different firms;
- firms cannot achieve every output scale or product mix;
- outputs prices cannot be accurately measured.

The frontier definition is the same as in the cost case, except for the dependent variable: we replace total cost with total profit and the inefficiency term (u_{it}) is subtracted as in the production case, given that the frontier represents maximum profit. In order to obtain scores between zero and one, as in the cost case, profit efficiency is given by the ratio of observed profit to frontier maximum profit (the ideal best practice for which u_{it}=0).

For the deterministic kernel of the frontier, we adopt a translog specification[10] as such[11]:

$$\ln TC(or\,TP) = a_0 + \sum_i a_i \ln y_i + \sum_j b_j \ln p_j + \frac{1}{2}(\sum_i \sum_j c_{ij} \ln y_i \ln y_j + \sum_i \sum_j d_{ij} \ln p_i \ln p_j) + \\ + \sum_i \sum_j g_{ij} \ln y_i \ln p_j \qquad (11)$$

where *TC* and *TP* are total cost and total profit for the i-th firm in the observed period;

Y_i are quantities of output or netputs (fixed inputs that have been built up over a long time and are difficult to adjust quickly);

[10] The choice of the translog rather than the Fourier is motivated by two reasons. First, Altunbas and Chakravarty (2001) identify some problems associated with the Fourier functional form, especially when dealing with heterogeneous datasets. Secondly, Swank (1996) and Berger and Mester (1997) observe that the translog functional form and Fourier flexible form are substantially equivalent from an economic viewpoint and both rank individual bank efficiency in almost the same order. Vander Vennet (2002) confirms that the Fourier gives very similar results compared to the translog, that is less computational demanding.

[11] For simplicity, we omit the subscripts referring to time and single firms.

P_j are input prices.

As usual, we impose symmetry

$$(c_{ij} = c_{ji}, \quad d_{ij} = d_{ji}) \tag{12}$$

and linear homogeneity in factor prices

$$(\sum_j b_j = 1, \quad \sum_i d_{ij} = 0, \quad \sum_i g_{ij} = 0) \tag{13}$$

standardising total cost *TC* (or total profit *TP*) and input prices P_j by the last input price.

Both in the cost and in the profit cases, efficiency estimates are obtained by comparison based on a common frontier, requiring the assumption that all the firms in the sample share the same technology and comparable environmental conditions. Recent studies on performance of financial business (e.g. Bos *et al*., 2005) underline how the assessed efficiency may reflect two factors that are difficult to distinguish: the actual managerial skill in combining production factors and the impact of some environmental variables and/or firm specific factors capable of influencing performance. Environmental variables are exogenous factors completely out of the management control and taking the same value for all firms operating in the same geographical area: e.g. population density or pro-capita GDP in a certain region or country. Firm specific factors represent firm characteristics deriving from past strategies and out of the management control in the short run; they take a different value for every unit in the sample, e.g. asset size and level of capitalisation. In order to build an accurately shared frontier (that is a realistic benchmark of reference for all the companies in the sample) we need to deal with the problem of possible heterogeneity in the sample, including some firm specific factors or environmental variables, representing main differences among analysed firms. Consistently with our research aim, we have to compare different groups of firms: banks diversificating into the insurance business and their more specialised competitors on the banking side and bancassurance firms against independent life companies on the insurance side. Then we have to overcome the limitation of possible strong heterogeneity in the sample.

2.3.1 Accounting for heterogeneity

Following Coelli *et al*. (1999), there are two different ways of accounting for heterogeneity, including environmental conditions or firms specific factors in the frontier models. Following these authors we label the two different approaches as "Case 1" and "Case 2".

Case 1 – Environmental/firm specific factors have a direct influence on the production structure

Under the Case 1, we assume that environmental conditions/firm specific factors may have a direct influence on the production structure. We include some control variables in the deterministic portion of the stochastic frontier and this implies «*assuming that each firm faces a different production frontier*» (Coelli *et al*. 1999, p. 254):

$$\ln y_{it} = \beta_0 + \sum_{k=1}^{K} \beta_k \ln x_{k,it} + \sum_{j=1}^{M} \theta_j \ln z_{j,it} + v_{it} - u_{it} \qquad (14)$$

where M are the environmental/firm specific factors z_j assuming different values for each i-th firm. This specification, referred to productive efficiency, can be straightforwardly adjusted for the cost or profit cases assuming total cost or total profit as dependent variables and changing the sign of the inefficiency component (u_{it}) for the cost case. For example, Altunbas *et al*. (2000) propose a cost function that controls for banking risk and output quality, by including the ratio of non performing loans to total loans and the ratio of liquid assets to total assets directly in the deterministic kernel of the frontier. In the insurance sector Barros *et al*. (2006) include directly in the cost function two dummies accounting for control by banks (bancassurance) and foreign ownership. This kind of approach produces efficiency estimates that are *net* of environmental influences directly considered in the translog portion: so if we accounted for all possible factors we could define the efficiency obtained as the pure managerial efficiency. In order to obtain gross measure of efficiency, i.e. inclusive of the effect of environmental variables, we can

compare all sample firms with the frontier associated with the most favourable conditions, obtained replacing $\sum_{j=1}^{M} \theta_j z_{j,it}$ with $\max\left[\sum_{j=1}^{M} \theta_j z_{j,it}\right]$[12].

Case 2 Environmental/firm specific factors influence the inefficiency distribution

Under the Case 2, environmental/firm specific variables are not directly included in the frontier, but are used to model the inefficiency distribution. The underlying hypothesis is that all the firms in the sample share a common technology but some exogenous factors influence the distance from the best practice (i.e. the inefficiency component). Consistently, the deterministic kernel of the frontier is the same as in equation (11). The inefficiency component is assumed to be distributed independently, but not identically. For each observation the inefficiency effect is obtained as truncation at zero of a normal distribution where the mean μ_{it} is a function of *M* factors representing the firm specific conditions:

$$\mu_{it} = \delta_0 + \sum_{j=1}^{M} \delta_j z_{j.it} \tag{15}$$

This approach has been applied by several studies. Worthington (1998) estimates the efficiency of 22 Australian building societies during the period 1992-1995, accounting for firm size, level of capitalisation, number of branches and agencies in the distribution net. Frame and Coelli (2001) model inefficiency of US credit unions accounting for the percentage of investments passed to the U.S. Central Credit Union and three different categorical variables. Williams (2004) accounts for different firm specific factors influencing inefficiency in his study on management behaviour. Greene and Segal (2004) model the mean inefficiency in a sample of US life insurers as a function of the organisational form (mutual or stock companies), time (through a year dummy) and product mix (considering the natural log of various output quantities).

[12] For the cost case we use $\min\left[\sum_{j=1}^{M} \theta_j z_{j,it}\right]$.

We can also find studies in which the inefficiency is not explained by a vector of firm specific factors but by a vector of *group* specific conditions, so that all the firms in the group share the same value of the environmental variables. This is the case of Beccalli (2004) using the Battese and Coelli model in order to account for different environmental conditions faced by UK and Italian investments firms, or Miyakoshi and Tsukuda (2004) accounting for regional differences in their analysis of Japanese banking efficiency.

The efficiency estimates resulting from this model incorporate the effect of environmental factors, so can be viewed as ***gross*** measures of efficiency. To obtain measures of net efficiency we can modify the formulation for the single firm efficiency score[13]. This is expressed as:

$$E\left[\exp\left(-u_{it}\right)\middle|\varepsilon_{it}\right]=\left[\exp\left(\mu_{*}+0.5\sigma_{*}^{2}\right)\right]\cdot\left\{\phi\left[\left(\mu_{*}/\sigma_{*}\right)+\sigma_{*}\right]\right\}/\left\{\phi\left(\mu_{*}/\sigma_{*}\right)\right\} \tag{16}$$

where Φ(.) denotes the distribution function of a standard normal random variable,

$$\mu_{*}=\left(1-\gamma\right)\left[\delta_{0}+\sum_{j=1}^{M}\delta_{j}z_{j,it}\right]+\gamma\varepsilon_{it} \tag{17}$$

$$\sigma_{*}^{2}=\gamma\left(1-\gamma\right)\sigma_{s}^{2} \tag{18}$$

and

$$\sigma_{s}^{2}=\sigma_{u}^{2}+\sigma_{v,}^{2}\quad\gamma=\sigma_{u}^{2}\big/\sigma_{s}^{2} \tag{19}$$

[13] The reported expressions are referred to the cost case. For the correspondent in the production/profit case, see Coelli *et al*. (1999), p. 255-256.

In order to obtain net efficiency scores, we suppose that all firms face the most favourable conditions, replacing $\sum_{j=1}^{M}\theta_j z_{j,it}$ in equation (17) with $\min\left[\sum_{j=1}^{M}\theta_j z_{j,it}\right]$ and then re-calculate the efficiency predictions with equation (16) (see Coelli *et al*., 1999; Glass and McKillop, 2006). The difference between gross and net technical efficiency scores can be viewed as the contribution of environmental and firm specific factors to the firm performance.

Recently, some studies have used both the Case 1 and the Case 2 models trying to include the exogenous variables directly in the frontier or as determinants of inefficiency. Bonin *et al*. (2005) introduce year and country dummy variables in order to measure bank efficiency in European transition countries. Glass and McKillop (2006) determine the importance to account for several control variables in modelling efficiency of US credit unions. Fitzpatrick and McQuinn (2008) include country dummies both in the frontier and between the determinants of technical inefficiency, modelled also by different national macroeconomic conditions (GDP and unemployment rate).

Some studies (e.g. Kumbhakar and Lovell, 2000) observe the difficulty in choosing if an environmental variable is a characteristic of the production frontier or a determinant of productive (in)efficiency (i.e. choosing between Case 1 and Case 2 model). This can be done on the basis of theoretical reasons or through statistical hypothesis testing. From this latter point of view, a possible solution is to construct an artificial nested model (see for example Coelli *et al*., 1999; Glass and McKillop, 2006) that includes environmental variables both in the translog function and as determinants of inefficiency. Then this nested model is compared with Case 1 and Case 2 models on the basis of a likelihood ratio test to determine which approach supplies the best fit to sample data.

From our point of view the Case 2 Model is more convenient because, as outlined in Bos *et al*. (2005, p. 11) «*we can account for heterogeneity across banks and still benchmark all (different) banks against an identical frontier*».

Using this approach we can also assess the impact of different firm characteristics avoiding the limits of a two-stage method in which efficiency estimates are regressed upon a vector of firm specific factors or environmental conditions supposed to influence firm performance. As outlined in Battese and Coelli (1993) and in Battese *et al*. (1998), this

approach suffers from a strong inconsistency: unless the regression coefficients are all equal to zero, the considered factors do have an influence on the inefficiency level. This is in contrast with the assumption of u_{it} identically distributed traditionally used in the first stage frontier analysis.

2.4 Conclusions

Frontier methodologies to the measurement of efficiency can be both parametric or non parametric. Even if every approach presents some advantages and drawbacks, we choose to apply the parametric Stochastic Frontier Analysis (SFA) in order to have the opportunity of testing different hypotheses and identify the model which gives the best fit to sample data.

Regardless the chosen approach, comparison based on a common frontier require the assumption that all the firms share the same technology and environmental conditions. For this reason we conduct two separated analyses on the banking and the insurance sides. Nevertheless we cannot fail to consider the heterogeneity problem, because we still compare quite different subgroups of financial entities:

- banks diversificating into the insurance industry and their more specialised competitors on the banking side*;*
- bancassurance firms against independent life companies on the insurance side.

The issue of possible heterogeneity in the sample has received great attention in the recent literature, being capable, if ignored, to cause strong estimation bias in efficiency scores:

"the question how to specify the benchmark and how to consider heterogeneity is crucial because it influences efficiency estimates substantially" (Bos *et al.*, 2005, p. 1).

A possible solution to overcome this problem is to incorporate in the frontier model some firm specific factors or environmental variables representing main differences among sample firms. These exogenous factors are supposed to be out of the management control in the short run but able to influence the attained performance. Following Coelli *et al*. (1999) there are two different frontier models accounting for heterogeneity, in which exogenous factors are directly introduced into the deterministic kernel of the cost or profit frontier or supposed to influence only the distance from the best practice. In both cases it is

possible to calculate net or gross measures of efficiency, including or not the impact of exogenous variables. Consistently with our research aims, it is more convenient the model in which firm specific factors or environmental variables are included as determinants of the inefficiency component, because we can account for differences among the firms and still compare them against a common benchmark.

Treating the question of sample heterogeneity, we give an innovative contribution to the existing literature by contemporaneously overcome two different problems:

- we limit possible estimation bias due to sample heterogeneity, considering different features of firms involved in the comparisons (banks diversificating into the insurance industry and their more specialised competitors on the banking side and bancassurance firms against other life companies on the insurance side);
- we analyse the efficiency effect of some firm specific factors and environmental variables without incurring in the problem of a two stage procedure.

Chapter 3: Banks diversificating into the insurance industry *vs.* specialised competitors

3.1 Introduction

The aim of this chapter is to present the empirical analysis conducted in order to answer the first research question:

RQ1: Are banks engaged in the insurance business more cost and profit efficient than their competitors specialised in traditional and investment banking?

The structure is the following:

- Section 3.2 describes sample selection criteria and variables included in the cost and profit efficiency models;
- Section 3.3 presents main results with reference to a European sample of banking institutions;
- Section 3.4 proposes a focus on the Italian case;
- Section 3.5 concludes commenting our findings relative to the competitive viability of a bancassurance strategy from the banking point of view.

3.2 Data and variables

The aim of this paragraph is to describe the sample and the variables used in the research design. Section 3.2.1 presents sample selection criteria, Section 3.2.2 discusses the choice of input and output variables and Section 3.2.3 deals with firm specific factors included in the frontier model accounting for heterogeneity.

3.2.1 Sample selection criteria

In order to answer our research question we first need to define the bancassurance business. Following Vander Vennet (2002), a bank is classified as a financial conglomerate when the two following conditions are met:

- the bank is engaged in non traditional activities (investment banking and/or insurance) through an in-house department or a consolidated subsidiary, and
- the ratio of not interest income to total revenues exceeds 20%.

In order to provide a more accurate focus on bancassurance business[14], we modify the first criteria in a more selective way: we consider only combinations between banking and insurance (bancassurance combinations, BCs), while previous studies (e.g. Allen and Rai, 1996; Vander Vennet, 2002; Casu and Girardone, 2004) deal with financial conglomerates as combinations between commercial banking and both investment banking or insurance.

We define 'not bancassurance-oriented' institutions (NBIs) as a residual cluster, including all banks that do not meet both conditions: so NBIs can be specialised commercial banks or the combinations between commercial and investment banking, while we exclude banks specialised in investment banking or in a particular business, such as consumer finance or leasing. Our approach is also consistent with recent developments in the EU regulation, recognising bancassurance as a relevant kind of diversification. Under the European regulatory framework, insurance activity is generally conducted through separated entities: so we check for the condition that the bank consolidates at least one insurance subsidiary[15]. Annual statements and ownership information for the year 2005 are derived from the Fitch/IBCA database Bankscope[16]. Consistent with the aim to assess the effect of controlling insurance subsidiaries, we believe that it is more informative to collect consolidated financial statements instead of individual ones.

Dropping observations with missing (or extreme) values and eliminating foreign subsidiaries, our final sample consists of 278 banks in the EU-15 area, with different institutional types: commercial, savings and cooperative.

[14] One might claim that the effects of bancassurance should be detected by distinguishing the amount of not interest income deriving from the insurance business or from other non traditional banking activities. However, this detailed information is not available in the Bankscope database. As such, the restriction of the first criteria (consolidation of an insurance subsidiary) seems to be able to assure an accurate focus on bancassurance.

[15] We include banking institutions identified as financial conglomerates under Article 3 of Directive 2002/87/EC in the list edited by the Mixed Technical Group on April 2006.

[16] We also check for ownership information analysing company annual statements and web sites.

TABLE 1 - Overview of the selected sample in the EU-15 banking industry

Country	NBI	BC	Tot	Country	NBI	BC	Tot	Country	NBI	BC	Tot	Country	NBI	BC	Tot
Austria	14	1	15	France	48	11	59	Italy	18	22	40	Spain	51	9	60
Belgium	4	1	5	Germany	23	1	24	Luxembourg	0	0	0	Sweden	1	3	4
Denmark	19	3	22	Greece	13	0	13	Netherlands	5	3	8	UK	9	6	15
Finland	2	2	4	Ireland	3	2	5	Portugal	4	0	4	**Total**	214	64	**278**

BC: Bancassurance Combinations, NBI: 'Not bancassurance-oriented' Institutions

Source: Author's own elaboration on Bankscope data

3.2.2 Input and output definition

There are two traditional approaches to define output in banking (Berger and Humphrey, 1997):

- the production approach: banks are considered as institutions providing some services to their customers; these services can be measured as physical quantities, e.g. the number of accounts or transactions over a given time period;
- the asset or intermediation approach: banks are viewed as mediators between demand and supply of funds. This approach has been widely used in banking studies dealing with efficiency (Vander Vennet, 2002; Molyneux and Casu, 2003; Casu and Girardone, 2004; Becalli *et al*., 2006; Fiorentino *et al*., 2006) and there is a large consensus on which variables should be selected: labour, fixed assets and deposits as inputs; loans, securities and other earning assets as outputs.

The production approach is preferable for evaluating the efficiency of single branches while the intermediation approach may be more appropriate for evaluating entire financial institutions.

There is also a third option, the value added approach (see for example Resti, 1997; Fiordelisi and Molyneux, 2006; Battaglia *et al.*, 2008), that identifies inputs and outputs depending on the contribution of bank items (from both sides of the balance sheet) to create value added. Under this view, customer deposits are considered as an output, together with loans and securities, given that commissions and services fees are generally higher than interest paid on customers accounts. We use total net loans (Y_1), total other

earning assets (Y_2)[17] and total customer deposits (Y_3) as outputs and consider labour, fixed assets and total funding as inputs. The price of labour (p_1) is obtained dividing personnel expenses by the number of employees[18]. The price of fixed assets (p_2) is calculated as total expenses for depreciation and amortisation relative to fixed assets, while the cost of funding (p_3) is defined as the ratio of total interest expenses to the sum of total deposits and other funding.

As dependent variables, we define Total cost (*TC*) as the sum of interest and other operating expenses and Total Profit (*TP*) as pre-tax profit. Using a translog specification, we have to solve the problem of sample firms with negative values of profit, for which we cannot take the logarithm. A common adjustment (e.g. Vander Vennet, 2002; Casu and Girardone, 2004; Fiordelisi and Molyneux, 2006) is to add the constant term $\theta = |\pi^{min}| + 1$ to every firm profit in the sample. In this case, we have to subtract θ also from both the numerator and the denominator of the firm *PE* expression (see for example Berger and DeYoung, 2002).

If the number of firms exhibiting a loss is small relative to the sample size, we can also drop relative observations as in Humphrey and Pulley (1997) or in Huang (2000).

Finally we can redefine profit efficiency as follows (see for example De Young and Hasan, 1998; Akighbe and McNulty, 2003):

$$PE_i = \begin{cases} \dfrac{\pi_i}{\pi_{\max}} & if\ \pi_i > 0 \\ 0 & if\ \pi_i \le 0 \end{cases} \tag{20}$$

[17] We try two different definitions for Y_2: Total Securities and Total Other Earning Assets. As expected, results are very similar given that Total Securities is the main component of Total Other Earning Assets.

[18] The number of employees is not always available in the IBCA database: so many studies use the ratio between personnel expenses and total assets (e.g. Vander Vennet, 2002; Casu and Girardone, 2004; Fiordelisi and Molyneux, 2006). Given the relatively small size of our sample we prefer to fill in the gap with a search on institutional bank/group websites.

In our sample we have only nine banks exhibiting a loss: so we decide to drop these observations rather than running the adjustment above described[19]. As a consequence, the profit efficiency estimation is based on a sample of 269 firms.

Rogers (1998) observes as non traditional banking activities should be included between output in efficiency studies. His output definition has been used also in Vander Vennet (2002) in order to better account for output diversification beyond traditional banking.

In the attempt to represent modern banking production we define a second specification in which traditional output are replaced by revenue flows: total interest income (Y'_1), representing traditional banking intermediation, and total not interest income (Y'_2) accounting for fee based activities (as insurance).

Summary statistics of the input and output variables are presented in Table 2 for both the full sample and the two subgroups of BCs and NBIs.

TABLE 2 - Descriptive statistics of input and output variables for the EU-15 banking sample over 2005

Variable		Mean	Std. Dev.	Min	Max
Full sample (278 observations)					
TC	Total cost	2,944,217	8,097,469	5,160	69,500,000
y1	Total loans	35,500,000	82,800,000	34,500	613,000,000
y2	Total other earning asset	36,000,000	118,000,000	6,163	864,000,000
y3	Total customer deposits	29,800,000	75,600,000	49,020	500,000,000
p1	Price of labour	63.2679	21.1780	26.3398	235.4430
p2	Price of fixed asset	0.1435	0.1238	0.0240	1.1111
p3	Price of funding	0.0220	0.0080	0.0080	0.0569
y1'	Net interest income	2,542,131	6,477,178	3,700	41,700,000
y2'	Not interest income	830,005	2,506,219	430	17,900,000
TP	Total profits	583,752	1,493,540	-881,800	10,600,000
E	Equity	3,279,360	7,486,409	6,200	50,500,000

[19] Rather than making a data transformation (i.e. adding the constant θ to every observation in the sample), we prefer to estimate alternative profit efficiency using the original data set since the loss of information is very small (less than 3.5% of our sample).

Variable		Mean	Std. Dev.	Min	Max
Bancassurance combinations (64 observations)					
TC	Total cost	9,122,497	14,100,000	17,600	69,500,000
y1	Total loans	102,000,000	134,000,000	34,500	613,000,000
y2	Total other earning asset	117,000,000	213,000,000	185,120	864,000,000
y3	Total customer deposits	87,800,000	126,000,000	399,728	500,000,000
p1	Price of labour	67.9321	24.2939	29.1385	173.3174
p2	Price of fixed asset	0.1381	0.1378	0.0278	1.1111
p3	Price of funding	0.0221	0.0083	0.0080	0.0458
y1'	Net interest income	7,677,966	10,900,000	16,100	41,700,000
y2'	Not interest income	2,778,478	4,499,214	15,500	17,900,000
TP	Total profits	1,834,991	2,555,768	-881,800	10,600,000
E	Equity	9,717,090	12,800,000	24,900	50,500,000
Not Bancassurance-oriented institutions (214 observations)					
TC	Total cost	1,096,508	3,458,772	5,160	35,600,000
y1	Total loans	15,500,000	43,200,000	36,800	385,000,000
y2	Total other earning asset	11,700,000	44,800,000	6,163	441,000,000
y3	Total customer deposits	12,500,000	38,100,000	49,020	317,000,000
p1	Price of labour	61.8729	20.0054	26.3398	235.4430
p2	Price of fixed asset	0.1451	0.1196	0.0240	0.7143
p3	Price of funding	0.0220	0.0079	0.0101	0.0569
y1'	Net interest income	1,006,180	3,060,827	3,700	30,600,000
y2'	Not interest income	247,284	836,167	430	8,248,000
TP	Total profits	209,549	598,183	-171,400	5,684,000
E	Equity	1,354,057	2,845,038	6,200	23,000,000

All values are in thousand euros, except for relative prices.
BC: Bancassurance Combinations, NBI: 'Not bancassurance-oriented' Institutions

Source: Author's own elaboration on Bankscope data

3.2.3 Firm specific factors and environmental conditions included to account for heterogeneity

To face possible estimation bias we have to account for heterogeneity between the two subsamples, using the Case 1 or the Case 2 models explained in Chapter 2. In order to consider differences across the analysed banks we decide to introduce some firms specific factors supposed out of the management control in the short run but able to influence the attained performance.

Firm specific factors to be included in the model have been chosen on the basis of two simple criteria:

- variables should have an influence on the production structure or the inefficiency distribution, on the basis of theoretical literature and evidence from empirical studies;
- variables show a significant difference in means between the two subgroups, so that they are suitable to consider peculiarity of banks diversificating into the insurance business and banks engaged only in traditional and investment banking.

The list of variables selected is reported in Table 3 together with the results from testing difference in means between the two subgroups (under the assumption of unequal variance).

TABLE 3 - Measuring cost and profit efficiency in the EU-15 banking industry over 2005
Bank specific factors introduced in the model to account for sample heterogeneity

	LN_TA	E/TA	NII/TR	LN_INTG	COMM	LISTED
NBI_mean	15.6523	0.0892	0.2124	7.4097	0.4019	0.2991
BC_mean	17.9717	0.0604	0.2606	12.0418	0.5938	0.6719
diff NBI-BC	-2.3194	0.0288	-0.0482	-4.6321	-0.1919	-0.3728
t-stat[a]	-8.8364	6.5044	-3.5347	-9.0847	-2.7253	-5.5677
p-value	0.0000	0.0000	0.0006	0.0000	0.0076	0.0000

NOTES: BC: Bancassurance Combinations, NBI: 'Not bancassurance-oriented' Institutions
[a] Two sample t-test of differences in mean between BCs and NBIs, under the assumption of unequal variance
H_0: mean(NBI)-mean(BC)=0 H_1: mean(NBI)-mean(BC)≠0

Source: Author's own elaboration on Bankscope data

In detail, we consider the following variables:

- *Size (LN_TA)*. The relationship between size and efficiency has always received great attention in efficiency studies, representing an important policy issue, especially during M&A waves. Even if there are no clear conclusions and results changes depending on methodologies applied (as outlined in Weill, 2004) accounting for size differences is certainly significant. As we can see from the mean of the natural log of total assets *(LN_TA)* BCs are, on average, larger than NBIs;
- *Risk (E/TA)*. Many efficiency studies outline the importance of accounting for bank risk preferences (see for example Mester, 1996; Laeven, 1999; Altunbas *et al*., 2000). We consider the ratio between equity and total asset *(E/TA)* as an indicator of management risk preferences. We note that BCs are more risky than NBIs, showing a lower mean level of capitalisation;
- *Diversification (NII/TR)*. Consistent with our research topic we believe that the degree of diversification could have an impact on bank operational performance. We have already reviewed studies dealing with this issue in Chapter 1. Given that we used the ratio of not interest income to total revenues *(NII/TR)* as a criterion to identify BCs it is obvious that the degree of diversification is larger than in NBIs. However it is important to notice that diversification is quite high also in NBIs;
- *Intangible Assets (LN_INTG)*. There is a growing attention on soft investment, such as advertisement, R&D expenditures or investments enhancing human capital and the future ability of firms to create value. To our knowledge only few studies have related this issue to efficiency (see for example Casolaro and Gobbi, 2006; Beccalli, 2007 relative to investments in IT). We believe that intangible assets could have an influence on operational efficiency. BCs show a greater value of investment in intangibles (as for total assets we take the natural log, *LN_INTG*): this is probably due to the fact that they are more often large financial groups;
- *Institutional type (COMM)*. In our sample we have banks of different institutional types: commercial, savings and cooperative. The model adopted can influence the production structure and the conditions faced in competition with other institutions, as outlined in many studies (between the others Altunbas *et al*., 2001; Bos *et al*., 2005) . So we introduce a dummy variable, named *COMM*, that distinguishes commercial banks from savings and cooperatives; its mean shows that BCs are more often commercial banks;

- *Listing (LISTED)*. We have both listed and unlisted banks. We believe that corporate governance mechanism can influence the firm performance, more or less subject to shareholder control or to take over threats: Beccalli *et al*. (2006) show the existence of a positive relationship between efficiency and stock performance. So listed banks, more exposed to competitive pressures, could pay a particular attention on efficiency. We introduce a dummy, named *LISTED*, to distinguish between listed and unlisted banks: as expected, BCs are more often listed companies with respect to NBIs.

Many studies dealing with cross country comparison of financial firms performance (Dietsch and Lozano-Vivas, 2000; Maudos *et al*., 2002; Molyneux and Casu, 2003; Beccalli, 2004; Fiordelisi and Molyneux, 2006) show that nationality has an important influence on the efficiency level. Despite the harmonisation process followed by EU members, there are still significant differences across several economic and institutional contexts. Following this literature we also include a set of country dummies (CD_k) to synthetically control for different national conditions[20].

3.3 Results

In Section 3.3.1 we start presenting our empirical findings from the base model, analysing the resulting frontiers and outlining its limitations. Secondly, in Section 3.3.2 we discuss the solution for the sample heterogeneity problem and the inclusion of firm specific factors.

In final we examine the results from our preferred model commenting differences in the mean level of cost and profit efficiency between the two subsamples of BCs and NBIs and the impact of the included exogenous factors.

3.3.1 Base Model

Table 4 reports results for cost and profit efficiency, with both input and output specifications, under the Base Model, in which BCs and NBIs are supposed to share the

[20] We select banks operating in the EU-15 area. In the final sample we have no observations for Luxembourg. As usual, one dummy (UK_dummy) is dropped from the model to avoid multicollinearity.

same technology and the same environmental conditions. In this case we adopt the SFA as specified in equation (7), without the inclusion of exogenous factors.

TABLE 4 - Measuring cost and profit efficiency in the EU-15 banking industry over 2005
Base Model - Pooled frontier

Panel A - COST EFFICIENCY

VALUE ADDED APPROACH				
Group	**Mean**	**Std dev**	**Min**	**Max**
NBI (n = 214)	0.8208	0.0985	0.4356	0.9589
BC (n = 64)	0.7949	0.0998	0.5066	0.9473
Test of difference in mean[a]	t stat 1.8286		p-value 0.0704	
TRADITIONAL AND NON TRADITIONAL BANKING OUTPUT				
Group	**Mean**	**Std dev**	**Min**	**Max**
NBI (n = 214)	0.8141	0.0840	0.3273	0.9567
BC (n = 64)	0.8255	0.0710	0.6115	0.9490
Test of difference in mean[a]	t stat -1.0755		p-value 0.2843	

Panel B – ALTERNATIVE PROFIT EFFICIENCY

VALUE ADDED APPROACH				
Group	**Mean**	**Std dev**	**Min**	**Max**
NBI (n = 206)	0.6413	0.1680	0.0646	0.9224
BC (n = 63)	0.6737	0.1476	0.3147	0.9064
Test of difference in mean[a]	t stat -1.4759		p-value 0.1427	
TRADITIONAL AND NON TRADITIONAL BANKING OUTPUT				
Group	**Mean**	**Std dev**	**Min**	**Max**
NBI (n = 206)	0.6831	0.1374	0.107133	0.9274
BC (n = 63)	0.6936	0.1225	0.3558	0.9025
Test of difference in mean[a]	t stat -0.5752		p-value 0.5663	

BC: Bancassurance Combinations, NBI: 'Not bancassurance-oriented' Institutions
[a] Two sample t-test of differences in mean between BC and NBI, under the assumption of unequal variance.
H_0: mean(NBI)-mean(BC)=0 H_1: mean(NBI)-mean(BC)≠0

Source: Author's own elaboration on Bankscope data

Cost efficiency seems to have a very similar level between the two subgroups. With the value added approach NBIs are more efficient while under the specification with traditional and non traditional banking output BCs have a small advantage and less variability than NBIs. Moving to the profit side, BCs show a marginal advantage (not statistically significant) in both input and output specifications. These results are consistent with Vander Vennet (2002) showing that:

"specialised banks are more efficient in traditional intermediation activities (…) while conglomerates appear to be slightly better managed when non traditional activities are included (…) In terms of profit efficiency, financial conglomerates achieve a slightly higher efficiency level than their specialised peers, but the difference is only marginally significant" (Vander Vennet, 2002, p. 266-268).

Despite the consistency with previous results, it is necessary to consider that we adopt a different focus on bancassurance and that we want to control for possible strong heterogeneity in the sample.

As outlined in Chapter 2 we can undertake comparisons on the basis of a common frontier only if all the firms in the sample share the same technology and environmental conditions: this assumption is quite strong for BCs and NBIs, engaged in a different mix of activities. So in order to avoid estimation bias we have to control for poolability between the two subgroups. At this aim we run a generalised log-likelihood ratio test; the LR statistic is defined by:

$$\lambda = -2\{\ln[L(H_0) - \ln[L(H_1)]]\} \tag{21}$$

where $\ln[L(H_0)]$ is the value of the log-likelihood function for the stochastic frontier estimated by pooling the data and $\ln[L(H_1)]$ is the sum of the values of the log-likelihood functions for the two separated frontiers for BCs and NBIs (Battese *et al*., 2004). The degrees of freedom for the Chi-square distribution are the difference between the number of parameters estimated under H_1 and H_0. Results for the poolability test are reported in Table 5.

TABLE 5 - Measuring cost and profit efficiency in the EU-15 banking industry over 2005
Log-likelihood ratio test for poolability of BCs and NBIs under the base model frontier

TEST PERFORMED	TEST STAT[a]	CRITICAL VALUE	DECISION
Cost frontier with the value added approach	χ^2=50.90	$\chi^2_{(0.05)}$=41.34	Reject H0
Cost frontier with traditional/non traditional output	χ^2=53.81	$\chi^2_{(0.05)}$=32.67	Reject H0
Profit frontier with the value added approach	χ^2=78.41	$\chi^2_{(0.05)}$=41.34	Reject H0
Profit frontier with traditional/non traditional output	χ^2=41.93	$\chi^2_{(0.05)}$= 32.67	Reject H0

BC: Bancassurance Combinations, NBI: 'Not bancassurance-oriented' Institutions

[a] The LR statistic is λ -2{ln[L(H0)]-ln[L(H1)]} where ln[L(H0)] is the value of the log-likelihood function for the stochastic frontier estimated by pooling the data and ln[L(H1)] is the sum of the values of the log-likelihood functions for the two separated frontiers for BCs and NBIs.

Source: Author's own elaboration on Bankscope data

We always reject the null hypothesis of poolability, concluding that a common frontier is not applicable to our sample.

Allen and Rai (1996) find that it was not possible to compare banks from universal and separated banking countries on the basis of a common frontier, while Vander Vennet (2002) concludes that poolability between banks with different degree of conglomeration can be accepted, except for the cost model with specification of traditional and non traditional banking output. This difference, beyond the selection of different sample, is probably due also to the definition of different subgroups and to the consideration of consolidated statements.

Rejecting poolability, we can consider cost and profit frontier obtained for each subgroup; we report results from these separated frontiers in Table 6, even if they are not helpful to our purpose to compare BCs and NBIs against a common benchmark.

TABLE 6 - Measuring cost and profit efficiency in the EU-15 banking industry over 2005 Base Model – Separated Frontiers

Panel A - COST EFFICIENCY

VALUE ADDED APPROACH				
Group	**Mean**	**Std dev**	**Min**	**Max**
NBI (n = 214)	0.8148	0.1039	0.4204	0.9636
BC (n = 64)	0.9737	0.0027	0.9656	0.9813
TRADITIONAL AND NON TRADITIONAL BANKING OUTPUT				
Group	**Mean**	**Std dev**	**Min**	**Max**
NBI (n = 214)	0.8034	0.0923	0.2969	0.9525
BC (n = 64)	0.8983	0.0410	0.7595	0.9667

Panel B – ALTERNATIVE PROFIT EFFICIENCY

VALUE ADDED APPROACH				
Group	**Mean**	**Std dev**	**Min**	**Max**
NBI (n = 206)	0.6214	0.1874	0.0551	0.9304
BC (n = 63)	0.7550	0.1959	0.2903	0.9980
TRADITIONAL AND NON TRADITIONAL BANKING OUTPUT				
Group	**Mean**	**Std dev**	**Min**	**Max**
NBI (n = 206)	0.6972	0.1219	0.1295	0.9223
BC (n = 63)	0.9471	0.0053	0.9320	0.9612

BC: Bancassurance Combinations, NBI: 'Not bancassurance-oriented' Institutions

Source: Author's own elaboration on Bankscope data

Analysing results from separated cost frontiers, using the value added approach, BCs look all similar, with a very high mean efficiency and a low standard deviation: on the opposite NBIs show a lower level of mean efficiency and a larger variability. In addition to this, the value of the log- likelihood function for BCs is less than that obtained using ordinary least squares. This means that this specification is not able to detect a significant inefficiency component in the subgroup of BCs. The specification using traditional and non traditional banking output shows a greater variability in the efficiency estimation for both BCs and

NBIs: in any case BCs seem more efficient than NBIs. Mean profit efficiency is higher for BCs with both input and output specifications: standard deviation, in this case, is lower for BCs under the specification with traditional and non traditional banking output.

In order to construct a shared frontier we have to overcome the heterogeneity problem including firm specific factors and environmental variables considering mean differences between the two subgroups.

3.3.2 Accounting for heterogeneity

Comparisons based on separated frontiers are not very significant for our research aims. So we try to construct a model accounting for heterogeneity between the two subgroups in which the LR test allows for poolability between BCs and NBIs. In order to do this we can use both the Case 1 and the Case 2 models explained in Chapter 2, including environmental/firm specific variables directly in the production function or as determinants of the inefficiency component. Even if the Case 2 is more convenient for our purpose, we also try the statistical method to choose which model gives the best fit to sample data.

As suggested by literature dealing with efficiency measurement (see for example Coelli *et al*., 1999; Glass and McKillop, 2006) we use a log-likelihood ratio test to contrast the two null hypotheses associated with the Case 1 and the Case 2 models against the alternative hypothesis represented by the artificial nested model. The relative test statistic is calculated as in equation (21), where $\ln[L(H_0)]$ is the value of the log-likelihood function for the null hypotheses corresponding to the Case 1 or the Case 2 Model, and $\ln[L(H_1)]$ is the value of the log-likelihood function for the alternative artificial nested model. The degrees of freedom for the Chi-square distribution involved are the number of parameters settled at zero under the null. Results from these tests are reported in Table 7.

TABLE 7 - Measuring cost and profit efficiency in the EU-15 banking industry over 2005 Testing Case 1[a] and Case 2[b] models against the artificial Nested model[c]

TEST PERFORMED	TEST STAT[d]	CRITICAL VALUE	DECISION
COST EFFICIENCY – VALUE ADDED APPROACH			
Case 1 (H_0) against Nested (H_1)	χ^2=60.91	$\chi^2_{(0.05)}$=30.14	Reject H_0
Case 2 (H_0) against Nested (H_1)	χ^2=120.25	$\chi^2_{(0.05)}$=30.14	Reject H_0
COST EFFICIENCY – TRADITIONAL AND NON TRADITIONAL BANKING OUTPUT			
Case 1 (H_0) against Nested (H1)	χ^2=62.41	$\chi^2_{(0.05)}$=30.14	Reject H_0
Case 2 (H_0) against Nested (H1)	χ^2=73.37	$\chi^2_{(0.05)}$=30.14	Reject H_0
PROFIT EFFICIENCY – VALUE ADDED APPROACH			
Case 1 (H_0) against Nested (H_1)	χ^2=105.45	$\chi^2_{(0.05)}$=30.14	Reject H_0
Case 2 (H_0) against Nested (H_1)	χ^2=99.58	$\chi^2_{(0.05)}$=30.14	Reject H_0
PROFIT EFFICIENCY – TRADITIONAL AND NON TRADITIONAL BANKING OUTPUT			
Case 1 (H_0) against Nested (H_1)	χ^2=76.81	$\chi^2_{(0.05)}$=30.14	Reject H_0
Case 2 (H_0) against Nested (H_1)	χ^2=71.01	$\chi^2_{(0.05)}$=30.14	Reject H_0

[a] Case 1 model: environmental/firm specific factors are supposed to influence the production structure and are directly included in the deterministic kernel of the frontier.
[b] Case 2 model: environmental/firm specific factors are supposed to influence the distance from the best practice and determine the inefficiency distribution.
[c] Nested model: environmental/firm specific factors are included both in the deterministic kernel of the frontier and as determinants of inefficiency.
[d] The LR statistic is λ -2{ln[L(H0)]-ln[L(H1)]} where ln[L(H0)] is the value of the log-likelihood functions under the null hypotheses corresponding to Case 1 and Case 2 models and ln[L(H1)] is the value of the log-likelihood function for the alternative artificial nested model.

Source: Author's own elaboration on Bankscope data

In both cases we have to reject the null hypotheses in favour of the nested model, so the statistical approach is not able to discriminate which model, between Case 1 and Case 2, provides the best fit to the data. In this case we decide which specification to use on the basis of theoretical motivations. The model in which variables are directly included in the deterministic portion of the frontier determines different benchmarks for sample units with different exogenous factors. We prefer the Case 2 model which allows us to consider heterogeneity among firms and still benchmark all of them against an identical frontier. So we determine cost and profit efficiency introducing firm specific factors as determinants of (in)efficiency: this model, first introduced by Battese and Coelli (1995) is also called

Technical Inefficiency Effects model (TE model), because it allows to measure the effect of some exogenous factors on the attained performance.

Before taking any comparison on the basis of the resulting common frontier we have to control that this specification solves the heterogeneity problem, allowing for poolability between BCs and NBIs. As in the case of the base model we run a log-likelihood ratio test. Results from this test are reported in Table 8.

TABLE 8 - Measuring cost and profit efficiency in the EU-15 banking industry over 2005
Log-likelihood ratio test for poolability between BCs and NBIs under the Case 2 model[a]

TEST PERFORMED	TEST STAT[b]	CRITICAL VALUE	DECISION
Cost frontier - value added approach	χ^2=48.82	$\chi^2_{(0.05)}$=62.83	Accept H0
Cost frontier - traditional/non traditional output	χ^2=47.78	$\chi^2_{(0.05)}$=53.38	Accept H0
Profit frontier – value added approach	χ^2=129.13	$\chi^2_{(0.05)}$=62.83	Reject H0
Profit frontier - traditional/non traditional output	χ^2=29.6	$\chi^2_{(0.05)}$=53.38	Accept H0

[a] Case 2 model: environmental/firm specific factors influence the distance from the best practice and are the determinants of the inefficiency distribution.
[b] The LR statistic is λ -2{ln[L(H0)]-ln[L(H1)]} where ln[L(H0)] is the value of the log-likelihood function for the stochastic frontier estimated by pooling the data and ln[L(H1)] is the sum of the values of the log-likelihood functions for the two separated frontiers for BCs and NBIs.

Source: Author's own elaboration on Bankscope data

We can see that the variables included allow to construct a common frontier in 3 of 4 cases (except for profit efficiency under the value added approach). So it is reasonable to compare BCs and NBIs against a common frontier, as shown in Table 9[21].

TABLE 9 - Measuring cost and profit efficiency in the EU-15 banking industry over 2005
Pooled Frontier including firm specific factors as determinants of (in)efficiency

COST EFFICIENCY				
INPUT/OUPUT SPECIFICATION	**NBI MEAN**	**BC MEAN**	**T-STAT[a]**	**P-value**
Value added approach	0.8549	0.8446	0.5613	0.57
Traditional and non traditional banking output	0.7793	0.8844	-5.9992	0.00

[21] Estimated parameters for the resulting frontiers are reported in the Appendix.

ALTERNATIVE PROFIT EFFICIENCY				
INPUT/OUPUT SPECIFICATION	**NBI MEAN**	**BC MEAN**	**T-STAT[a]**	**P-value**
Traditional and non traditional banking output	0.6672	0.7135	-1.6509	0.10

BC: Bancassurance Combinations, NBI: 'Not bancassurance-oriented' Institutions

[a] *Two sample t-test of differences in mean between BCs and NBIs*

H_0: *mean(NBI)-mean(BC)=0* H_1: *mean(NBI)-mean(BC)≠0*

Source: Author's own elaboration on Bankscope data

Under the value added approach there is a slight cost advantage in favour of NBIs, but it is not statistically significant. Results from alternative profit efficiency are not reported because of the rejection of the poolability test.

Moving to the specification with traditional and non traditional banking output, we find a strong and statistically significant advantage for BCs on both the cost and the profit sides. So under the value added approach there are no significant gaps between BCs and NBIs, while the latter result more performing when non traditional banking output is considered.

Including exogenous factors as determinants of the inefficiency component we can also analyse their effect on the attained performance, studying the signs and the significance of the resulting coefficients. These are reported in Table 10 for both firm specific factors and country dummies included to account for national differences.

TABLE 10 - Measuring cost and profit efficiency in the EU-15 banking industry over 2005
Firm specific factors determining the inefficiency distribution

	COST EFFICIENCY		PROFIT EFFICIENCY
	(value added approach)	**(traditional and non traditional output)**	**(traditional and non traditional output)**
VARIABLE	COEFFICIENT	COEFFICIENT	COEFFICIENT
LN_TA	-0.0806***	-0.0198	-0.2455***
E/TA	0.0712	-0.3337***	-1.0651***
NII/TR	0.2599***	-0.3638***	0.0148
LN_INTG	0.0048	-0.0154*	-0.0024
COMM	0.0695	-0.0591	-0.0466
LISTED	0.0752	-0.0183	-0.1683

Austria_dummy	-0.2141	0.0709	0.1588
Belgium_dummy	0.2981	0.3114	-3.558***
Denmark_dummy	0.2403	-0.3584	-1.3564
Finland_dummy	-0.3568	0.4814***	-2.955***
France_dummy	0.2222	-0.1820	0.4581
Germany_Dummy	0.4369	0.2659**	0.1593
Greece_dummy	0.7099**	0.7446***	-0.2876
Ireland_dummy	-0.8232	-0.0705	0.3014
Italy_dummy	0.5925*	0.2210	-0.0353
Netherlands_dummy	-0.4284	0.1213	-0.0448
Portugal_dummy	0.3443	0.3083	-0.4469
Spain_dummy	-0.0937	0.3672***	-1.0664**
Sweden_dummy	0.3483	-0.7485	-0.1521

A coefficient >0 means a positive effect on the inefficiency component u_i and then a negative relationship with efficiency; the opposite for a coefficient <0. ** p-value<0.1; ** p-value<0.05; ***p-value<0.01*

Source: Author's own elaboration on Bankscope data

Firm size *(LN_TA)* appears always positively related to efficiency (the coefficient is negative and statistically significant in 2 of 3 cases). In the efficiency literature dealing with financial firms we can find mixed results on the relationship between efficiency and size. While there is a large number of studies dealing with scale economies, only few analyses have investigated bank size as a determinant of X-efficiency. Worthington (1998) find that larger organisations have an advantage in managing institutional operations observing that "*… larger building societies direct more managerial inputs into identifying and resolving inefficiency; ex ante one would expect a negative coefficient when cost inefficiency is regressed against total assets*" (Worthington 1998, p. 463). Vander Vennet (2002) find that cost efficiency is largely unrelated to size, while smallest banks appear less profit efficient. Weill (2004) tries different frontier techniques to study the relationship between size and efficiency, finding that Data Envelopment Analysis (DEA) efficiency scores increase monotonically with size, while there is no a clear trend for SFA and DFA scores. In any case, restricting the analysis to the comparison between only extreme classes, all approaches agree in assigning a better performance to the largest banks, except than in Switzerland. In their SFA analysis, Cavallo and Rossi (2006) include both the natural logarithm of total

assets and three dummies to distinguish among small, medium and large banks, with different results across countries.

The relationship with the level of capitalisation *(E/TA)* is ambiguous: when the coefficients are significant they signal a positive relationship between capitalisation and efficiency. This agrees with Mester (1993) underlying as this does not mean that banks can enhance their efficiency by an higher capital asset ratio, but "*it may be an indication that higher capital ratios may prevent moral hazard*" (Mester 1993, p. 23). If a bank's capital level decreases, managers have an increasing incentive to take on excessive risk, engaging in activities that do not create value for shareholders. This sign of the relationship is confirmed by Worthington (1998) but in contrast with Cavallo and Rossi (2002) and Casolaro and Gobbi (2007) showing a negative relationship between capitalisation and efficiency for both cost and profit models. The authors recognised as the casualty is ambiguous because "*Large capital ratios may follow from excess capacity or may be due to agency problems as long as more efficient banks can signal their quality through a high leverage…*" (Casolaro and Gobbi, 2006, p. 25). Mixed results are presented in Casu and Girardone (2004).

The level of diversification *(NII/TR)* shows different coefficients depending on input and output definition. Under the value added approach it has a positive sign, showing a negative relationship between diversification and cost efficiency. This is consistent with our finding of a little advantage in favour of NBIs when non traditional output are not considered. On the opposite, using the specification with traditional and non traditional banking output, the coefficient is negative and statistically significant, meaning a direct relationship between cost efficiency and diversification. Also this result is consistent with our finding of an advantage for BCs using this approach. Moving to the profit case the coefficient is not statistically significant: so we do not find evidence of the one stop banking theory.

The amount of investment in intangibles *(LN_INTG)* shows coefficients of different signs and levels of significance. This is probably due to the fact that these assets enhance firm ability to realise profit or to reduce costs only in the long run, while we are referring to the balance sheet of a specific financial year.

The dummy linked to institutional type *(COMM)* is never significant, meaning that commercial banks do not have a structural advantage on cooperative and savings banks as confirmed in other studies (e.g. Altunbas *et al*. 2001; Weill, 2004; Girardone *et al.*, 2004).

Studying the dummy linked to listing *(LISTED)*, listed companies seem to be more efficient than unlisted companies from both the cost and the profit sides when using the specification with traditional and non traditional banking output. A reverse relationship is revealed under the value added approach. The coefficients, however, are not significant: this could be due to the fact that this dummy is strictly linked to size and capitalisation.

Countries dummy are quite different from one model to another[22]: Greece and Italy seem to have a cost disadvantage under the value added approach; when non traditional activities are included the disadvantage for Italy disappears while it remains for Greece, together with Germany, Finland and Spain. On the profit side Belgium, Finland and Spain show an advantage. It is then possible to affirm that even a different geographic distribution of BCs and NBIs across Europe can influence the mean level of efficiency in the two subgroups.

In order to assess the relevance of the firm specific factors contribution to the attained performance, we also measure net efficiency scores, calculated supposing that all the firms in the sample share the most favourable conditions.

Net efficiency scores for both the cost and the profit cases are reported in Table 11 for every model (except for alternative profit efficiency under the value added approach, for which we reject poolability).

TABLE 11 – Measuring cost and profit efficiency in the EU-15 banking industry over 2005
Case 2 Model: net cost efficiency scores

NET COST EFFICIENCY				
INPUT OUTPUT SPECIFICATION	***NBI MEAN***	***BC MEAN***	***T-STAT[a]***	***P-VALUE***
Value added approach	0.9661	0.9683	-0.6947	0.49
Traditional and non traditional banking output	0.9789	0.9824	-3.4030	0.00

[22] The sign and the magnitude of country dummy coefficients should be interpreted in comparison with the omitted variable UK_dummy.

NET PROFIT EFFICIENCY				
INPUT OUTPUT SPECIFICATION	***NBI MEAN***	***BC MEAN***	***T-STAT[a]***	***P-VALUE***
Traditional and non traditional banking output	0.9128	0.9326	-2.7499	0.01

BC: Bancassurance Combinations, NBI: 'Not bancassurance-oriented' Institutions

[a] *Two sample t-test of differences in mean between BCs and NBIs*

H_0: mean(NBI)-mean(BC)=0 H_1: mean(NBI)-mean(BC)≠0

Source: Author's own elaboration on Bankscope data

On the cost side, with respect to gross efficiency scores, the substantial parity between BCs and NBIs under the value added approach is confirmed. The advantage for BCs resulting from the use of traditional and non traditional banking output is still significant but strongly reduced. Moving to the profit side the advantage for BCs is still evident but not so relevant as in terms of gross efficiency scores. This probably means that the considered firm specific factors play a very important role in determining the performance of banking institutions.

3.4 A focus on the Italian case

In this section, we run the same model defined for the Eu 15 area (Case 2) for a sample of Italian banking institutions. We propose this focus on the domestic market for the following reason:

- for the insurance side, as described in the next chapter, we were able to analyse only a domestic sample; as a consequence in order to provide a complete view of the bancassurance phenomenon from both the banking and the insurance sides we can only refer to the case of Italy;
- for Italian banking institutions we can draw consolidated statements from ABI Banking Data, a database provided by ABI (Associazione Bancaria Italiana). This database contains more detailed data than Bankscope, so that we can use more sophisticated definitions of some variables.

We analyse consolidated statements for all the Italian banking groups; we drop observations relative to financial entities that are specialised in investment banking or in a particular business, such as consumer finance or leasing. In order to classify these banks as bancassurance combinations (BCs) or 'not bancassurance-oriented institutions' (NBIs) we

adopt the Vander Vennet specification as in the European case. So a bank is classified as a BC if it is engaged in insurance activities through an in-house department or a consolidated subsidiary, and the ratio of not interest income to total revenues exceeds 20% while NBIs are defined as a residual cluster. Our final sample is composed as shown in Table 12.

TABLE 12 – Overview of the selected sample of Italian banking institutions (2005-2006)

	2005	2006	Total
BC	23	24	47
NBI	18	15	33
Total	41	39	**80**

BC: Bancassurance Combinations, NBI: 'Not bancassurance-oriented' Institutions

Source: Author's own elaboration on ABI Banking Data

As we can see the bancassurance phenomenon is quite common in Italy: banks consolidating an insurance companies are more numerous that banks specialised in traditional and investment banking.

In order to identify input and output variables, we adopt the same approach used for the European case, testing two different definitions: the value added approach and a specification distinguishing traditional and non traditional banking output. Even if we dispose of more detailed data we are not able to define a specification distinguishing the amount of revenues resulting from life business or from other non traditional banking activities.

Insurance companies, indeed, are characterised by a different accounting method depending on the ownership structure:

- bancassurance companies wholly controlled by banks are included with the method of full consolidation, so that the balance sheet shows the values of technical reserves and the profit and loss account shows the values of premiums and incurred benefits from the life business;

- insurance companies deriving from a joint venture between a bank and an insurer are consolidated with the equity method so that we cannot see the values of technical reserves, premiums or incurred benefits deriving from the life business, but we have only the value of the stake in the bank's assets.

This means that we are able to calculate revenues from the life insurance business only in the case of banks fully consolidating a bancassurance company, while in the case of banks participating in a joint venture we can only calculate the value of the stake in the associated company.

Given the impossibility of measuring insurance revenues for all banking groups consolidating a life company, we maintain the same specification used in the European case, based on net interest income, representing traditional banking output, and not interest income, representing all activities different from traditional banking (not only life insurance).

Summary statistics for the input and output variables are reported in Table 13.

TABLE 13 - Descriptive statistics of input and output variables for the Italian sample of banks (2005-2006)

Variable		Mean	Std. Dev.	Min	Max
Full sample (80 observations)					
TC	Total cost	2,606,703	5,530,092	52,459	40,400,000
y1	Total loans	41,000,000	88,900,000	1,071,560	525,000,000
y2	Total other earning asset	13,800,000	41,300,000	102,669	254,000,000
y3	Total customer deposits	16,400,000	28,100,000	491,310	148,000,000
p1	Price of labour	66.2990	7.5824	51.4832	93.1369
p2	Price of fixed asset	0.5004	0.2941	0.1034	2.4174
p3	Price of funding	0.0361	0.0088	0.0099	0.0657
y1'	Net interest income	552,809	1,152,836	-882,648	7,067,117
y2'	Not interest income	2,863,907	5,255,847	91,298	35,200,000
TP	Total profits	2,606,703	5,530,092	52,459	40,400,000
E	Equity	41,000,000	88,900,000	1,071,560	525,000,000

Variable		Mean	Std. Dev.	Min	Max
Bancassurance combinations (47 observations)					
TC	Total cost	4,276,466	6,752,460	127,085	40,400,000
y1	Total loans	67,100,000	109,000,000	1,854,607	525,000,000
y2	Total other earning asset	23,000,000	52,200,000	464,791	254,000,000
y3	Total customer deposits	26,300,000	33,300,000	984,173	148,000,000
p1	Price of labour	68.2811	8.6332	51.4832	93.1369
p2	Price of fixed asset	0.4828	0.1767	0.1607	0.8208
p3	Price of funding	0.0348	0.0081	0.0099	0.0562
y1'	Net interest income	913,606	1,399,068	-882,648	7,067,117
y2'	Not interest income	4,611,345	6,312,284	175,934	35,200,000
TP	Total profits	4,276,466	6,752,460	127,085	40,400,000
E	Equity	67,100,000	109,000,000	1,854,607	525,000,000
Not Bancassurance-oriented institutions (33 observations)					
TC	Total cost	2,606,703	5,530,092	52,459	40,400,000
y1	Total loans	41,000,000	88,900,000	1,071,560	525,000,000
y2	Total other earning asset	13,800,000	41,300,000	102,669	254,000,000
y3	Total customer deposits	16,400,000	28,100,000	491,310	148,000,000
p1	Price of labour	66.2990	7.5824	51.4832	93.1369
p2	Price of fixed asset	0.5004	0.2941	0.1034	2.4174
p3	Price of funding	0.0361	0.0088	0.0099	0.0657
y1'	Net interest income	552,809	1,152,836	-882,648	7,067,117
y2'	Not interest income	2,863,907	5,255,847	91,298	35,200,000
TP	Total profits	2,606,703	5,530,092	52,459	40,400,000
E	Equity	41,000,000	88,900,000	1,071,560	525,000,000

All values are in thousand euros, except for relative prices.
BC: Bancassurance Combinations, NBI: 'Not bancassurance-oriented' Institutions

Source: Author's own elaboration on ABI Banking Data

Finally, we define the same firm specific factors used in the previous analysis, with some improvement allowed by the use of a more detailed database[23]. Before including these variables in the model as determinants of firms (in)efficiency we want to assess if they are

[23] Environmental variables (i.e. country dummies) included to account for national differences are no more necessary.

able to identify important differences between the two subsamples as in the European case. At this aim we run a set of tests of differences in mean reported in Table 14.

TABLE 14 – Measuring cost and profit efficiency in the Italian banking industry (2005-2006)
Bank specific factors introduced in the model to account for sample heterogeneity

	LN_TA	TCR%	%INS	LN_INTG	COMM	LISTED
NBI_mean	15.2271	0.12034	0.0000	9.6064	0.4848	0.2121
BC_mean	17.5177	0.09874	0.0297	13.1348	0.6383	0.7021
diff NBI-BC	-2.2905	0.0216	-0.0297	-3.5283	-0.1534	-0.4900
t-stat[a]	-10.8054	2.6295	-7.3075	-9.0847	-1.3550	-4.9576
p-value	0.0000	0.0126	0.0000	0.0000	0.1800	0.0000

NOTES: BC: Bancassurance Combinations, NBI: 'Not bancassurance-oriented' Institutions
[a] Two sample t-test of differences in mean between BCs and NBIs, under the assumption of unequal variance.
H_0: mean(NBI)-mean(BC)=0 H_1: mean(NBI)-mean(BC)≠0

Source: Author's own elaboration on ABI Banking Data

As we can see, differences in the mean levels of the analysed bank specific factors are highly significant, except for the dummy distinguishing between commercial and cooperative banks. We can observe that:

- *Size (LN_TA)*. Similar to the European case, BCs have a mean dimension bigger than NBIs;
- *Risk (TCR%)*. Instead of introducing the simple ratio of equity over total asset, as in the European case, we adopt a more sophisticated measure of capital adequacy, total capital ratio (%), given by regulatory capital over risk weighted assets. As in the European case, BCs are more risky than NBIs, showing a lower level of capitalisation;
- *Diversification (%INS)*. For Italian banking institutions we have more detailed data allowing us to focus more strictly on the bancassurance phenomenon. In this case we do not consider all activities different from traditional banking intermediation, measuring the ratio of not interest income over total revenues, but we define a ratio relative exclusively to the life insurance business. At this aim, we calculate the ratio between the book value of the consolidated insurance company (the entire value for wholly owned insurance companies, and the proportion controlled by the bank for jointly owned insurance companies). This ratio can provide a quite accurate measure of

the insurance weight into the banking group[24]. The difference between the two subgroups is naturally highly significant because the defined variable takes a value equal to zero for all NBIs;

- *Intangible Assets (LN_INTG)*. As for the European case BCs show a greater value of investment in intangibles probably due to the fact that they are more often large financial groups;
- *Institutional type (COMM)*. In the Italian case we consider as commercial banks institutions adopting the form of stock companies ("Società per azioni") while we consider mutual companies banks adopting a cooperative form ("Banche Popolari" and "Banche di credito cooperativo"). As we can see form Table 14, BCs are more often commercial banks even if the difference in mean with NBIs is not highly statistically significant;
- *Listing (LISTED)*. As for the European case, we find that BCs are more frequently listed than NBIs.

Before applying to the Italian sample our preferred model (Case 2) we have to control that the definition of the frontier with the inclusion of environmental variables allows for poolability between BCs and NBIs. At this aim we run a log-likelihood ratio test, reporting results in Table 15.

TABLE 15 - Measuring cost and profit efficiency in the Italian banking industry (2005-2006)
Log-likelihood ratio test for poolability of BCs and NBIs in the Case 2 model[a]

TEST PERFORMED	TEST STAT[b]	CRITICAL VALUE	DECISION
Cost frontier - value added approach	χ^2= 30.64	$\chi^2_{(0.05)}$=46.19	Accept H0
Cost frontier - traditional/non traditional output	χ^2=29.77	$\chi^2_{(0.05)}$=38.88	Accept H0
Profit frontier – value added approach	χ^2=101.26	$\chi^2_{(0.05)}$=46.19	Reject H0
Profit frontier - traditional/non traditional output	χ^2=30.41	$\chi^2_{(0.05)}$=38.88	Accept H0

[a] Case 2 model: environmental/firm specific factors influence the distance from the best practice and are the determinants of the inefficiency distribution.
[b] The LR statistic is λ -2{ln[L(H0)]-ln[L(H1)]} where ln[L(H0)] is the value of the log-likelihood function for the stochastic frontier estimated by pooling the data and ln[L(H1)] is the sum of the values of the log-likelihood functions for the two separated frontier for BCs and NBIs.

Source: Author's own elaboration on ABI Banking Data

[24] We do not include this measure in the cost or profit translog function, because it cannot represent a measure of the insurance output produced in the observed year.

As for the European case we can compare BCs and NBIs against a common benchmark in all cases, except for profit efficiency measured with the value added approach[25]. The resulting mean level of cost and profit efficiency are reported in Table 16.

TABLE 16 - Measuring cost and profit efficiency in the Italian banking industry (2005-2006) Pooled Frontier including firm specific factors as determinants of (in)efficiency

COST EFFICIENCY				
INPUT/OUPUT SPECIFICATION	**NBI MEAN**	**BC MEAN**	**T-STAT[a]**	**P-value**
Value added approach	0.8134	0.8197	-0.1719	0.86
Traditional and non traditional banking output	0.8951	0.893	0.0850	0.93
ALTERNATIVE PROFIT EFFICIENCY				
INPUT/OUPUT SPECIFICATION	**NBI MEAN**	**BC MEAN**	**T-STAT[a]**	**P-value**
Traditional and non traditional banking output	0.7858	0.7356	1.1694	0.25

BC: Bancassurance Combinations, NBI: 'Not bancassurance-oriented' Institutions

[a] *Two sample t-test of differences in mean between BCs and NBIs*

H_0: *mean(NBI)-mean(BC)=0* H_1: *mean(NBI)-mean(BC)≠0*

Source: Author's own elaboration on ABI Banking Data

Our findings for Italian banks are quite different from the European case. With reference to the latter we found a significant advantage for BCs from both the cost and the profit side under the specification with traditional and non traditional banking output, while the two subsamples showed a very similar level of cost efficiency under the value added approach (results from alternative profit efficiency with the value added approach are not reported because of the rejection of the poolability test). Restricting observation to Italy, we observe quite similar level of performance across the two subgroups, regardless the adopted input and output definition from both the cost and the profit sides.

From the results of the Case 2 Model, reported in Table 17, we can also observe the signs and the significance of firms specific factors coefficients, in order to assess their influence on efficiency.

[25] Estimated parameters for the resulting frontiers are reported in the Appendix.

TABLE 17 - Measuring cost and profit efficiency in the Italian banking industry (2005-2006) Firm specific factors determining the inefficiency distribution

	COST EFFICIENCY		PROFIT EFFICIENCY
	(value added approach)	**(traditional and non traditional output)**	**(traditional and non traditional output)**
VARIABLE	COEFFICIENT	COEFFICIENT	COEFFICIENT
LN_TA	-0.483***	-0.316***	-0.217**
TCR%	-2.794***	-4.193*	-7.908***
INS%	2.432**	-2.429	-5.460***
LN_INTG	0.192***	-0.0154*	0.406***
COMM	-0.302**	-0.1755	-0.457
LISTED	0.480**	-0.3188**	-0.077

A coefficient >0 means a positive effect on the inefficiency component u_i and then a negative relationship with efficiency; the opposite for a coefficient <0. ** p-value<0.1; ** p-value<0.05; ***p-value<0.01*

Source: Author's own elaboration on ABI Banking Data

Firm size *(LN_TA)* appears always positively related to efficiency (the coefficient is negative and statistically significant in all cases), confirming the result already found for the European case.

The relationship with the level of capitalisation *(TCR%)* is less ambiguous than in the previous case, showing a strong negative coefficient in all model specifications, concluding that banks with higher solvency ratios have a better performance from both the cost and the profit sides.

The level of diversification into the insurance industry (INS%) shows different coefficients depending on input and output definition. Under the value added approach it has a positive sign, showing a negative relationship between diversification and cost efficiency as in the European case. On the opposite, using the specification with traditional and non traditional banking output, the coefficient is negative and statistically significant, in both the cost and the profit model. Form this latter point of view we can assume that in the Italian banking industry there are some positive effects of one stop shopping. But the relevance of this cost and revenue synergies is probably limited or compensated by other negative effects, given that the two subsample have a very similar level of performance.

The amount of investment in intangibles *(LN_INTG)* shows coefficients of different signs and significance. This is probably due to the fact that these assets enhance firm ability to realise profit or to reduce costs only in the long run, while we are referring to the balance sheet of a specific financial year.

The dummy linked to institutional type *(COMM)* is significant only in 1 of 3 cases, meaning that commercial banks do not have a structural advantage on cooperative banks as confirmed in other studies (e.g. Altunbas *et al*., 2001; Weill, 2004; Girardone *et al.*, 2004).

Listed companies seem to be more efficient than unlisted companies from both cost and profit sides when using the specification with traditional and non traditional banking output. The coefficient *(LISTED)* however is significant only for the cost side. In addition, this variable is probably strictly linked to dimension and institutional type.

3.5 Conclusions

The aim of this Chapter is to compare banks diversificating into the insurance business (bancassurance combinations, BCs) with banks operating only in traditional and investment banking ('not bancassurance-oriented institutions', NBIs). Following Vander Vennet (2002), we define as BCs banks consolidating an insurance companies and presenting a ratio of not interest income over total revenues greater than 20%.

We first analyse a sample of banking institutions operating in the EU 15 area. BCs and NBIs result quite heterogeneous with respect to some firm specific factors, such as size, level of capitalisation, amount of investment in intangibles, institutional type, listing and, for definition, level of diversification. In order to avoid estimation bias in efficiency scores due to sample heterogeneity, we incorporate in the model the cited firm specific factors as determinants of (in)efficiency and a set of country dummies. The inclusion of these exogenous factors allows us to obtain a shared benchmark between the two subgroups and analyse their impact on performance avoiding the problems of a two step procedure.

Results from the European sample show that BCs and NBIs have a very similar performance under the value added approach, while BCs present a strong advantage under the definition with traditional and non traditional banking output, on both the cost and the profit sides.

Analysing the coefficients assumed by firm specific factors we can conclude that differences between the two subgroups are also influenced by size and level of capitalisation. For diversification, results depend on the approach used in input and output definition. The coefficient assumed under the value added approach indicates a negative relationship with efficiency, while the coefficient under the specification with traditional and non traditional banking output shows a positive relationship (statistically significant only on the cost side). Calculating net efficiency scores (i.e. assuming that all sample firms share the same conditions) we find that the advantage of BCs is strongly reduced and that the included firm specific factors can explain a large proportion of differences across the two subgroups.

Restricting the analysis to the Italian case, the relevance of sample heterogeneity and then the need for the inclusion of firm specific factors are absolutely confirmed, while results for the Case 2 model are quite different. In this case we do not find strong evidence of an advantage in favour of BCs, regardless the approach used in input and output definition, on both the cost and the profit sides. Analysing the coefficients assumed by firm specific factors as determinants of (in)efficiency we find, as in the European case, that diversification has, respectively, a negative and a positive relationship with performance under the value added approach and under the specification with traditional and non traditional banking output. In this case the positive relationship between efficiency and diversification obtained including non traditional banking output is highly significant also on the profit side: this could be interpreted as a signal for the opportunity of one stop shopping in Italy. But the relevance of this cost and revenue synergies is probably limited or compensated by other negative effects, given that the two subsamples have a very similar level of mean performance.

We can conclude that in order to compare BCs and NBIs it is crucial to account for sample heterogeneity and that there are only weak evidences in favour of the soundness of a bancassurance strategy: for the European sample the advantage of BCs is highly sensitive to the definition of input and output variables, while for the Italian sample we find a substantial parity between the two subgroups.

In order to give a complete evaluation of bancassurance phenomenon we should also investigate the insurance side, assessing if life insurance companies controlled by banks are more efficient than independent life insurance companies, always on the basis of a frontier analysis.

Chapter 4: Bancassurance companies *vs.* life independent companies

4.1 Introduction

In this chapter we present the empirical analysis conducted in order to answer the second and the third research questions:

RQ2 (Insurance side): Are bancassurance companies more cost and profit efficient than independent companies operating in the life business?

RQ3 (Alternative structures comparison): Which model of bancassurance reaches the best performance?

We describe sample selection criteria and variables included in the cost and profit efficiency models in Section 4.2 while main results are presented in Section 4.3. In Section 4.4 we conclude commenting our findings relative to the validity of a bancassurance strategy from the insurance point of view.

4.2 Data and variables

The aim of this paragraph is to describe the sample and the variables used in the research design. Section 4.2.1 presents sample selection criteria, Section 4.2.2 discusses the choice of input and output variables and Section 4.2.3 deals with firm specific factors included in the frontier model.

4.2.1 Sample selection criteria

Studies dealing with the insurance industry are generally conducted on a national base, while cross country comparisons (e.g. Rai, 1996; Diacon *et al*., 2002) are still less frequent: this is probably due to the scarce availability of reliable data in a comparable format and to the lower level of harmonisation with respect to the banking sector. In addition to this we cannot limit our analysis to financial data, but we also need information on the ownership structure and the distribution channels.

In order to use information with a reasonable level of detail and reliability we restrict our analysis to the relevant case of the Italian life insurance industry. The Italian life insurance market ranks fourth in Europe (CEA, 2008); it is much more developed than the market for P&C products with life premiums representing a significant 65.1% share in total premiums. It also presents interesting perspectives for further growth: the penetration rate (the ratio between life premiums and GDP) is still lower than in other European countries like UK or France. The bancassurance phenomenon is strongly relevant from both a distributional and an ownership points of view: in 2006, nearly 60% of life premiums were collected through bank branches (ANIA, 2008); in addition to this if we look at the ranking in terms of 2006 market share, three of the top five operators were totally or jointly owned by banks.

To answer our research questions we first need to define bancassurance firms. Following an ownership criterion, we classify as bancassurance firms life companies that:

- are wholly owned or controlled by banks (insurance companies controlled by banks, CBs);
- are jointly owned by a bank and an insurer, with both equal or unequal participations (joint ventures, JVs).

Independent companies (ICs) are assumed as a residual cluster. It is worth noticing that under this classification we are not able to account for lighter forms of integration and cooperation between banks and insurers, such as non-equity strategic alliances or simple cross selling agreements: as a consequence we fail to consider that also independent companies can distribute their products through bank branches.

As reviewed in Chapter 2 existing studies have considered bancassurance from an ownership or a distributional perspective in a mutually exclusive way: we try to give an innovative contribution dealing with both aspects of the bancassurance phenomenon. For this reason it is important to collect information about the share of premiums collected by bank branches regardless the existence of equity links with banking institutions.

Data sources are the following:

- ownership information used to deal with bancassurance as equity links between banks and insurance companies. We collect this information from companies' web sites;

- relevance of bancassurance as a distribution channel in every company, measured as the percentage of premiums collected by bank branches, provided by ANIA[26] (Associazione Nazionale delle Imprese Assicuratrici);
- life technical accounts (for both specialised and composite companies) for the years 2005 and 2006 are drawn by INFOBILA[27], a database realised by ANIA.

The selected sample is an unbalanced panel data of 168 year observations[28] relative to companies of different ownership types, as showed in Table 18:

TABLE 18 - Overview of the selected sample of Italian insurance companies (2005-2006)

Type	2005	2006	Tot obs
Controlled by banks (CB)	13	12	25
Independent companies (IC)	49	51	100
Joint ventures (JV)	21	22	43
Total	83	85	**168**

Source: Author's own elaboration on ANIA Data

As we can see, there are more independent companies than bancassurance firms; in addition to this it is worth noticing that joint ventures are quite common in the Italian market. During the observed two-year period, 2005-2006, there were two M&A operations: Generali Vita was incorporated in Assicurazioni Generali; Fata Assicurazioni, Assitalia and Ina Vita merged in Ina-Assitalia. Only one company has changed its ownership type: BPM Vita was a captive company in 2005 (fully controlled by the banking institution BPM) and became a joint venture between BPM and the insurer Fondiaria Sai in 2006.

[26] In terms of premiums, insurance firms members of ANIA represent 91% of the Italian market.
[27] With respect to other possible data sources, INFOBILA presents the following advantages:
- it has a complete coverage of Italian insurance companies;
- with reference to composite companies (offering both life and P&C insurance), it is able to disentangle financial information (like assets, costs, revenues…) for different lines of business.

[28] We drop extreme outliers, i.e. observations with values outside the range given by the medium plus or minus three times the standard deviation.

4.2.2 Input and output definition

Even if intermediation is one of the most important function for life companies

"ignoring insurance outputs is likely to overlook important distinctions among insurers (…) Accordingly, the asset approach is not optimal for life insurers" (Cummins and Weiss, 1998, p. 22).

As a matter of fact most previous studies (Cummins *et al.*, 1996; Cummins and Zi, 1997; Cummins and Weiss, 1998; Cummins *et al.*, 1999; Cummins *et al.*, 2003; Cummins and Rubio Misas, 2006) suggest a value added approach, identifying the following main activities:

- financial intermediation: insurers issue policies and annuity contracts and invest funds in traded securities or asset classes that are not available to most investors, such as privately placed bonds;
- risk-pooling and risk-bearing: insurance provides a mechanism through which consumers and businesses exposed to losses can engage in risk reduction through pooling; insurers also add value by holding equity capital to bear the residual risk of the pool;
- "real" financial services relating to insured losses: exploiting their expertise in management risk and finance, insurers can provide a variety of real services for policyholders, such as personal financial planning; this activity is strictly related to the previous ones.

An output measure for the risk pooling and bearing activity can be provided by incurred benefits, representing payments made to policyholders when the insured event happens. Funds not needed for customers claims or other expenses are added to reserves and invested in securities or other asset classes. So additions to reserves can be viewed as the output of the intermediation function[29].

This kind of approach is followed by the most recent studies (see for example Fenn *et al*., 2008; Trigo-Gamarra, 2007) even if there are also empirical analyses using different proxies for insurance output, as the amount of premium income (see for example Greene and Segal, 2004; Diacon *et al*., 2002).

[29] For a detailed review of the theoretical foundations for measuring the insurance output with the value added approach, see Cummins and Weiss (1998).

We follow Fenn *et al*. (2008) in defining insurers' output (Y_1) as net incurred claims, obtained as gross claims less claims paid by reinsurers, plus bonus and rebates, plus additions to reserves. As observed by the authors the product provided by insurers to their policyholders can be viewed as the expected present value of future claims. Premiums paid by policyholders normally exceed this value, resulting from a combination of producers' and consumers' surplus, so that differences in prices of products across firms may result in misleading conclusions about their operational efficiency. The choice of input measures is simpler: most empirical analyses include labour, business services/materials and financial capital (sometimes with distinction between equity and debt capital). Input prices are included in both the cost and the profit models: a quite frequent solution is to assume that insurance companies purchase their production factors in competitive markets so that prices are invariable across firms. So labour price is generally included as the medium annual wage in the insurance sector for the observed year and country (e.g. Fenn *et al*., 2008; Cummins and Rubio-Misas, 2006; Hwang and Gao, 2005). Other authors (Barros *et al*., 2006; Greene and Segal, 2004; Rai 1996) calculate the price of labour dividing total personnel expenses by the number of employees and agents. A third option, when the number of employees and agents is not available, but we want to specify variable input prices, is to divide acquisition costs (including both employees and agents compensation) by total assets, as in Bikker and Van Leuvensteijn (2008). We can make similar observations for the price of business services and materials, obtained on the basis of administrative costs registered in single firms technical accounts. We choose this last option and adapt it to account also for costs related to the investment activity, defining two input prices: net operating expenses plus other technical charges/total assets (p_1) and investment charges (inclusive of unrealized losses)/total assets (p_2). In order to include financial capital, we should distinguish between equity and debt capital. We follow Fenn *et al*. (2008) considering equity (n_1) - given by total shareholders' capital and reserves – and technical provisions (n_2) as netputs, i.e. fixed inputs which have been built up over a long period and cannot be changed in the short run. Total Cost is defined as all expenses reported in the technical account, excluding net incurred claims in order to avoid confusion with the output measure (see Fenn *et al*., 2008); revenues are calculated as net earned premiums plus investment income. Total profit is simply the difference between revenue and cost as defined above. Summary statistics relative to input and output variables are reported in Table 19.

TABLE 19 – Descriptive statistics of input and output variables for the Italian sample of insurance companies (2005-2006)

Type		TC	TP	y1	n1	n2	p1	p2
CB	mean	162,645	1,499,801	1,462,725	228,443	5,979,725	0.0118	0.0144
	st dev	*(297,644)*	*(2,180,759)*	*(2,122,881)*	*(372,659)*	*(9,456,252)*	*(0.0045)*	*(0.0076)*
	min	9,301	101,753	100,898	11,020	119,011	0.0043	0.0051
	max	1,313,627	6,638,969	6,521,860	1,410,801	33,400,000	0.0253	0.0328
IC	mean	110,043	678,905	632,164	401,997	3,239,935	0.0157	0.0138
	st dev	*(187,730)*	*(1,073,804)*	*(986,025)*	*(967,046)*	*(5,182,425)*	*(0.0138)*	*(0.0074)*
	min	254	412	149	4,534	403	0.0037	0.0018
	max	851,820	4,607,041	4,388,901	6,340,885	23,200,000	0.0848	0.0394
JV	mean	161,812	1,452,330	1,423,325	195,808	4,937,074	0.0116	0.0179
	st dev	*(196,052)*	*(1,902,063)*	*(1,861,756)*	*(309,461)*	*(6,222,843)*	*(0.0037)*	*(0.0078)*
	min	1,692	27,594	27,150	6,558	33,293	0.0052	0.0038
	max	805,753	8,841,834	8,652,146	1,426,134	25,800,000	0.0209	0.0333
Total	mean	131,121	999,022	958,259	323,396	4,082,029	0.0141	0.0150
	st dev	*(209,638)*	*(1,558,427)*	*(1,501,068)*	*(779,532)*	*(6,297,881)*	*(0.0111)*	*(0.0077)*
	min	254	412	149	4,534	403	0.0037	0.0018
	max	1,313,627	8,841,834	8,652,146	6,340,885	33,400,000	0.0848	0.0394

CB Controlled by Banks; IC Independent Company; JV Joint Venture
Total Cost TC: total expenses from the technical account, excluding net incurred claims
Total Profit TP: net earned premiums + investment income – total cost
output y_1 Net incurred claims: claims net of reinsurance, plus bonus and rebates, plus additions to reserves
netput n_1 Total equity capital: total shareholders' capital and reserves at the beginning of the period
netput n_2 Total technical provisions: total technical reserves at the beginning of the period
price p_1 Total cost for managing insurance: net operating expenses plus other technical charges/total assets
price p_2 Total cost for managing investments: investment charges (inclusive of unrealized losses)/total assets

Source: Author's own elaboration on ANIA Data

4.2.3 Firm specific factors included to account for heterogeneity

In order to deal with possible heterogeneity in the sample, we include the following firm specific factors:

- Z_1_*%banc*, the percentage of premiums collected by bank branches;
- Z_2_*MS*, the market share with reference to the Italian life industry;
- Z_3_*%fin*, the weight of policies with an high financial content;
- Z_4_*comp*, a dummy indicating if the firm is a life specialist or a composite company offering also P&C insurance.

Summary statistics are reported in Table 20: differences in means across ownership types show that these variables can represent relevant disparities across companies included in the sample.

TABLE 20 – Summary statistics of firm specific factors for the Italian sample of insurance companies (2005-2006)

Variable	Mean				Difference in means		
	Total	**CB**	**IC**	**JV**	**IC-CB**	**JV-CB**	**JV-IC**
Z1_%banc	0.4406	0.7956	0.1648	0.8758	-0.6308***	0.0802	0.7110***
Z2_MS	0.0117	0.0177	0.0075	0.0182	-0.0103**	0.0005	0.0108***
Z3_%fin	0.4947	0.4073	0.4338	0.6871	0.0265	0.2798***	0.2533***
Z4_comp	0.3452	0.0400	0.4600	0.2558	0.42***	0.2158	-0.2042**

CB Controlled by Banks; IC Independent Company; JV Joint Venture
** p-value<0.1; ** p-value<0.05; ***p-value<0.01*

Source: Author's own elaboration on ANIA Data

First of all, in order to consider bancassurance also as a distribution channel we include the percentage of premiums collected by bank branches (Z_1). As predictable, the bancassurance share is more relevant in CB or JV companies (differences in means with respect to ICs are both statistically significant); anyway we cannot ignore that also IC companies collect about 16% of their premiums through bank branches. It is interesting to note that the average level of bancassurance is higher for JVs than for CBs: this could be due to the fact that some

CBs included in the sample make a considerable use of financial advisors. Anyway the difference in means between CBs and JVs is not statistically significant.
Secondly we include the market share with respect to the Italian life insurance industry (Z_2): JVs and CBs are on average bigger and with a larger share than ICs, with a statistically significant difference, while there is not a relevant gap between the two categories of bancassurance firms.

We also consider the type of policies provided by the firm (Z_3): we are particularly interested in the share of life products with an high financial content falling into the III or the V class identified by the 96/1992 Directive (respectively unit/index linked and capitalisation). Bancassurance firms have traditionally focussed on this kind of policies, particularly suitable to catch complementaries and similarities between the banking and the insurance activities: in fact for unit and index linked contracts the percentage of premiums collected by bank branches reaches a very high level, nearly 80% (ANIA, 2008). In our sample the specialisation in products with an high financial content is particularly strong for JV companies, with significant differences with respect to both the CBs and the ICs.

Finally, we account for the business mix of the company (Z_4), including a dummy distinguishing between life specialists and composite companies. We can notice that almost the half of IC companies offer both life and P&C insurance, while bancassurance firms are more often life specialists. Under the current legislation insurance companies are not allowed to undertake both life and P&C business, except for companies authorised before 1979. Some large Italian companies fall into this special category, so it is important to account for the existence of composite companies. In addition to this we have to consider that every life insurance company can offer non life policies in for accidents and disease ("Infortuni" and "Malattia").

4.3 Results

Empirical results are presented with a separated discussion for cost and profit efficiency, respectively in sections 4.3.1 and 4.3.2.

4.3.1 Cost efficiency

Cost efficiency is first estimated with a base model, without the introduction of the firm specific factors described in section 4.2.3. Table 21 reports mean efficiency levels for different ownership types.

TABLE 21 – Measuring cost efficiency in the Italian insurance industry (2005-2006)
Base Model: cost efficiency for different ownership types

Panel A – Summary statistics for cost efficiency across different ownership types

Type	Mean	Std. Dev	Min	Max
CB	0.906	0.042	0.832	0.959
IC	0.896	0.079	0.613	0.983
JV	0.924	0.039	0.796	0.970

Panel B – Test of differences in means for cost efficiency across different ownership types

Groups	Diff.
Eff(IC)-Eff(CB)	-0.0107
Eff(JV)-Eff(CB)	0.0180
Eff(JV)-Eff(IC)	0.0287*

CB Controlled by Banks; IC Independent Company; JV Joint Venture
** p-value<0.1; ** p-value<0.05; ***p-value<0.01*

Source: Author's own elaboration on ANIA Data

With reference to the base model we find that both types of bancassurance firms are more cost efficient than independent companies, but the difference is statistically significant only for the advantage of JVs over ICs. The latter also present more variability, with a larger distance between the minimum and the maximum value. Finally, there is any relevant gap between CBs and JVs.

The main limitation of the base model is that it does not allow to investigate determinants of firm performance other than the pure management ability in combining productivity

factors (unless the application of a two stage procedure, suffering from the problems previous explained).

The adoption of the Case 2 model[30] permits to estimate the efficiency scores and the impact of firm specific factors in a simultaneous way. The obtained results are reported, respectively, in Table 22 and 23.

TABLE 22 – Measuring cost efficiency in the Italian insurance industry (2005-2006)
Case 2 Model: gross cost efficiency for different ownership types

Panel A – Summary statistics for gross cost efficiency across different ownership types

Type	Mean	Std. Dev	Min	Max
CB	0.939	0.033	0.876	0.974
IC	0.902	0.085	0.620	0.988
JV	0.953	0.034	0.830	0.985

Panel B – Test of differences in means for gross cost efficiency across different ownership types

Groups	Diff.
Eff(IC)-Eff(CB)	-0.0368*
Eff(JV)-Eff(CB)	0.0142
Eff(JV)-Eff(IC)	0.051***

CB Controlled by Banks; IC Independent Company; JV Joint Venture
** p-value<0.1; ** p-value<0.05; ***p-value<0.01*

Source: Author's own elaboration on ANIA Data

In comparison with the base model, the over performance of JVs becomes more relevant; in addition to this we also observe a statistically significant advantage of CBs over ICs. These gaps are observed with reference to gross efficiency scores incorporating the effect of firm specific factors included in the model as determinants of firm (in)efficiency. In order to better understand differences among ownership types is then essential to analyse the impact of these variables on firm performance.

[30] Estimated parameters for the resulting cost frontier are reported in the Appendix.

TABLE 23 – Measuring cost efficiency in the Italian insurance industry (2005-2006)
Case 2 Model: firm specific factors effect on cost efficiency

Variable	Coeff.
Cost	0.191**
Z1_%banc	-0.465**
Z2_MS	-6.334**
Z3_%fin	-0.713*
Z4_comp	-0.308**

** p-value<0.1; ** p-value<0.05; ***p-value<0.01*

Source: Author's own elaboration on ANIA Data

First of all, the share of premiums collected through bank branches (Z_1) is positively related to cost efficiency, revealing that insurance companies selling their products in collaboration with a bank benefit from cost economies with respect to other distribution channels. This result is similar to the findings of Hwang and Gao (2005) with reference to the Irish life industry; it is also confirmed by some statistics provided for the Italian market by ANIA (2008): the incidence of acquisition and administration costs on collected premiums results lower for bank branches with respect to both agents and financial advisors.
Secondly, the position in the market (Z_2) has also a positive relationship with efficiency. This result, however, is not sufficient to catch the direction of causality: it could be that the most efficient companies are able to gain market share from their competitors (as suggested by the efficient structure hypothesis, see for example Demsetz, 1973) or that large firms with a key role in the industry pay more attention to the pursuit of cost efficiency and have more power in the market for productivity factors.

The weight of insurance policies with an high financial content (Z_3) has a positive impact on firm performance, revealing that the management of this kind of products is, on average, less costly than for other classes. This finding is also consistent with the fact that most of these policies are sold through bank branches, resulted to be the most economical channel.

Finally, the dummy for composite company (Z_4) appears positively related to cost efficiency: it could be that the combination of life and P&C business benefits from some scope economies. This result is also consistent with Fenn *et al*. (2008) finding an higher mean level of cost efficiency for composite companies with respect to both life and P&C specialists.

Anyway it has a relevance limited by the fact that the current legislation forces insurance companies to specialise in one of the two business in a mutually exclusive way.

These evidences shed some light on the cost advantage for bancassurance firms: life companies falling into CB or JV types strongly rely on distribution by bank branches, realising cost economies with respect to other possible channels. The over performance of JVs could be due also to the specialisation in financial products, particularly high in companies involving both banking and insurance partners. Finally, bancassurance firms are between the largest operators in the industry and benefit from the positive relationship between market share and cost efficiency. These effects seem to be more relevant than scope economies deriving from being a composite company, in favour of independent companies. In order to assess the relevance of the firm specific factors contribution to performance we also calculate net efficiency scores, reported in Table 24.

TABLE 24 – Measuring cost efficiency in the Italian insurance industry (2005-2006)
Case 2 Model: net cost efficiency for different ownership types

Panel A – Summary statistics for net cost efficiency across different ownership types

Type	Mean	Std. Dev	Min	Max
CB	0.967	0.014	0.939	0.984
IC	0.946	0.066	0.698	0.990
JV	0.972	0.018	0.887	0.988

Panel B – Test of differences in means for net cost efficiency across different ownership types

Groups	Diff.
Eff(IC)-Eff(CB)	-0.0217
Eff(JV)-Eff(CB)	0.0042
Eff(JV)-Eff(IC)	0.0259**

CB Controlled by Banks; IC Independent Company; JV Joint Venture
** p-value<0.1; ** p-value<0.05; ***p-value<0.01*

Source: Author's own elaboration on ANIA Data

Assuming that all insurers face the same conditions, namely the most favourable, the advantage of CBs with respect to ICs disappears and that of JVs is substantially reduced. This means that the firm specific factors can explain most of the gaps across different ownership types. In the light of these results we can conclude that bancassurance is a winner strategy from the cost point of view. But it is also important to notice that some of its 'positive features' are not an exclusive of companies totally or partially owned by banks. In fact, ICs can sign one or more commercial agreements with banks for selling their products through their branches or can include policies with an high financial content in their range of products. So, once assumed parity of conditions, the only confirmed evidence in favour of a particular organisational model is for JVs: in this case the advantage is relevant and statistically significant in every model. This result suggests that JVs benefit from positive efficiency effects other than those related to the included firm specific factors, probably deriving from the combination of skills and know how from the banking and the insurance partners.

4.3.2 Profit efficiency

As for the cost case, profit efficiency is first estimated with a base model, without the introduction of firm specific factors. Table 25 reports mean efficiency for different ownership types.

TABLE 25 – Measuring profit efficiency in the Italian insurance industry (2005-2006)
Base Model: profit efficiency for different ownership types

Panel A – Summary statistics for profit efficiency across different ownership types

Type	Mean	Std. Dev	Min	Max
CB	0.774	0.145	0.421	0.970
IC	0.707	0.148	0.317	0.944
JV	0.724	0.150	0.416	0.975

Panel B – Test of differences in means for profit efficiency across different ownership types

Groups	Diff.
Eff(IC)-Eff(CB)	-0.0671
Eff(JV)-Eff(CB)	-0.0501
Eff(JV)-Eff(IC)	0.0170

CB Controlled by Banks; IC Independent Company; JV Joint Venture
** p-value<0.1; ** p-value<0.05; ***p-value<0.01*

Source: Author's own elaboration on ANIA Data

First of all, we can notice that efficiency scores are lower and with a larger variability with respect to the cost case. CBs show an higher level of performance, followed by JVs and ICs, but differences among ownership types are not statistically significant. In order to detect possible determinants of profit efficiency we also apply the Case 2 model[31]: gross efficiency scores obtained and coefficients relative to the impact of firm specific factors are reported, respectively, in Table 26 and 27.

TABLE 26 – Measuring profit efficiency in the Italian insurance industry (2005-2006)
Case 2 Model: gross profit efficiency for different ownership types

Panel A – Summary statistics for gross profit efficiency across different ownership types

Type	Mean	Std. Dev	Min	Max
CB	0.916	0.107	0.579	0.984
IC	0.911	0.118	0.498	0.988
JV	0.830	0.113	0.620	0.972

[31] Estimated parameters for the resulting profit frontier are reported in the Appendix.

Panel B – Test of differences in means for gross profit efficiency across different ownership types

Groups	Diff.
Eff(IC)-Eff(CB)	-0.0052
Eff(JV)-Eff(CB)	-0.0855**
Eff(JV)-Eff(IC)	-0.0803***

CB Controlled by Banks; IC Independent Company; JV Joint Venture
** p-value<0.1; ** p-value<0.05; ***p-value<0.01*

Source: Author's own elaboration on ANIA Data

After the inclusion of firm specific factors, we find a significant disadvantage for JVs with respect to both CBs and ICs. In order to detect possible sources of this gap we analyse the impact of single firm specific factors on firm performance.

TABLE 27 – Measuring profit efficiency in the Italian insurance industry (2005-2006)
Case 2 Model: firm specific factors effect on profit efficiency

Variable	Coeff.
Cost	-0.571***
Z1_%banc	-0.136
Z2_MS	3.898
Z3_%fin	1.19***
Z4_comp	-0.298**

** p-value<0.1; ** p-value<0.05; ***p-value<0.01*

Source: Author's own elaboration on ANIA Data

In this case, the relationship between firm specific factors and performance is statistically significant only for two variables.

The distribution of premiums through bank branches (Z_1) appears positively related to profit efficiency, but the relationship is not statistically significant. So we do not find strong evidence in favour of one stop banking, namely the idea that consumers are willing to pay higher prices because of reductions in user transaction and search costs associated with consuming different financial services offered by the same provider, at the same location. The relationship between market share (Z_2) and profit efficiency is not statistically

significant, so it seems that larger firms are not able to exploit their market power to charge higher prices. We find a significant coefficient for the variable related to the specialisation in offering insurance products with an high financial content (Z_3), signalling a negative relationship with profit efficiency. This could be due also to recent evolutions in the Italian financial services industry. Up to 2003 linked products registered a strong growth; after the end of the euphoric phase for capital markets, Italian households have turned their attention to more traditional insurance products, included in the I class (see for example Marchionni, 2006). Finally we find a positive relationship between the dummy related to composite company (Z_4) and profit efficiency, signalling possible revenue scope economies between life and P&C business.

These findings can explain the disadvantage found for JVs, presenting a strong specialisation in insurance products with an high financial content. As in the cost case, we also calculate net efficiency scores, reported in Table 28.

TABLE 28 – Measuring profit efficiency in the Italian insurance industry (2005-2006)
Case 2 Model: net profit efficiency for different ownership type

Panel A – Summary statistics for net profit efficiency across different ownership type

Type	Mean	Std. Dev	Min	Max
CB	0.98753	0.00081	0.98507	0.98879
IC	0.98739	0.00077	0.98487	0.98892
JV	0.98721	0.00076	0.98545	0.98894

Panel B – Test of differences in means for net profit efficiency across different ownership type

Groups	Diff.
Eff(IC)-Eff(CB)	-0.0001
Eff(JV)-Eff(CB)	-0.0003
Eff(JV)-Eff(IC)	-0.0002

CB Controlled by Banks; IC Independent Company; JV Joint Venture
** p-value<0.1; ** p-value<0.05; ***p-value<0.01*

Source: Author's own elaboration on ANIA Data

Assuming that all firms face the same environmental conditions, the mean level of profit efficiency across ownership types is very similar, in terms of both mean and standard deviation. This seems to indicate that bancassurance strategy is not so relevant on the profit side and that the main differences across firms are related to other features, such as the type of policies included in the product range.

4.4 Conclusions

The aim of this Chapter is to compare bancassurance companies against other life (independent) insurers. Existing studies dealing with the potential efficiency gains of bancassurance from the insurance side have considered the phenomenon from an ownership or a distributional perspective in a mutually exclusive way. In addition to this, as we are aware, there are no empirical analyses assessing performance differences across alternative structures. In order to give an advance to the existing literature we adopt a comprehensive view of the bancassurance phenomenon from both an ownership and a distributional points of view. First of all we distinguish life insurance companies wholly controlled by banks (CBs), companies deriving from a joint venture between a bank and an insurer partner (JVs) and other life independent companies (ICs). Secondly, we measure the percentage of premiums collected through bank branches, so that we do not fail to consider that also independent companies can use the bancassurance distribution channel.

We also avoid the potential bias due to possible sample heterogeneity by adopting the model of Battese and Coelli (1995), in which several exogenous factors, out of the management control, are introduced as determinants of (in)efficiency; in this way, we are also able to detect possible sources of performance differences across different subgroups.

We can summarise our main results with reference to the second and the third research questions.

RQ2 (Insurance side): Are bancassurance companies more cost and profit efficient than independent companies operating in the life business?

Results show that in every specification bancassurance firms, both CBs and JVs, are more cost efficient than independent companies; however their advantage is mainly explained by

some “positive features” that are not an exclusive of insurance companies totally or partially owned by banks. For example it is possible for an independent company to increase its share of premiums collected by bank branches through selling agreements and strategic alliances with banking institutions; at the same time an independent company can modify its product range in order to include more products with an high financial content.
On the profit side we do not find any strong evidence that bancassurance is a winner strategy: CBs seem to overperform ICs but JVs are the less efficient. The impact of the share of premiums distributed by bank branches is positively related to performance but not in a statistically significant way; the weight of financial products with an high financial content is strongly negatively related to firm performance.

RQ3 (Models comparison): Which model of bancassurance reaches the best performance?
From the cost side we find a strong evidence in favour of a particular organisational model only for the case of joint ventures, presenting a statistically significant advantage in both the base and the TE models. This advantage is confirmed also by net efficiency scores, calculated supposing that all sample firms face the most favourable conditions with reference to the specific factors included in the frontier model. The identification of other possible source of cost efficiency for JVs, especially with respect to CBs, undoubtedly deserves further investigation.

From the profit side, when including firm specific factors, JVs presents a strong disadvantage with respect to other ownership types, while the gap between CBs and ICs is not statistically significant. Once that we consider efficiency scores net of the influence of some firm specific factors, such as the specialisation in products with an high financial content and the combination between life and P&C business, there are no relevant differences across several ownership types.

Concluding Remarks

The aim of this thesis is to assess the potential efficiency gains of a bancassurance strategy from both the banking and the insurance sides. Most existing studies dealing with bancassurance are descriptive in nature, providing a broad insight into the economic rationales for the combination between the banking and the insurance activities. Empirical analyses providing quantitative findings are still less frequent and almost always concentrated on the risk diversification hypothesis, supposing that banks enter the insurance business in order to improve the risk return profile of their portfolio. Studies investigating the risk diversification hypothesis find a quite extensive range of results, generally in favour of the bancassurance strategy: anyway diversification is not a sufficient economic rationale for the creation of big and complex structures such as financial conglomerates, unless the combination between the banking and the insurance activities produces some cost or revenue synergies, resulting in an higher level of efficiency with respect to more specialised competitors. In the light of these considerations, the attention should be paid on the estimation of cost and revenue scope economies, in order to asses if the spreading of fixed cost or the existence of cost complementaries between banking and insurance products result in a cost advantage and/or if the provision of different financial products under the same roof can induce customers to pay higher prices (one stop banking). The measurement of scope economies in financial firms has always been a very challenging issue: in empirical studies dealing with different products in the same financial sector (i.e. deposits and loans in commercial banking), the main problem is to find fully specialised firms (i.e. banks producing only deposits or loans in a mutually exclusive way). In the case of bancassurance this problem is solved, being perfectly possible to find banks not operating in the insurance industry and vice versa; nevertheless the measurement of scope economies remains tricky due to some econometric difficulties. In addition to this, some recent studies suggest that the mean level of X-efficiency (i.e. the management ability in combining production factors) can indirectly signal the existence of cost and revenue synergies: if diversified firms show an higher level of performance than their more specialised competitors we can conclude in favour of the realisation of scope economies and vice versa (Cummins *et al*., 2003).

Even if the exploitation of cost and revenue synergies is commonly recognised as one of the most valid economic rationales for the combination between the banking and the insurance activities, we can find only few empirical analyses dealing with efficiency and bancassurance. At our knowledge, only one study (Verweire, 1999) has assessed the potential gains of bancassurance from both the banking and the insurance sides, comparing financial conglomerates, on one hand, against specialised competitors, both banks or insurers, on the other. Using a such heterogeneous sample, the only possibility is to compare firms on the base of conventional balance sheet ratios, such as ROE and ROA. The adoption of more sophisticated methodologies as efficient frontiers would be more informative, but it is not feasible to compare banks, insurers and conglomerates against a common benchmark. To overcome this limitation we conduct two separated analyses, one on the banking side and one for the insurance sector, answering the following research questions:

RQ1 (Banking side): Are banks engaged in the insurance business more cost and profit efficient than their competitors specialised in traditional and investment banking?

RQ2 (Insurance side): Are bancassurance companies more cost and profit efficient than independent companies operating in the life business?

In addition to this, as we are aware, there are no empirical evidences on performance differences among alternative structures for the combination between the banking and the insurance activities, even if this is probably a relevant research issue, especially for practitioners. In order to give an innovative contribution to the existing literature we do not limit the analysis in the insurance industry to the comparison of bancassurance *vs* independent companies, but we also investigate performance differences among several organisational models (i.e. captive or joint ventures). This lead us to answer a third research question:

RQ3 (Alternative structures comparison): Which model of bancassurance reaches the best performance?

In order to answer the first research question we conduct a frontier analysis on the banking side, running two different tests: the first with reference to a European sample and the

second with reference to an Italian sample. The restriction to the domestic market was necessary due to the lack of available and reliable cross country data on the insurance side, in order to have a complete view of the phenomenon at least for the representative case of Italy, where bancassurance is well developed. In both the European and the Italian cases we consider banking consolidated statements in order to catch the effect of control or significantly participate an insurance company. Following the classification criteria used by Vander Vennet (2002), we define bancassurance combinations (BCs) and 'not bancassurance-oriented' institutions (NBIs). With the aim of giving more robustness to our results, we try two different specifications of input and output variables: 1) the value added approach, which defines loans, total other earning assets and customer deposits on demand as outputs, and labour, fixed assets and funding as inputs; 2) an alternative specification which replaces output volumes with revenue flows in order to distinguish traditional banking output (measured by net interest income) and non traditional banking output (measured by not interest income).

Recent literature dealing with financial firms performance suggest that sample heterogeneity can strongly bias efficiency estimates: given that we are comparing two different subgroups, such as BCs and NBIs, we have to consider this problem, incorporating in the model several firm specific factors representing main differences between the two subgroups. We include these variables as determinants of banks (in)efficiency, so that we are able to avoid estimation bias due to heterogeneity and still benchmark all different firms against a common frontier. In addition to this, the simultaneous estimation of efficiency scores and the impact of (in)efficiency determinants allows us to measure the influence of exogenous factors out of the management control in the short run, without incurring in the problems of a two step procedure.

Results from the European sample can be considered in favour of the bancassurance strategy finding a substantial parity between BCs and NBIs under the value added approach and a relevant advantage for BCs under the specification with traditional and non traditional banking output, on both the cost and the profit sides. Looking at the coefficients assumed by the variables included as determinants of firm performance, we observe a negative relationship between diversification and cost efficiency under the value added approach and a positive relationship under the alternative output specification. We can conclude that the cost advantage deriving from the combination between the banking and

the insurance activities is highly sensitive to the definition of input and output variables. Moving to the profit side, BCs show an higher level of mean efficiency, but the coefficient of diversification in determining firm performance is not statistically significant, so that we do not find strong evidence of one stop banking. It is probable that the profit advantage founded for BCs depends from exogenous factors different from the level of diversification. The global effect of all exogenous factors included in the model is quite relevant: net efficiency scores are significantly higher and different from gross efficiency scores. In addition to this, when we suppose that all sample firms share the same exogenous conditions, i.e. the most favourable, differences in the mean levels of performance across BCs and NBIs are strongly reduced. The main limitation of the analysis conducted for the banking side with reference to the European sample is the impossibility to adopt a strict focus on the bancassurance strategy, distinguishing cost and revenues deriving from the insurance business and from other non traditional banking activities.

Results from the Italian sample are quite different, without any strong evidence in favour of bancassurance. BCs and NBIs show very similar level of cost and profit efficiency, under both the value added and the alternative approaches used to define input and output. As in the European case, we also observe the coefficient of firm specific factors assumed as determinants of (in)efficiency. With reference to the national market we dispose of a more detailed dataset, allowing us to replace the index for general diversification in activities other than the traditional banking intermediation, with a ratio measuring the specific weight of the insurance business in the banking group (given by total equity of participated insurance companies over total equity of the group). The resulting relationship with cost efficiency is negative under the valued added approach and positive under the specification with traditional and non traditional banking output. Moving to the profit side we also find a positive and significant relationship with the investment in insurance and the attained performance. The supposed cost and revenue synergies, however, are probably of a scarce magnitude or compensated by other diseconomies, given that the medium level of cost and profit efficiency is very similar across BCs and NBIs. With reference to exogenous factors, we are able to replace a general diversification index with the specific weight of insurance in the banking group in terms of equity. Nevertheless we cannot provide a more accurate focus on bancassurance also for the deterministic kernel of the frontier, because it is not possible to identify a specific output variable measuring life business conducted by the banking group during each observed period (both in volume or as revenue flow).

With reference to the first research question relative to the banking side, we can conclude that evidences in favour of the bancassurance strategy are highly sensitive to the model applied in the European case and weak in the Italian case. This difference in the obtained results can be explained by the use of a different sample, but also by the availability of more detailed data for the domestic market, allowing a more strict focus on the bancassurance phenomenon rather than the general financial conglomeration. Anyway the lack of detailed data allowing for a more strict focus on the bancassurance phenomenon remains a strong limitation of the work also for the case of Italy.

In order to answer the second research question, we conduct an empirical analysis on the insurance side, restricted to the Italian case, due to the lack of detailed and reliable data on a cross country base. We compare bancassurance companies, wholly or jointly owned by banks, with independent life insurance companies. We consider bancassurance on both an ownership and a distributional perspectives. From the first point of view (ownership) we distinguish life insurance companies that are fully controlled by banks (captive, CBs) and joint ventures between a bank and an insurer partner (JVs). From a distributional point of view we measure the percentage of premiums collected by bank branches for every insurer, so that we do not fail to consider that even life independent companies (ICs) can use the bancassurance channel, for example signing cross selling agreements or non equity strategic alliances.

On the cost side we find a strong evidence in favour of bancassurance, with CBs and JVs that overperform ICs. The advantage of bancassurance companies is particularly relevant and statistically significant when we consider gross measure of efficiency, incorporating the effect of exogenous factors. When we observe net scores the advantage of CBs over ICs disappears while that in favour of JVs is strongly reduced. It is important to notice that the cost advantage for bancassurance companies is substantially explained by some positive features that are not exclusive of insurance companies wholly or jointly owned by banks. The more important factors are the share of premiums collected by bank branches and the proportion of high financial content policies in the business mix. So we can affirm that bank branches are a more economical distribution channel with respect to other solutions (i.e. agents, brokers) and that the management of financial products is less expensive than for traditional insurance products.

Moving to the profit side we do not find any strong evidence in favour of bancassurance: the relationship between the performance attained and the share of premiums collected by bank branches is positive, but not statistically significant, signalling only a weak evidence in favour of one stop banking. The percentage of high financial content is negatively related to cost efficiency in a significant way.

With reference to the third research question, we are interested in detect which organisational form presents the best performance. At this aim we consider net efficiency scores calculated supposing that all firms share the same conditions, i.e. the most favourable, and so representing management ability in combining production factors. Results seem to be in favour of JVs presenting an advantage or a substantial parity with respect to CBs. The identification of possible sources of this advantage undoubtedly deserves further investigation.

The main limitation of this study is the lack of data to conduct the analysis on both the banking and the insurance sides with a cross country perspective. We can draw some comprehensive conclusions only with reference to the domestic market for which we analyse the phenomenon from both the points of view. From the banking side we only find weak evidence in favour of bancassurance. The weight of insurance business in the banking group seems to positively influence both cost and profit efficiency, but this relationship is limited only to the alternative approach with traditional and non traditional banking output and does not result in a medium higher level of BCs performance with respect to NBIs. Investigating the insurance side, the most relevant finding is that the distribution of insurance products through bank branches is a valid strategy, resulting in significant cost economies. From the profit side, the evidence in favour of bancassurance as a distribution strategy is less strong, still existent but not statistically significant. Findings with reference to the business concentration on financial products are mixed: we find that these policies are less costly to manage than traditional protection insurance but less profitable. It is probable that their attractiveness for customers has been dramatically reduced after the end of the most euphoric phase for capital markets. Even if we end our analysis to the year 2006, it is likely that this trend has become even more evident after the financial turmoil started in the summer of 2007. During negative phases for global economy and financial markets, the uncertainty and the lack of confidence between investors drive customers' preferences towards traditional protection products rather than financial products, such as

unit and index linked policies. If we consider also the reduction in welfare state protection and social security it seems easily predictable a future further development of insurance products providing a 'second pillar' in addition to public social protection and guaranteeing stable income over the life cycle.

We can then affirm that the convenience of bancassurance as a distribution channel is relevant and consolidated while the success of insurance products with an high financial content is more volatile and strictly dependent on current market trends. As a consequence the mix of products should be continuously revised in the light of customers' needs evolution and the growing complexity and competitiveness of financial markets. Facing this challenging scenario require strong competences in the insurance business, reinforcing the empirical evidence in favour of JVs, with the presence of an insurance partner, with respect to CBs.

At last, in the light of the above considerations, it is possible to affirm that the existence of ownership links is not necessarily the best strategy for the realisation of cost and revenue synergies between the banking and the insurance activities and that banks can consider also the alternative of more flexible and reversible forms of cooperation, such as cross selling agreements and non equity financial alliances. The preference for a specific bancassurance structures is probably linked also to the characteristics of the institutions involved. The analysis of the success of different bancassurance models with reference to the characteristics of the participating banks and insurance companies is out of the aim of this thesis but undoubtedly deserves further investigations.

Appendix

In this Appendix, we report estimated parameters for the following Case 2 models:

- **Table A.1** Cost frontier – Value added approach – Eu-15 banking industry over 2005
- **Table A.2** Cost frontier – Approach with traditional and non traditional banking output – Eu-15 banking industry over 2005
- **Table A.3** Profit frontier – Approach with traditional and non traditional banking output – Eu-15 banking industry over 2005
- **Table A.4** Cost frontier – Value added approach – Italian banking industry over 2005-2006
- **Table A.5** Cost frontier – Approach with traditional and non traditional banking output – Italian banking industry over 2005-2006
- **Table A.6** Profit frontier – Approach with traditional and non traditional banking output – Italian banking industry over 2005-2006
- **Table A.7** Cost frontier – Italian life insurance companies over 2005-2006
- **Table A.8** Profit frontier – Italian life insurance companies over 2005-2006

Table A.1

Estimated parameters for cost frontier under the value added approach – Case 2 model for the Eu-15 banking industry over 2005

Variables	Coeff.
beta0 (const)	4.284
ln(y1)	2.296***
ln(y2)	0.974**
ln(y3)	-1.757***
ln(p1/p3)	-0.379
ln(p2/p3)	0.216
½ ln(y1)ln(y1)	0.175***
ln(y1)ln(y2)	-0.154***
ln(y1)ln(y3)	-0.105
½ ln(y2)ln(y2)	0.185***
ln(y2)ln(y3)	-0.064*
½ ln(y3)ln(y3)	0.117
½ ln(p1)ln(p1)	0.136
ln(p1)ln(p2)	-0.075
½ ln(p2)ln(p2)	0.025
ln(y1)ln(p1)	-0.049
ln(y1)ln(p2)	-0.062
ln(y2)ln(p1)	0.004
ln(y2)ln(p2)	-0.070*
ln(y3)ln(p1)	0.048
ln(y3)ln(p2)	0.109**
ln(z)	-0.961*
½ ln(z)ln(z)	-0.099
ln(z)ln(y1)	0.002
ln(z)ln(y2)	-0.006
ln(z)ln(y3)	0.159***
ln(z)ln(p1)	-0.025
ln(z)ln(p2)	0.050
delta0 (const)	1.475***
LN_TA	-0.0806***
E/TA	0.0712
NII/TR	0.2599***
LN_INTG	0.0048
COMM	0.0695
LISTED	0.0752
Austria_dummy	-0.2141
Belgium_dummy	0.2981
Denmark_dummy	0.2403
Finland_dummy	-0.3568
France_dummy	0.2222
Germany_Dummy	0.4369
Greece_dummy	0.7099**
Ireland_dummy	-0.8232
Italy_dummy	0.5925*
Netherlands_dummy	-0.4284
Portugal_dummy	0.3443
Spain_dummy	-0.0937
Sweden_dummy	0.3483

** p-value<0.1; ** p-value<0.05; ***p-value<0.01*

Table A.2

Estimated parameters for cost frontier under the approach with traditional and non traditional banking output – Case 2 model for the Eu-15 banking industry over 2005

Variables	Coeff.
beta0 (const)	5.834***
ln(y1)	0.412
ln(y2)	1.583***
ln(p1/p3)	0.143
ln(p2/p3)	-0.113
½ ln(y1)ln(y1)	-0.215**
ln(y1)ln(y2)	0.080
½ ln(y2)ln(y2)	-0.111**
½ ln(p1)ln(p1)	-0.038
ln(p1)ln(p2)	0.010
½ ln(p2)ln(p2)	0.001
ln(y1)ln(p1)	0.022
ln(y1)ln(p2)	-0.088*
ln(y2)ln(p1)	-0.223***
ln(y2)ln(p2)	0.154***
ln(z)	-1.467**
½ ln(z)ln(z)	-0.160
ln(z)ln(y1)	0.133
ln(z)ln(y2)	0.041
ln(z)ln(p1)	0.220**
ln(z)ln(p2)	-0.044
delta0 (const)	-1.047**
LN_TA	-0.020
E/TA	-0.334***
NII/TR	-0.364***
LN_INTG	-0.015*
COMM	-0.059
LISTED	-0.018
Austria_dummy	0.071
Belgium_dummy	0.311
Denmark_dummy	-0.358
Finland_dummy	0.481**
France_dummy	-0.182
Germany_Dummy	0.266**
Greece_dummy	0.745***
Ireland_dummy	-0.070
Italy_dummy	0.221
Netherlands_dummy	0.121
Portugal_dummy	0.308
Spain_dummy	0.367***
Sweden_dummy	-0.748

** p-value<0.1; ** p-value<0.05; ***p-value<0.01*

Table A.3
Estimated parameters for profit frontier under the approach with traditional and non traditional banking output – Case 2 model for the Eu-15 banking industry over 2005

Variables	Coeff.
beta0 (const)	-7.320***
ln(y1)	4.018***
ln(y2)	1.858**
ln(p1/p3)	2.884***
ln(p2/p3)	-0.333
½ ln(y1)ln(y1)	0.188
½ ln(y1)ln(y2)	-0.136
ln(y2)ln(y2)	0.219**
½ ln(p1)ln(p1)	-0.320**
ln(p1)ln(p2)	0.148
½ ln(p2)ln(p2)	-0.191**
ln(y1)ln(p1)	-0.180
ln(y1)ln(p2)	0.112
ln(y2)ln(p1)	-0.204*
ln(y2)ln(p2)	0.074
ln(z)	-4.991***
½ ln(z)ln(z)	0.491*
ln(z)ln(y1)	-0.239
ln(z)ln(y2)	-0.066
ln(z)ln(p1)	0.357**
ln(z)ln(p2)	-0.202**
delta0 (const)	1.603
LN_TA	-0.246***
E/TA	-1.065***
NII/TR	0.015
LN_INTG	-0.002
COMM	-0.047
LISTED	-0.168
Austria_dummy	0.159
Belgium_dummy	-3.558***
Denmark_dummy	-1.356
Finland_dummy	-2.956**
France_dummy	0.458
Germany_Dummy	0.159
Greece_dummy	-0.288
Ireland_dummy	0.301
Italy_dummy	-0.035
Netherlands_dummy	-0.045
Portugal_dummy	-0.447
Spain_dummy	-1.066**
Sweden_dummy	-0.152

** p-value<0.1; ** p-value<0.05; ***p-value<0.01*

Table A.4

Estimated parameters for cost frontier under the value added approach – Case 2 model for the Italian banking industry over 2005-2006

Variables	Coeff.
beta0 (const)	48.351***
ln(y1)	8.402***
ln(y2)	2.136***
ln(y3)	-7.515***
ln(p1/p3)	-13.223***
ln(p2/p3)	2.150***
½ ln(y1)ln(y1)	-1.560***
ln(y1)ln(y2)	-0.588**
ln(y1)ln(y3)	2.285***
½ ln(y2)ln(y2)	0.340***
ln(y2)ln(y3)	0.223
ln(y3)ln(y3)	-2.817***
½ ln(p1)ln(p1)	1.738***
ln(p1)ln(p2)	-0.374***
½ ln(p2)ln(p2)	0.355***
ln(y1)ln(p1)	-1.164***
ln(y1)ln(p2)	-0.081
ln(y2)ln(p1)	-0.045
ln(y2)ln(p2)	-0.147
ln(y3)ln(p1)	1.354***
ln(y3)ln(p2)	0.208
ln(z)	-2.859***
½ ln(z)ln(z)	0.197***
delta0 (const)	5.655***
ln z1 (tass)	-0.483***
ln z2 (int)	0.192***
z3 (% ins)	2.432**
z4 (comm)	-0.302**
z5 (listed)	0.480**
z6 (TCR)	-2.794**

** p-value<0.1; ** p-value<0.05; ***p-value<0.01*

Table A.5

Estimated parameters for cost frontier under the approach with traditional and non traditional banking output– Case 2 model for the Italian banking industry over 2005-2006

Variables	Coeff.
beta0 (const)	10.657***
ln(y1)	-2.680***
ln(y2)	3.432***
ln(p1/p3)	1.126
ln(p2/p3)	1.733**
½ ln(y1)ln(y1)	0.337***
ln(y1)ln(y2)	-0.333***
½ ln(y2)ln(y2)	0.278***
½ ln(p1)ln(p1)	-0.233
Ln(p1)ln(p2)	-0.197*
½ ln(p2)ln(p2)	0.068
ln(y1)ln(p1)	0.472***
ln(y1)ln(p2)	-0.200*
ln(y2)ln(p1)	-0.345***
ln(y2)ln(p2)	0.183***
ln(z)	-1.958***
½ ln(z)ln(z)	0.136**
delta0 (const)	2.826**
ln z1 (tass)	-0.316***
ln z2 (int)	0.218***
z3 (% ins)	-2.429
z4 (comm)	-0.176
z5 (listed)	0.319***
z6 (TCR)	-4.193*

** p-value<0.1; ** p-value<0.05; ***p-value<0.01*

Table A.6

Estimated parameters for profit frontier under the approach with traditional and non traditional banking output– Case 2 model for the Italian banking industry over 2005-2006

Variables	Coeff.
beta0 (const)	6.829***
ln(y1)	11.229***
ln(y2)	-7.754***
ln(p1/p3)	-9.689***
ln(p2/p3)	2.286
½ ln(y1)ln(y1)	-0.796***
ln(y1)ln(y2)	0.665***
½ ln(y2)ln(y2)	-0.556***
½ ln(p1)ln(p1)	2.423***
Ln(p1)ln(p2)	-0.641***
½ ln(p2)ln(p2)	-0.392***
ln(y1)ln(p1)	-1.304***
ln(y1)ln(p2)	0.575***
ln(y2)ln(p1)	0.900***
ln(y2)ln(p2)	-0.306***
ln(z)	0.857
½ ln(z)ln(z)	-0.040
delta0 (const)	-3.200***
ln z1 (tass)	-0.217**
ln z2 (int)	0.406***
z3 (% ins)	-5.460***
z4 (comm)	-0.457
z5 (listed)	-0.077
z6 (TCR)	-7.908***

** p-value<0.1; ** p-value<0.05; ***p-value<0.01*

Table A.7

Estimated parameters for cost frontier – Case 2 model for Italian life insurance companies over 2005-2006

Variable	Coeff.
beta0 (cost)	1.947***
ln(y1)	0.497***
ln(p1/p2)	0.564***
½ ln(y1) ln(y1)	0.197***
½ ln(p1/p2) ln(p1/p2)	0.198***
ln(y1) ln(p1/p2)	-0.005
ln(n1)	0.155**
ln(n2)	0.309***
½ ln(n1) ln(n1)	0.057***
ln(n1) ln(n2)	-0.002
½ ln(n2) ln(n2)	0.169***
ln(n1)ln(y1)	-0.055***
ln(n2)ln(y1)	-0.154***
ln(n1)ln(p1)	-0.006
ln(n2)ln(p1)	0.006
delta0 (cost)	0.191**
z1_%banc	-0.465**
z2_MS	-6.334**
z3_%fin	-0.713*
z4_comp	-0.308**

** p-value<0.1; ** p-value<0.05; ***p-value<0.01*

Table A.8

Estimated parameters for profit frontier – Case 2 model for Italian life insurance companies over 2005-2006

Variable	Coeff.
beta0 (cost)	1.793
ln(y1)	0.593**
ln(p1/p2)	-0.0003
½ ln(y1) ln(y1)	0.347***
½ ln(p1/p2) ln(p1/p2)	-0.049
ln(y1) ln(p1/p2)	-0.156***
ln(n1)	0.324*
ln(n2)	0.431
½ ln(n1) ln(n1)	-0.004
ln(n1) ln(n2)	-0.029
½ ln(n2) ln(n2)	0.267***
ln(n1)ln(y1)	0.020
ln(n2)ln(y1)	-0.303***
ln(n1)ln(p1)	-0.001
ln(n2)ln(p1)	0.183***
delta0 (cost)	-0.571***
z1_%banc	-0.136
z2_MS	3.898
z3_%fin	1.19***
z4_comp	-0.298**

** p-value<0.1; ** p-value<0.05; ***p-value<0.01*

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