Concentration in lending:
commercial vs financial credits

by
Lucia Gibilaro
University of Bergamo
and
Gianluca Mattarocci
University of Rome "Tor Vergata"

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Abstract

The performance of financial intermediaries is affected by changes in the creditworthiness of the counterparties towards which they present large exposures.

The concentration risk measuring approaches differ based on the attention paid to the individual counterparties (single name approach) and/or the role attributed to the sectoral/geographic portfolio distribution.

The specific characteristics of a financing contract may affect the level of effectiveness of the two approaches for assessing the portfolio concentration risk. In fact, the differences between commercial credit and financial credit are deemed relevant in literature in order to justify the presence of structural differences in the customer portfolio of intermediaries specialized in one or the other credit typology.

The analysis of the Italian situation highlights significant differences in the portfolio of intermediaries specialized in the traditional credit offer with respect to factoring companies. In fact, the credit portfolio of the latter appears to be structurally more concentrated, particularly when using the single name assessment approach. With respect to bank credit, the greater concentration of the customer portfolio of those who work in the commercial credit sector has no repercussions on the risk of the transaction and is not particularly affected by the behavior of major creditworthy customers.

1. Introduction[1]

The availability of credit for an enterprise is affected by the counterparty risk weighing on the money lender: if the amount of the loan is significant, the performance of the financial intermediary may prove to be significantly conditioned by the trend of the counterparty's creditworthiness owing to the exposure to the concentration risk.

The literature identifies two major approaches to the measurement of the concentration risk: the single name approach in the individual perspective, and the sectoral / geographic approach in the portfolio perspective.

The effectiveness of the two logics for measuring the concentration risk in risk control may be affected by the financial or commercial nature of the liability underlying the financial contract.

Indeed, with a view to safeguarding the stability of a financial intermediary, the prudential regulations currently in force require the financial intermediaries to comply with capital adequacy guidelines in the face of the concentration of risk: such a requirement is measured according to the single name perspective and, at present, does not take into account the financial or commercial nature of large exposures.

This paper deals with the effectiveness of the tools to check concentration according to the single name approach and the sectoral / geographic approach with respect to the portfolio financing of exposures representing financing liability or current liabilities for the enterprise. Based on a review of both the literature and the current prudential regulations, this paper proposes an empiric verification of the degree of concentration of financial and commercial credit portfolios according to the two main approaches proposed in the literature. Initially, the paper refers to the most authoritative academic literature on the single name and sectoral / geographical concentration risk (paragraph 2), analyzing the implications of the approaches with respect to exposures having a financial and a commercial nature (paragraph 3) and, subsequently, presents the control instruments developed within the regulatory context for the Italian situation (paragraph 4). With a view to ascertaining the hypotheses being formulated, the paper proposes an empiric verification applicable to the domestic credit system based on a comparison of the concentration between portfolios of financial and commercial exposures according to the two approaches referred to above (paragraph 5). The last paragraph is devoted to a few concise conclusions (paragraph 6).

2. Concentration-measuring approaches: singles name vs. sectoral / geographical

The riskiness of a financial intermediary's credit portfolio depends on both a systemic risk that may not be done away with diversification and a non-systemic risk linked to the specific characteristics of individual trustworthy customers. By increasing the number of customers and applying the classical principles for diversifying a portfolio of financial activities, the relevance of

the specific risk tends to decrease[2] in a way that is more than merely proportional to the decrease in the performance that may be connected with such a diversification strategy[3].

The exposure to a specific credit portfolio risk is estimated by taking into account the level of concentration of the portfolio and adopting either the single name measurement approach or the approach based on sectoral / geographical characteristics[4].

The first approach assumes that the characteristics of the customers of a financial intermediary are so heterogeneous that the concentration risk may only be assessed by taking into consideration the exposure toward each customer. The importance of the analysis of the level of concentration is justified in literature in the face of:

❑ the collusion risk between major customers and financial intermediaries;
❑ the risk of illiquidity of the assets.

High levels of exposure toward individual customers may be a sign of a lower ability of the financial intermediary to impose its contractual conditions and to manage the credit process in an efficient manner. In fact, a financial intermediary is more likely to offer favorable loan terms to its most important customers just to keep the relationship going and, should difficulties arise, is stimulated to grant extensions or further loans in order to avoid the full loss of any previously granted loan[5].

The loans being granted are characterized by a low level of assets liquidity that is likely to determine the inability to comply with a repayment request, if any, by the intermediary's financial backers. A low level of concentration of the customer portfolio and the definition of different expires/durations for the lending relationships with the various customers allow reducing the liquidity risk connected with the credit activity[6].

The hypothesis of establishing a univocal relationship between business cycle and performance of the enterprises, attributing every likely anomaly to specific characteristics of the enterprise, limits to a significant extent the models to assess customers[7]. In fact, it does not stand to reason to assume that the impact of macroeconomic changes is independent of the characteristics of the context where the enterprise works[8] and, as a rule, it proves possible to identify the relationships between the economic sector and/or the geographic area it belongs to and the sensibility to the evolution of the reference scenario[9].

In fact, the approach based on sectoral / geographical profiles singles out within a credit portfolio those individuals that are homogeneous in respect of a few characteristics deemed relevant, which appear to feature the same level of exposure upon the occurrence of a few significant external events[10]. A high level of homogeneity of the creditworthy customers determines for the intermediary an excessive exposure to the risk of significant losses in consequence of the

[2] Santomero A.N. (1997), "Commercial banking risk management: an analysis of the process", *Journal of Financial Service Research*, vol. 12, pp. 83-115.

[3] Elyasiani E. e Deng S. (2004), *Diversification effect on the performance of financial services firms*, paper presented at the conference of Financial Management Association del 2004, Orlando.

[4] Kamp A., Pfingsten A. e Porath D. (2005), *Do banks diversify loan portfolios? A tentative answer based on individual bank loan portfolios*, Deutsche Bundesbank discussion paper n°3.

[5] Boot A.W.A. (2000), "Relationship banking: what we know?", *Journal of Financial Intermediation*, vol. 9, pp. 7-25.

[6] Cerasi V. e Daltung S. (2000), "The optimal size of bank: costs and benefits of diversification", *European Economic Review*, vol. 44, pp. 1701-1726.

[7] Gordy M.B. (2003), "A Risk factor model foundation for ratings-based bank capital rules", *Journal of Financial Intermediation*, vol. 12, pp. 199-232.

[8] Bonti G., Kalkbreber M., Lotz C. e Stahl G. (2005), *Credit risk concentration under stress,* paper presented at the conference of the Journal of Credit Risk "Concentration risk in credit portfolios", Basel.

[9] Hanson S., Pesaran N.H. e Shuerman T. (2005), *Scope of credit risk diversification*, IEPR working paper, New York.

[10] Altman E.J. e Saunders A. (1998), "Credit risk measurement: developments over the last 20 years", *Journal of Banking and Finance*, vol. 21, pp. 1721-1742.

propagation of generalized crises affecting enterprises belonging to special sectors and/or geographical areas[11].

The presence of a level of structural concentration in a few sectors of economic activity may affect the financial intermediaries who, over time, have gained distinctive expertise in working with a selected typologies of counterparties[12]. In fact, empiric analyses have shown that the decision to see to an excessive diversification of bank portfolios fails to be an efficient solution[13], particularly when the customers' reference markets are keenly competitive[14] and the costs to screen and monitor the counterparties are high[15].

Economic actors belonging to special geographic areas are affected to a different extent by the evolution of the business cycle[16], and a diversification by geographic locations may give rise to a decrease in the total risk assumption and an increase in the intermediary's level of efficiency[17]. However, the effectiveness of the procedures to screen and monitor customers does not prove to be independent of the closeness/distance with respect to the financial intermediary and, therefore, the credit portfolio may feature a level of a structural geographic concentration[18].

3. The concentration risk measurement approaches and the nature of the financial instruments

The literature on the concentration risk measurement approaches seems to focus essentially on the creditor's exposures resulting from the debtor's financial liabilities. A review of the literature highlights that the relationship between the type of approach to such a risk measurement and the nature of the debtor's financial or commercial liability has been explored to a lower extent. However, this closer examination is especially important in the light of the dimensions taken on by commercial credit that, based on empiric verifications relating to the domestic context, by the end of the 1990s has outdistanced short term bank lending by 10%[19].

Within the context of the single name approach, the concentration of the financial intermediary's assets towards a counterparty may result in significant losses when the exposure has a financial nature. In that case, even in the presence of various technical forms that contribute to determining the relevance of the exposure, the cause of the relationship is the debtor's financial needs, and repayment depends exclusively on the debtor's ability to generate cash flows.

According to the single name approach, the assessment of the concentration risk in financial transactions based on commercial credits - such as, for instance, invoices discounting subject to collection[20], factoring[21], and securitization operations[22] – requires a prior investigation into the basic

[11] Giesecke K. e Weber S. (2006), "Credit contagion and aggregate losses", *Journal of Economic Dynamics and Control*, vol. 30, pp. 741-767.

[12] Stomper A. (2005), *A theory of banks' industry expertise, market power and credit risk*, University of Vienna working paper, Vienna.

[13] Pfingsten A. e Rudolph K. (2002), *German banks' loan portfolio composition: market orientation vs specialization*, paper presented at V Swiss Society for Financial Market Research conference, Basel.

[14] Acharya V.V., Hasan I. e Saunders A. (2006), "Should banks be diversified? Evidence from individual bank loans portfolios", *Journal of Business*, vol. 79, pp. 1355-1412.

[15] Winton A. (2000), *Don't put all your eggs in one basket? Diversification and specialization in lending*, University of Wharton working paper, Philadelphia.

[16] FroLov M. (2006), *Do banks purposely diversify loan portfolios?*, KUMQRP discussion paper, Tokyo.

[17] D'Souza C. e Lai A. (2004), *Does diversification improve bank efficiency?*, paper presented during the Bank of Canada conference on "The Evolving Financial System and Public Policy", Ottawa.

[18] Carling K. e Lundberg S. (2002), *Bank lending, geographical distance and credit risk: an empirical assessment of the church tower principle*, Sveriges Riksbank working paper.

[19] Cannari L., Chiri S., Omiccioli M. (2005), *Imprese o intermediari?*, Prismi, Il Mulino, Bologna.

[20] For an analysis of the financial instrument, see Munari L. (a cura di) (2006), *Strumenti finanziari e creditizi*, McGraw-Hill, New York.

reason for granting a commercial credit. In fact, the literature singles out two types of reason that underlie the grant of a commercial credit[23]:

❑ the real determinants – such as guarantee of the product quality[24], price discrimination tool[25] and / or enhancement of the customers' loyalty[26];
❑ the financial determinants[27].

Should the financial reasons prevail, the analogies with respect to the operations having a financial nature predominate. In that case, the transferor takes on the role of an intermediary between the lender and the debtor[28]. Should the real determinants prevail, the use of the single name approach presents analogies and divergences with respect to exposures having a definitely financial nature. From the former point of view, the financial intermediary who carries on transactions based on commercial credits may report large exposures towards the supplier who transfers the credit or the debtor who purchases the product/service. Unlike the financial exposures based on the bilateral relationship between lender and debtor, in the financial operations based on the purchase of commercial credits the relationship is based on a pre-existent commercial relationship and, therefore, the financial relationship has a trilateral and self-settling nature[29]. Contrary to empiric evidence based on the concentration of exposures that represent credit liabilities for a debtor[30], the concentration of assets in such transactions toward a counterparty does not entail the exposure to the risk of greater losses with respect to a portfolio diversified on the front of the supplier-transferor and/or debtor-purchaser. In fact, even though the financial intermediary has a large exposure towards the transferor, the repayment of the loan depends primarily on the fulfillment on the part of commercial debtors. If the large exposure is towards the debtor-purchaser, it is generally determined by the existence of commercial relationships with more than one supplier, as well as by motivations determined by the optimization of the financial structure of the enterprise. Analogously to what happens with respect to the concentration towards the transferor, there are a number of independent repayment sources: if the extensions of payment from which a debtor benefits are on average longer than those admitted in its markets for re-placing the purchased goods and/or services[31], they should allow the repayment of debts. Besides, it turns out that the modest effectiveness of the concentration risk control through the single name approach is determined by

[21] For an analysis of the financial instrument, see Ruozi R. e Rossignoli B. (1985), *Manuale del factoring*, Giuffrè Editore, Milan.

[22] For an analysis of the financial instrument, see Giannotti G. (2004), *La cartolarizzazione dei crediti: rischi e regolamentazione*, Franco Angeli, Milan.

[23] For a litterary review of the main drivers of commercial lending, see Omiccioli M. (2004), "Il credito commerciale: problemi e teorie", *Temi di Discussione*, Banca d'Italia, June.

[24] Lee Y.W., Stow J.D. (1993), "Product Risk, Asymmetric Information and Trade Credit", *Journal of Financial and Quantitative Analysis*, vol. 28, pp. 88-96.

[25] Schwartz R.A. e Whitcomb D.K. (1978), "Implicit Transfers in the Extension of Trade Credit", in Boulding K.E. e Wilson T.F. (a cura di), *Redistribution through the Financial System*, Praeger, New York.

[26] Emery G.W. (1987), "An Optimal Financial Response to Variable Demand", *Journal of Financial and Quantitative Analysis*, vol. 22, pp. 209-225.

[27] Schwartz R.A. (1974), "An Economic Model of Trade Credit", *Journal of Financial and Quantitative Analysis*, n.9, pp. 643-657.

[28] Direr A. (2001), *Trade Credit and Systematic Risk*, Ecole Normale Superieure Sepremap working paper, Parigi.

[29] The third party relationship of the relationship is submitted to the hypothesis of no economic / juridical connection between transferor and debtors.

[30] Heitfield E., Burton B. e Chomsisengphet S. (2005), "The effect of Single Name and Sector Concentrations On the Distribution of Losses for Large Wholesale Credit Exposures", in Proceedings of *Concentration Risk in Credit Portfolios* conference, Deutsche Bundesbank e Basel Committee on Banking Supervision, Frankfurt, November.

[31] For an overview of commercial credit characteristics see Dallocchio M. e Salvi A. (2004), *Finanza d'azienda*, Egea, Milan, pp. 657-690.

the short maturity of the commercial credits, which is structurally lower than 90 days[32]. Based on the specificities of the financial transactions founded on commercial credits, the single name concentration risk control may represent an effective tool for limiting losses if measured within the portfolio of commercial credits that may be referred to each supplier: a debtor's significant relevance could imply an economic link between the transferor and the supplier.

Looking to sectoral / geographic concentration risk in financial exposures, the intermediary checks the systemic risk weighing on his portfolio: the effectiveness of such a tool is related to the influence exerted by the stratification variables with respect to the trend of the credit worthiness of the financed counterparties and the relevance of such profiles within the customer portfolio of the intermediary, as shown by the empiric verifications available in the literature[33]. As a result, the use of the sectoral / geographic approach must be backed up by tools based on the single name approach in contexts characterized by a considerable relevance of the specific risk.

Within the context of the commercial lending transactions, the assessment of the concentration risk through the approach based on sectoral / geographic characteristics seems suitable to allow the prevention of losses, leaving aside the motivation underlying the commercial credit application. In the perspective of the assessment of both the transferor and the debtor, and assuming a situation of competitiveness of the markets, the repayment of the debt is related to the placement of one's goods and/or services with end-purchasers. In that case, the repayment of the exposure would seem to be prevailingly affected by the trend of systemic variables such as, for instance, those related to the trend of the sectoral markets, rather than by the specific risk of the counterparty. In the domestic context, recent empiric evidence shows that commercial credit has an anti-cyclical nature, being used for the most part as a demand-supporting tool[34]. The significance of the systemic variables is positively affected by the concentration of debtors in a sector and / or a region and by the network effect among enterprises created within them by the extension of the commercial credit[35].

4. The regulations governing concentration in the domestic context

The control of the implications of the concentration risk on the stability of financial intermediaries represents one of the fundamental principles recognized at an international level for a safe and sound management of the intermediation activity[36]. Concentration may affect the performance of the financial intermediary and, should the exposure towards the relevant creditworthy party prove significant with respect to the lender's capital, the forfeiture of the creditworthiness of the counterparty may compromise the stability of the very intermediary[37]. Considering the approaches referred to in the literature in order to measure the risk of concentration[38], the domestic regulations, in keeping with those of the European Community, are exclusively inspired by the single name logic: the individual perspective of the risk analysis within the context of the credit portfolio is impervious to the influence of macroeconomic factors on the variability of the creditworthiness of

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[32] Associazione Italiana per il Factoring, *Statistiche Trimestrali*, different quarters.

[33] On the empirical analysis about the concentration measures for sectoral /geographical diversification in lending, see paragraph 2.

[34] Malgarini M. (2006), "New ISAE Questions on Trade Credit", *OECD Workshop on Business and Consumer Tendency Surveys*, September.

[35] Cardoso Locourtois M. (2004), *Chain Reactions, Trade Credit and Business Cycle*, Econometric Society, North America Summer Meeting n° 331.

[36] Basel Committee on Banking Supervision (1997), "Core Principles for Effective Banking Supervision", Basilea, April and next updates.

[37] Cicardo G., Laviola S., Losavio M. e Renzi A. (1995), *Rischi di mercato e grandi fidi: le nuove regole per la banca*, Bancaria Editrice, Rome.

[38] On the more used approaches for the evaluation of concentration see paragraph 2.

all the counterparties with whom the intermediary entertains a relationship characterizing the sectoral / geographic approach[39].

The prudential regulations on concentration, introduced within the Community through Directive 92/121/EEC, aim to limit the maximum risk of losses with respect to any single client or group of connected clients[40]. In the domestic context, the Bank of Italy extended these regulations in 1993 to banking groups and banks and, in 1998, also to supervised non-bank financial intermediaries.

In order to assure the financial intermediaries' stability, the Supervisory Authority has identified a few instruments that are likely to limit the practice of the credit activity at both a global and a specific level. From the former point of view, the credit activity in favor of counterparties that entail positions of considerable risks, that is to say exposures weighted by pre-established coefficients that exceed 10% of the regulatory capital, must be kept within the limit of eight times the regulatory capital; at an individual level, the risk position - obtained weighing the book value by pre-established coefficients - must not exceed 25% of the regulatory capital[41].

Notwithstanding the differences referred to in this paper between concentrated exposures resulting from financial and commercial liabilities, the instruments provided for by the prudential regulations are the same: non-bank financial intermediaries that carry out factoring transactions - that, according to statistics of the Bank of Italy[42], account for nearly one half of the financial operations based on the purchase of commercial credits carried out within the domestic context – are only allowed by the regulations to operate with higher concentrations levels in relation to their regulatory capital and, in *pro solvendo* (with recourse) exposures, allows the possibility of attributing the exposure to the transferor[43]. The regulations currently in force in the matter of concentration provide for an ad hoc treatment with respect to financial intermediaries who work prevailingly with the industrial group they belong to. In that case, the concentration toward the transferred debtor, that is to say the parent company or the companies belonging to one's own industrial group, represents the institutional goal of the intermediary[44].

5. Comparison between portfolios of financial and commercial credits: an empiric analysis relative to Italy

The different characteristics of the financial and commercial relationships have repercussions on the characteristics of the exposures of financial intermediaries and may cause a higher or lower effectiveness of one of the other concentration measurement approach. Analyses presented in

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[39] Cicardo G., Laviola S., Losavio M. e Renzi A. (1995), *Rischi di mercato e grandi fidi: le nuove regole per la banca*, Bancaria Editrice, Rome.

[40] For an overview of the law, see: Rossignoli B. (1993), "La vigilanza e il controllo dei grandi fidi", *Rivista Milanese di Economia*, vol. 46, pp. 72-81.

[41] For a more detailed analysis of law about concentration risk for banks, see Banca d'Italia, "Istruzioni di vigilanza per le banche", *Circolare* n. 229 del 21 aprile 1999 and next updates.

[42] For further details, see Banca d'Italia (different years), "Tassi attivi sui finanziamenti per cassa al settore produttivo-Distribuzione per durata originaria, tasso, tipologia operazione e localizzazione geografica della clientela", *Base Informativa Pubblica.*

[43] For a more detailed analysis of law about concentration risk for factoring companies, see Banca d'Italia, "Istruzioni di vigilanza per gli intermediari finanziari iscritti nell'"Elenco speciale", Circolare 216 del 16 agosto del 1996 e successivi aggiornamenti. In June 2006, Bank of Italy proposed to make rules about concentration coherent with ordinary laws. For further details, see Banca d'Italia (2006), *Disciplina della concentrazione dei rischi. Modifica delle disposizioni transitorie*, May.
For pro-solvendo exposures without notification financial intermediaries are obliged to identify the transferor as the counterparty risk. For further details, see Banca d'Italia (2005), *Bollettino di Vigilanza*, n. 5, May.

[44] Recently The Central Bank has cancelled the exception made for individual exposure for factoring pluricaptive companies, financial intermediaries hat offers services to their shareholders. For further details, see Banca d'Italia (2005), *Bollettino di vigilanza*, May.

literature have disclosed a few peculiarities of the commercial credits that set them apart with respect to other financial operations and determine the presence of a high level of structural concentration that may not be done away with[45].

This study considers the possibility that the differences reported in literature influence the effectiveness of the two approaches used for measuring the concentration in the financial and commercial operations.

5.1 The sample

The analysis of the financial credit portfolio has been carried out taking into consideration data relative to the entire Italian financial system registered by the Bank of Italy and available in the Public Data Base. In order to make a comparison between comparable magnitudes, the analysis was restricted to the short-term financing transactions represented by cash credits.

On the other hand, in view of the non-availability of system data having the same level of detail as those offered in respect of financial credits, the study of the characteristics of a portfolio of commercial credits called for the selection of a sample of specialized intermediaries - factoring companies - deemed to be representative of the system. The companies were selected based on the availability of supervisory reports and data relative to statistical reports collected by the Italian factoring association (Assifact). The sample may be considered to be representative of the Italian situation because, although the reporting members do not represent all the qualified entities, the volume of the acquired credits represents on average nearly 90% of the total national amount. (Graph 1)

Graph 1. The significance of the sample in the overall italian market

Fonte: Bank of Italy and Assifact data processed by authors

The typology of data selected to carry out the empiric verification on commercial credits proved binding in the selection of the reference time interval and the frequency of usable data. Therefore the analysis considered the system data and the statistics relative to the Assifact associates starting from 2003 with a quarterly frequency.

5.2 The methodology

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[45] Summer B. e Wilson N. (2000), "Trade credit management and the decision to use factoring: an empirical study", *Journal of Business, Finance and Accounting*, vol. 27, pp. 37-68.

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The analysis of the relevance of the two types of concentration for the different typologies of financial and commercial credits has been carried out based on indicators that allowed keeping into account the characteristics of the intermediaries' credit portfolios.

The study of sectoral / geographic concentration has been carried out taking into consideration the standard classification by regions and by sectors of economic activity used by the Bank of Italy for the financial intermediaries. In the light of the available literature, the decision was taken to analyze the sectoral / geographic concentration risk having recourse to the indexes that are most extensively used to assess the degree of concentration / entropy of customer portfolios[46]. More in detail, the analysis has taken into consideration the indexes outlined below:

- ❑ Gini index[47];
- ❑ entropy indexes[48];
- ❑ distance indexes[49].

The measure proposed by Gini represents an estimate of the dispersion of the observations with respect to a theoretical distribution that ensures a fair distribution of the credit portfolio. In formulas:

$$G_t = \frac{2}{n-1} \sum_{i=1}^{n} \left(Exp_i - \overset{\wedge}{Exp}_i \right)$$

where the concentration depends on the difference between the real distribution of n observations $\left(Exp_i \right)$ with respect to the theoretical distribution that represents the equitable distribution of the assets $\left(\overset{\wedge}{Exp}_i \right)$. In the presence of distributions characterized by a limited number of observations and a non-negligible degree of asymmetry and / or kurtosis, the indications provided by such an index may prove misleading[50].

The entropy indexes, instead, are not based on a comparison with an optimum theoretical distribution, as they merely measure the lack of homogeneity in the distribution, attributing different weights in relation to the extent of the deviations. The most widespread formulation provides for the calculation of a weighted average of the relative exposures:

$$H_t = \sum_{i=1}^{n} \frac{\dfrac{Exp_i}{Exp_{TOT}} \log\left(\dfrac{Exp_i}{Exp_{TOT}} \right)}{\log(n)}$$

[46] Heitfield E., Burton S. e Chomsisengphet S. (2005), *The effects of name and sector concentrations on the distribution of losses for portfolios of large wholesale credit exposures*, BIS working paper.

[47] Gini C. (1936), "On the measure of concentration with special reference to income and wealth", in AA.VV., *Abstracts of papers presented at the Cowles Commission Research Conference on Economics and Statistics*, Colorado College Press, Colorado Spring.

[48] Shannon C.E. (1948), "A mathematical theory of communication", *Bell System Technical Journal*, vol. 27, pp. 379-423.

[49] Kamp A., Pfingsten A. e Porath D. (2005), *Do banks diversify loan portfolios? A tentative answer based on individual bank loan portfolios*, Deutsche Bundesbank discussion paper, Francoforte.

[50] Hart P.E. (1971), "Entropy and other measures of concentration", *Journal of the Royal Statistic Society Series A*, vol. 134, pp. 73-85.

where the value of the index increases as the concentration of the investments increases $\left(\dfrac{Exp_i}{Exp_{TOT}}\right)$ according to a weighting factor derived from the logarithmic function $\left(\log\left(\dfrac{Exp_i}{Exp_{TOT}}\right)\right)$.

On the other hand, the distance indexes applied for assessing a credit portfolio provide direct information about the differences existing between the situation under consideration and the reference *benchmark* that was identified. The formulation relative to the first order differences is:

$$D_t = \frac{1}{n}\sum_{i=1}^{n}\frac{\left|\dfrac{Exp_i}{Exp_{TOT}} - \dfrac{\hat{Exp_i}}{\hat{Exp}_{TOT}}\right|}{\dfrac{Exp_i}{Exp_{TOT}} + \dfrac{\hat{Exp_i}}{\hat{Exp}_{TOT}}}$$

Estimate of this measure using the commercial credits as survey population $\left(\dfrac{Exp_i}{Exp_{TOT}}\right)$ and the financial credit portfolio as reference benchmark $\left(\dfrac{\hat{Exp_i}}{\hat{Exp}_{TOT}}\right)$ allows to obtain direct information about the degree of homogeneity / diversity between the types of activity. The analysis of such measure by individual geo-sectoral clusters permits to single out the main regions or sectors that contribute to determining differences in the concentration level measured through the indexes referred to above.

The significance of the concentration risk estimated through the single name approach in the financial and commercial operations has been analyzed taking into consideration the exposure towards the major client counterparties with respect to the total credit portfolio. Such a risk profile has been assessed by building a concentration relationship relative to the best customers and comparing the results obtained in respect of the financial and commercial credit operations[51]. In formulas:

$$CR_t = \sum_{i=1}^{n}\frac{Exp_i}{Exp_{TOT}}$$

In the light of the data available for the factoring and financial credit market, the analysis has been restricted to the ten top-ranking counterparties of every financial intermediary $(n=10)$[52].

5.3 Analysis of the concentration of the credit portfolio of financial intermediaries

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[51] Norden L. e Szerencses M. (2006), *Migration and concentration risk in bank lending: new evidence from credit portfolio data*, University of Mannheim working paper, Mannheim.

[52] The choice to consider only the first ten counterparts is coherent with approaches proposed in literature for the estimation of concentration risk in commercial lending in Italy. See Assifact (1997), *La domanda di factoring*, reserved pubblication, volume I.

A detailed analysis of data provided by the Bank of Italy on the exposures of the financial system as a whole and on those relative exclusively to the factoring operations points to differences in the distribution of credits by regions and by sectors of economic activity. (Graph 2)

Graph 2. Geographical concentration for financial and commercial credits
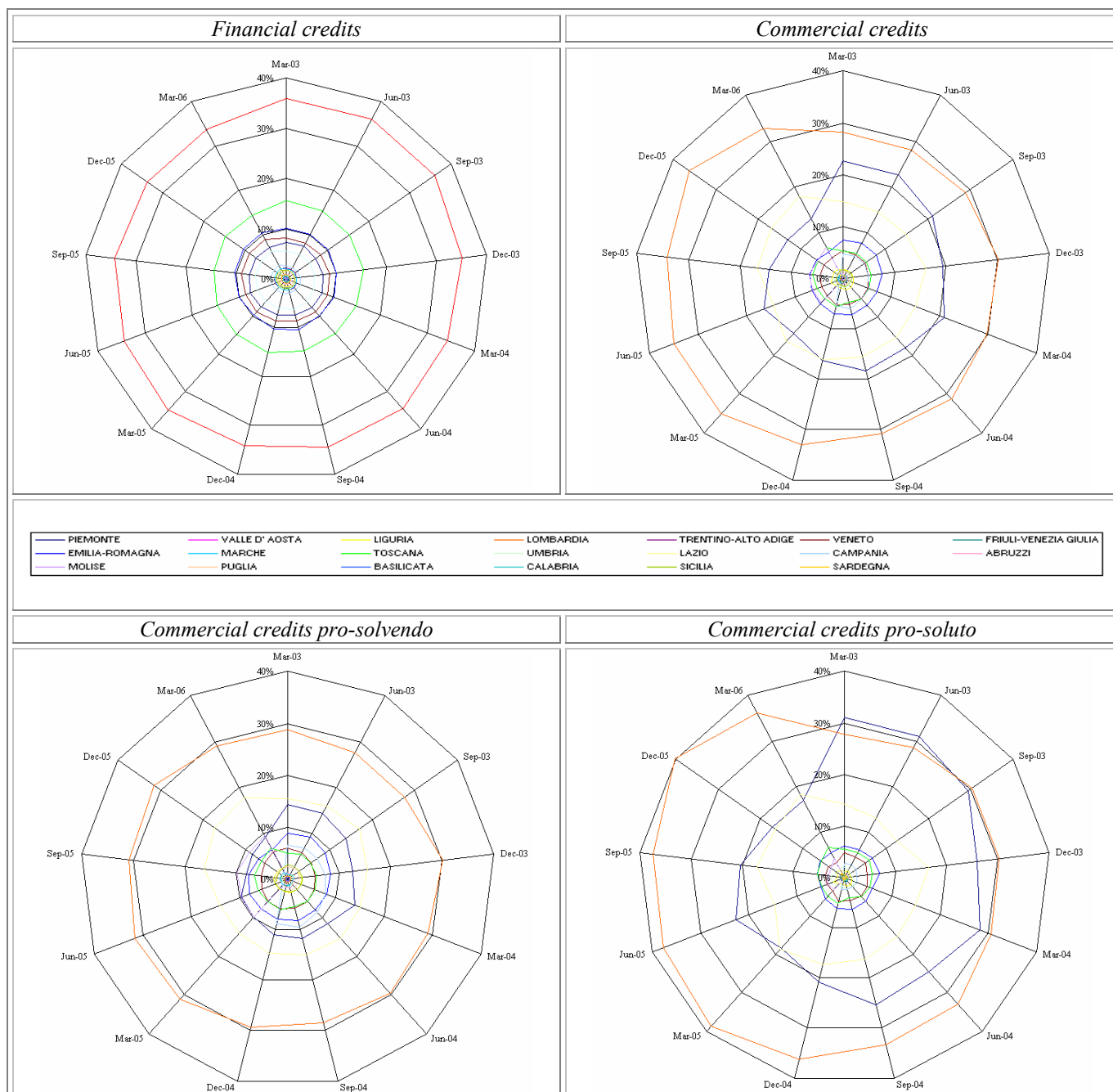
Source: Bank of Italy data processed by authors

The analysis of the region where the counterparty in the financial and commercial credits is located highlights different exposures with respect to the two typologies of operations, particularly in a few regions such as Molise and, depending on the credit purchase arrangements, in Lazio, Toscana and Lombardia. Such differences do not stand out merely in absolute terms with respect to a few Regions, as they have also repercussions on the credit concentration / dispersion. In fact, the

study of the Gini index for individual quarters allows noticing a concentration that is a few percentage points higher for commercial operations, with the exception of pro-solvendo transfers, throughout the period under consideration, and a greater variability, measured by the entropy index, for the operations having a financial nature and the pro-soluto transfers of commercial credits[53]. A direct comparison through the relative distance indexes shows that the greater concentration differences in the two portfolio typologies are connected with the different exposure toward regions in southern Italy, with special regard to Molise. (Table 1)

Table 1. Differences on concentration in financial and commercial credits on the basis of geographical characteristics

			GiniIndex			Entropy index		
			Mean	Max	Min	Mean	Max	Min
Financial credits			68.18%	69.41%	66.51%	74.62%	76.03%	73.56%
Commercial credits	*Overall*		71.04%	71.91%	70.36%	72.55%	81.07%	41.41%
	Pro-solvendo		66.01%	66.90%	64.78%	72.59%	79.64%	43.70%
	Pro-soluto		77.33%	78.90%	76.15%	76.96%	87.58%	71.48%
Relative distance index				Value		Region		
	Commercial credit Overall	*Mean*	37.26%		-			
		Max	22.13%		Molise			
		Min	0.05%		Lazio			
	Commercial credit Pro-soluto	*Mean*	24.05%		-			
		Max	96.84%		Molise			
		Min	0.10%		Toscana			
	Commercial credit Pro-solvendo	*Mean*	24.62%		-			
		Max	95.21%		Molise			
		Min	0.04%		Lombardia			

Source: Bank of Italy data processed by authors

The study of debtors, classified in relation to the sector they belong to, points to differences between the two types of operations that are even more significant, with structurally larger exposures for a few sectors in the factoring activity. (Graph 3)

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[53] For empirical results on the low concentration for specific sectors/regions, see Acharya V.V., Hasan I. e Sauders A. (2006), "Should banks be diversified? Evidence from individual bank loan portfolios", *Journal of Business*, vol. 79, pp. 1355-1412.

Graph 3. Sectoral concentration for financial and commercial credits
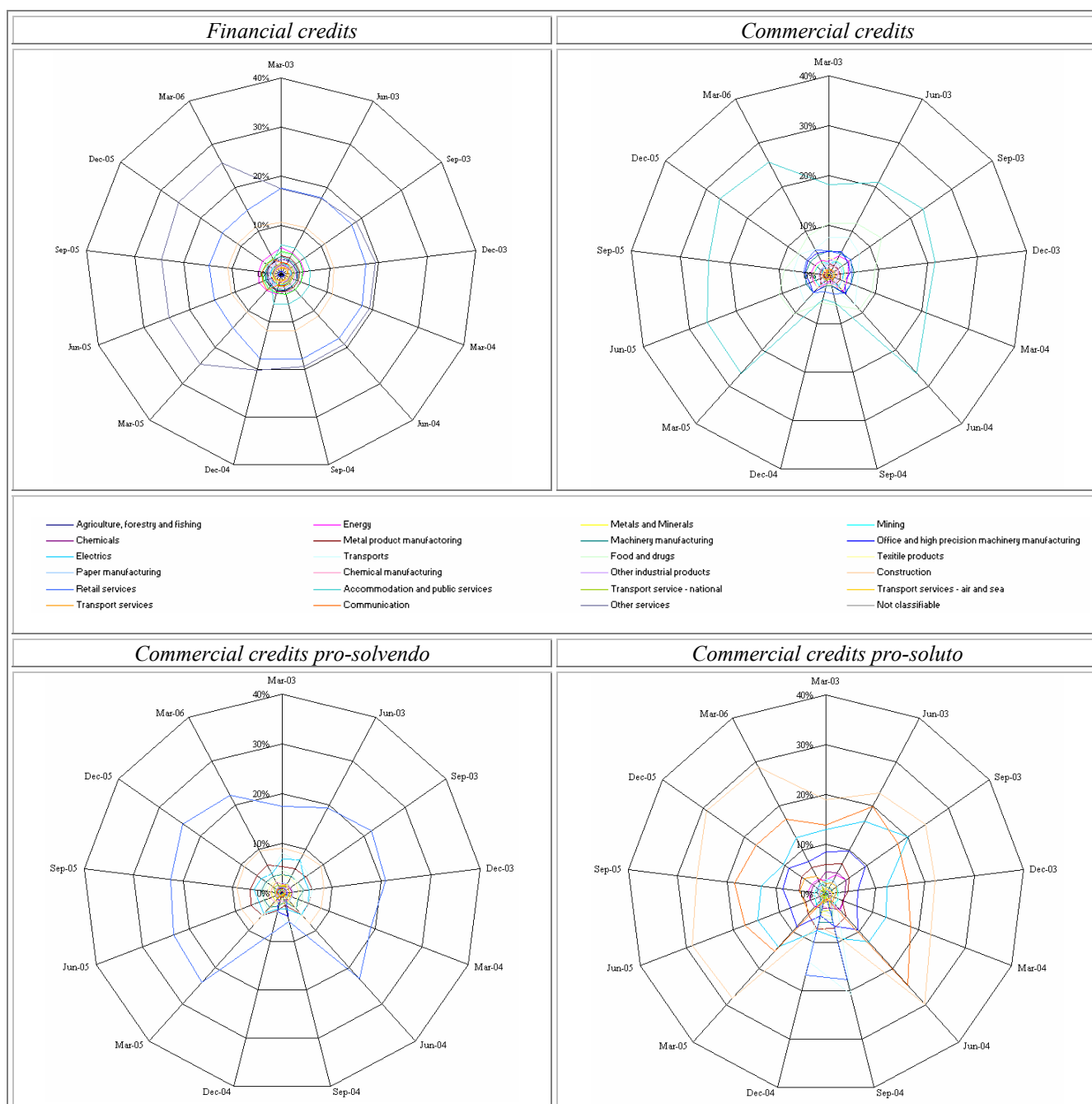
Source: Bank of Italy data processed by authors

The exposure concentration index for commercial credits proves always higher than that for financial credits (on average, less than 8 percentage points) and the difference in the values reported in the individual quarters ranges from a minimum of 0% to a maximum of nearly 11%. The analysis of the degree of entropy shows that the concentration proves much more variable in financial operations and pro-solvendo transfers than in the other commercial operations. The differences between commercial and banking credits prove more marked in such sectors as Accomodation and public services and, depending on the credit purchase arrangement under consideration, the sectors of Metals and minerals (with the exclusion of fixed and fertile materials), Chemical manufactoring, and the residual category of the other industrial products. (Table 2)

Table 2. Concentration differences for financial and commercial credits

			Gini index			Entropy index		
		Mean	Max	Min	Mean	Max	Min	
Financial credits		45.91%	50.15%	41.89%	86.36%	89.37%	82.73%	
Commercial credits	*Overall*	53.22%	59.04%	46.98%	68.36%	69.09%	67.10%	
	Pro-solvendo	53.64%	57.87%	47.70%	72.89%	73.82%	72.15%	
	Pro-soluto	56.43%	63.24%	49.73%	61.69%	63.08%	59.75%	

			Value	Sector
Relative distance index	*Commercial credits Overall*	Mean	44.55%	-
		Max	99.48%	Accomodation and public services
		Min	0.18%	Metals and minerals
	Commercial credits Pro-soluto	Mean	43.11%	-
		Max	98.03%	Accomodation and public services
		Min	0.32%	Chemical manufacturing
	Commercial credits Pro-solvendo	Mean	42.21%	-
		Max	99.84%	Accomodation and public services
		Min	0.09%	Other industrial products

Source: Bank of Italy data processed by authors

The divergences highlighted in the analysis of the entire population may be connected with the different relevance taken on by the exposures towards the best customers out of the total credits granted for the operations having a financial and a commercial nature. The study of the exposure towards the top ten counterparties of the intermediaries in the factoring and financial operations permits to highlight a few peculiarities of commercial credit. (Graph 4)

Graph 4. The role of ten more relevant debtors on the overall exposure for factoring and lending

	Mean	Median	Max	Min	σ	% periods when the role of top 10 customers is lower respect the value observed for factoring
Factoring companies	12.40%	11.94%	26.57%	4,89%	4.88%	-
Banks	7.01%	6.72%	8.33%	6.25%	0.81%	92.31%
Biggest banks	12.19%	12.48%	14.37%	10.31%	1.58%	53.85%
Big banks	10.65%	10.36%	12.33%	9.71%	0.91%	76.92%
Medium banks	11.22%	11.11%	12.52%	10.25%	0.65%	61.54%
Small banks	9.52%	9.59%	10.56%	8.75%	0.56%	84.62%
Smallest banks	6.01%	6.16%	7.12%	4.13%	0.82%	92.31%

Source: Bank of Italy and Italian public credit register data processed by authors

In fact, the average relevance of the top ten counterparties in the factoring operations proves higher than the average relevance for loans granted in the various technical forms by banks. Besides, a much more significant variability of the phenomenon may be noted with respect to the banking reality. Furthermore, the analysis of the individual quarters stresses that, with reference to financial credit, the relevance of the major counterparties out of the total is nearly always lower that in commercial credit (92.31% of cases), particularly when considering smaller banks[54].

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[54] Results obtained are coherent with other studies presented in literature on the Italian credit market that demonstrate a lower mean concentration level for small banks. For further details, see Rossignoli B. (1994), "Grandi rischi e concentrazione dei prestiti bancari. Alcune evidenze analitiche", *Rivista Milanese di Economia*, vol. 52, pp. 62-71.

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5.4 The risk of the portfolios of financial and commercial credits

The literature upholds that the phenomenon of defaults related to contracts with underlying commercial credits takes on lower relevance with respect to bank lending, given that in this type of operations there are two categories of entities that are likely to honor their commitments[55]. The analysis of the system data relative to the Italian situation in the last three-year period confirms this assumption, pointing to significant differences in the relevance of the phenomenon for the two types of operations. (Graph 4)

Graph 4. Ratio between defaults and amount of lending for banks and factoring companies
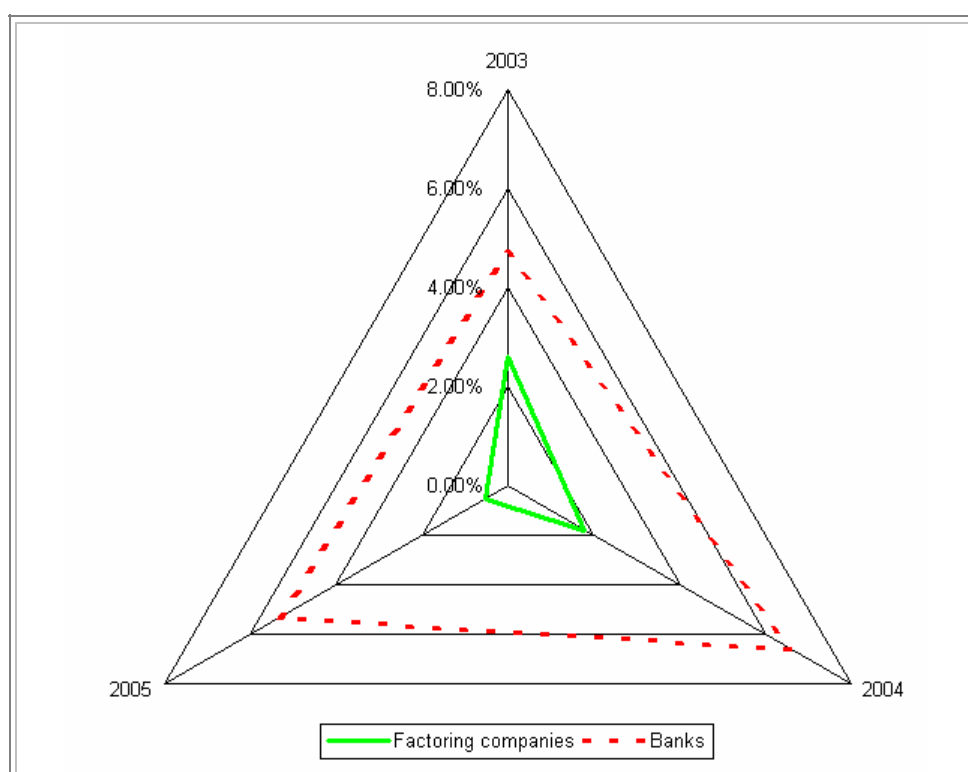
Source: Bank of Italy data processed by authors

The study of the defaults reported in the three-year period under consideration shows that, with respect to factoring, the ratio of the stock of defaults to investments is considerably lower when compared to the banking situation[56].

The low incidence of defaults in commercial credit notwithstanding the high degree of portfolio concentration as shown above may only be deemed justifiable if the financial intermediary succeeds in assessing and monitoring the credit risk correctly[57]. A detailed analysis of the defaults that affected the factoring companies in the three-year period being examined points to the minor role

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[55] Carretta A. (1996), "Il mercato del factoring e la centralizzazione dei rischi di credito", *Bancaria*, vol. 52, pp. 68-73.
[56] Cfr. Banca d'Italia, *Relazione annuale*, Anni vari.
[57] Basel Committee for Banking Supervision (2006), *Core principles for effective banking supervision*, Basilea, principle 10.

played by defaults determined by clients characterized by large exposures in terms of both frequency of occurrence of the events and amount of the exposure. (Graph 5)

Graph 5. Defaults related to more relevant customers for factoring

	Statistics	Counterpart evaluated			
		Overall	*Transferor Pro-solvendo*	*Transferor Pro-solvendo*	*Debtor Pro-soluto*
Number of defaults for big exposures	Mean	2.34%	0.12%	3.75%	0.86%
	Min	0.00%	0.00%	0.01%	0.00%
	Max	15.67%	1.47%	16.14%	6.07%
	Dev.st	4.65%	0.40%	5.12%	2.08%
Defaults related to big exposures respect to overall defaults	Mean	3.69	1.23	3.15	1.31
	Min	1.00	1.00	1.00	1.00
	Max	10.00	3.00	7.00	2.00
	Dev.st	3.17	0.60	2.30	0.48
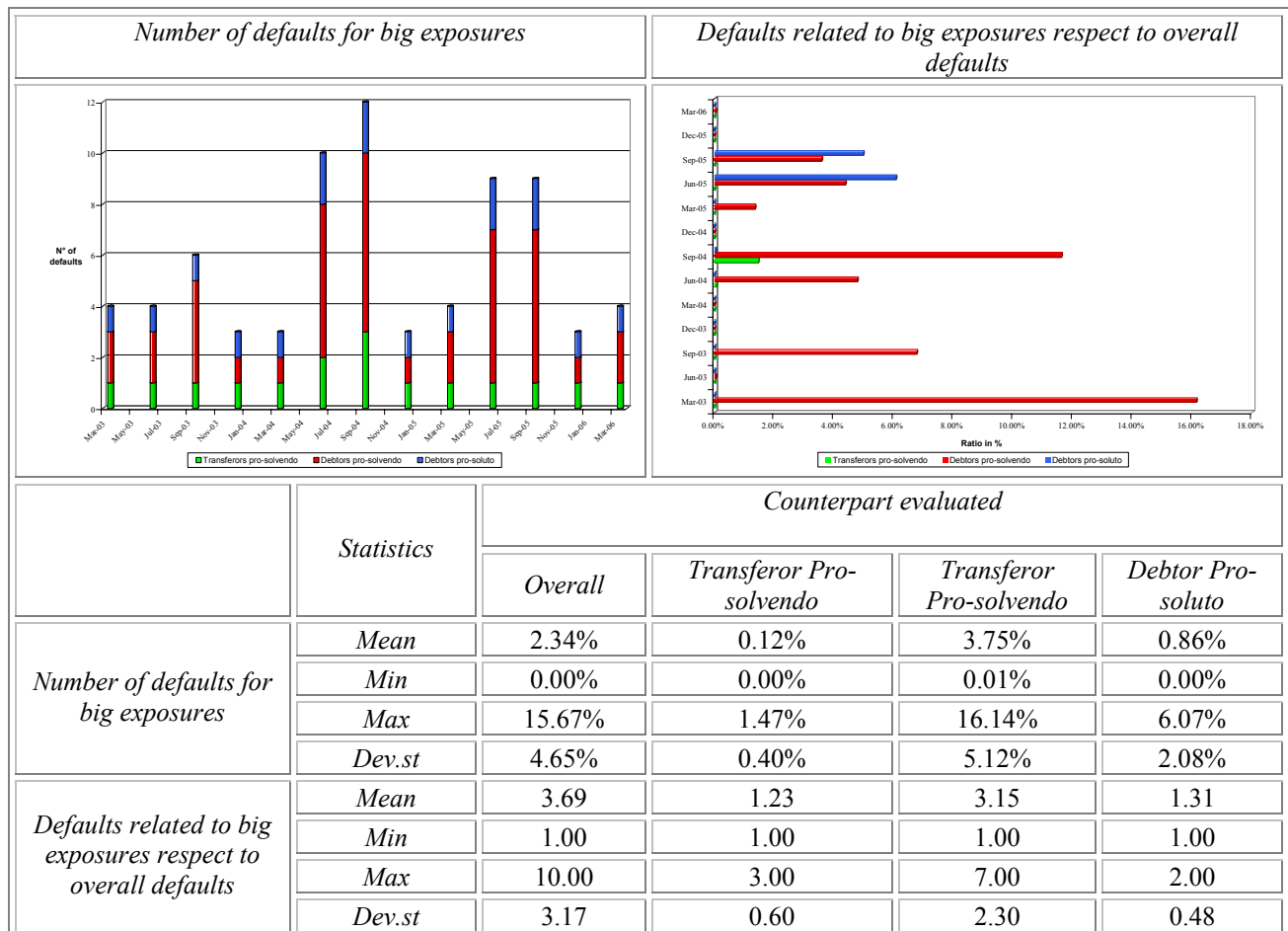
Source: Italian public credit register data processed by authors

In fact, the occurrence of conditions leading to a default classification is rare among the largest counterparties (a maximum of twelve entities reported as defaulters by the factoring companies as a whole during a quarter). As a rule, the reporting of such counterparties as defaulters coincides with a more generalized crisis of the sector giving rise to a nearly marginal incidence of such defaults out of the total, particularly with respect to pro-soluto operations.

On the other hand, the analysis of the relevance of the geographic location of the counterparties and of the sector the latter belong to permits to highlight more evident relationships with defaults than the analysis based on the single name approach. In fact, it would seem that, in the factoring activity, the characteristics of defaults are more consistent with the geo-sectoral profiles of the portfolios held by the intermediaries throughout the period under consideration. (Graph 6)

Graph 6. Defaults classified for counterparts' region and sector

Geographical distribution of defaults	Sectoral distribution of defaults

(Geographical radar chart — periods Mar-03, Jun-03, Sep-03, Dec-03, Mar-04, Jun-04, Sep-04, Dec-04, Mar-05, Jun-05, Sep-05, Dec-05, Mar-06; scale 20%–50%)

Legend (geographical): PIEMONTE, VALLE D'AOSTA, LIGURIA, LOMBARDIA, TRENTINO ALTO ADIGE, VENETO, FRIULI VENEZIA GIULIA, EMILIA ROMAGNA, MARCHE, TOSCANA, UMBRIA, LAZIO, ABRUZZO, MOLISE, CAMPANIA, PUGLIA, BASILICATA, CALABRIA, SICILIA, SARDEGNA

(Sectoral radar chart — periods Mar-03, Jun-03, Sep-03, Dec-03, Mar-04, Jun-04, Sep-04, Dec-04, Mar-05, Jun-05, Sep-05, Dec-05, Mar-06; scale 20%–50%)

Legend (sectoral): Agriculture, forestry and fishing; Energy; Metals and Minerals; Mining; Chemicals; Metal product manufacturing; Machinery manufacturing; Office and high precision machinery manufacturing; Electrics; Transports; Food and drugs; Textile products; Paper manufacturing; Chemical manufacturing; Other industrial products; Construction; Retail services; Accommodation and public services; Transport service - national; Transport services - air and sea; Transport services; Communication; Other services; Not classifiable

	Gini Index			Entropy Index		
	Mean	*Max*	*Min*	*Mean*	*Max*	*Min*
Geographical classification	67.64%	74.20%	62.12%	74.66%	79.63%	67.02%
Sectoral classification	65.48%	70.28%	62.08%	78.39%	80.64%	74.66%

Source: Italian public credit register data processed by authors

Although the level of concentration of defaults is by no means comparable with the concentration reported on the credit side (on average, over 40% lower), a comparison of the geo-sectoral clusters of the credit portfolio and of the defaults during various quarters points to a few similarities. (Table 3)

Table 3. A comparison between starting exposure and defaults

	Coherence between starting exposure and defaults for each category [*]			Coherence between starting exposure and defaults for group of categories [**]		
	Media	*Max*	*Min*	*Media*	*Max*	*Min*
Sectoral Classification	13.16%	26.32%	5.26%	92.54%	94.74%	78.95%
Geographical classification	9.21%	21.05%	0.00%	50.00%	63.16%	36.84%

Note:

[*] The coherence is studied comparing quarter by quarter regional and sectoral rankings for defaults at current quarter and starting exposure of previous quarter
[**] The comparison for groups is released considering only two subgroups (best and worst) for defaults at current quarter and starting exposure of previous quarter

Source: Italian public credit register data processed by authors

In just a few cases a comparison between the defaults and the portfolio composition during the preceding quarter permits to point to an accurate correspondence between the more relevant regions / sectors and characteristics of counterparts that are affected the most by phenomena of defaults (on average, in 13% and 9% of cases)[58].

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[58] The choice of the time horizon is coherent with Basel Committee's prescriptions. See Basel Committee on Banking Supervision (2006), *International convergence of capital measurements and capital standards*, Basilea, June, par. 452.

Keeping into consideration that the geo-sectoral factors do not represent the only cause of the default events[59], considerably different results may be obtained if, instead of the accurate correspondence, one considers the presence of a relationship between a higher (lower) than average concentration and the occurrence (non-occurrence) of insolvency phenomena. Such a relationship has been investigated by taking into consideration four subgroups for each quarter: sectors / regions that in the preceding quarter witnessed concentration levels higher than the median value and sectors / regions that during the quarter reported a number of defaults higher or lower than the median value. The comparison of the composition of the four groups made up by sectors and regions allowed singling out a clearer relationship: in nearly 50% of cases, the branches where the credit portfolio is more concentrated are also the branches that, *ex post,* prove riskier, while a correspondence in excess of 92% of cases may be reported when considering the geographic profiles.

6. Conclusions

The selection of the approach to measure the concentration risk does not appear neutral with respect to the nature of the credit that originated the intermediary's financial exposure. In particular, the motivations of the demand would seem to be characterizing within the commercial credit context. In the face of such peculiarities, the current prudential regulations are exclusively inspired by the single name approach and, besides, do not allow discriminating the nature of the credit.

The empiric analysis carried out in respect of the domestic financial system has shown that the intermediaries' assets resulting from the purchase of commercial credits is more concentrated than those resulting prevailingly from financial credits. Specifically, this evidence is particularly significant for the single name concentration that, therefore, would seem to be a structural aspect for portfolios of commercial credits. Nonetheless, unlike the empiric evidence reported in the international literature on the portfolios of financial credits, the single name concentration of the exposure is not associated with the reported occurrence of greater losses for the financial intermediaries whose portfolios have a prevailingly commercial nature. The result may be explained in relation to the greater attention paid by financial intermediaries in monitoring the risk of such counterparties, as well as the limited effectiveness of the control tools based on the single name concentration for portfolios of financial credits. In fact, the empiric evidence shows a significant improvement in the risk control effectiveness through the recourse to tools inspired by the sectoral / geographical logic.

With reference to the measurement, control and management of the concentration risk, the adoption of ad hoc control instruments for financial exposures characterized by a high specificity has been proposed on the occasion of the recent consultation made by the Committee that joins together the supervisory authorities of European bank[60]. Within the context of the financial operations based on commercial credits, the proposal would seem to be in line with the indications provided by this paper. In fact, the control instruments should take into account the relevance of the counterparty in the commercial portfolio of the supplier rather and in the portfolio of the financial intermediary, as well as the sectoral /geographic logic.

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[59] For further details see: De Laurentis G. (2001), *Rating interni e credit risk management*, Bancaria editrice, Rome, pp. 212-252.
[60] Committee of European Banking Supervisors (2006), "Questionnaire on the Survey on the market practices", marzo.

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Appendix

Table A.1 Relative distances indexes classified for region

Region	Relative distance indexes respect to financial credits								
	Commercial credits Overall			Commercial credits pro-solvendo			Commercial credits pro-solvuto		
	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min
Piemonte	39.97%	51.02%	28.29%	20.03%	32.19%	5.18%	51.58%	61.65%	40.18%
Valle d'Aosta	13.57%	21.46%	2.40%	36.35%	48.54%	22.58%	56.01%	84.39%	25.84%
Liguria	13.52%	24.39%	5.19%	24.72%	28.04%	19.92%	8.35%	21.22%	0.84%
Lombardia	5.24%	12.37%	0.04%	8.12%	13.28%	3.47%	6.09%	12.83%	1.67%
Trentino Alto Adige	66.96%	71.66%	61.50%	71.56%	78.57%	59.74%	62.81%	71.04%	56.34%
Veneto	27.50%	33.48%	20.80%	21.34%	26.65%	16.40%	34.13%	46.98%	25.51%
Friuli Venezia Giulia	29.47%	36.50%	23.91%	17.72%	23.94%	11.21%	43.56%	53.56%	32.92%
Emilia Romagna	18.83%	27.25%	12.97%	11.94%	23.53%	4.17%	26.51%	35.06%	18.83%
Marche	44.57%	48.92%	39.30%	29.82%	33.60%	20.14%	62.59%	73.05%	54.31%
Toscana	4.35%	13.18%	0.52%	2.42%	6.49%	0.10%	7.07%	21.26%	0.49%
Umbria	24.53%	31.21%	15.06%	7.88%	16.55%	2.28%	35.50%	45.21%	23.50%
Lazio	3.81%	11.29%	0.14%	3.15%	10.76%	0.30%	6.04%	11.92%	0.05%
Campania	38.79%	61.48%	26.17%	42.91%	52.97%	31.10%	33.54%	84.98%	2.26%
Abruzzo	29.53%	76.45%	0.54%	30.56%	66.21%	8.88%	53.67%	89.45%	16.35%
Molise	47.55%	95.21%	3.13%	52.18%	96.84%	9.29%	47.84%	92.13%	9.19%
Puglia	12.41%	21.99%	2.37%	15.24%	21.25%	9.63%	64.33%	81.24%	46.10%
Basilicata	21.50%	30.19%	12.04%	16.30%	29.35%	7.18%	25.33%	42.08%	13.48%
Calabria	14.83%	24.96%	4.71%	36.31%	44.94%	26.51%	26.57%	45.90%	14.29%
Sicilia	9.95%	23.92%	0.44%	15.51%	25.27%	2.81%	54.73%	68.62%	34.23%
Sardegna	25.57%	39.71%	2.21%	16.90%	23.32%	9.14%	38.86%	70.92%	6.26%

Source: Bank of Italy data processed by authors

Table A.2 Relative distances indexes classified for sector

Sector	Relative distance indexes respect to financial credits								
	Commercial credits Overall			Commercial credits Overall			Commercial credits Overall		
	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean
Agriculture, forestry and fishing	85.01%	88.19%	80.92%	75.28%	78.63%	67.47%	95.40%	97.30%	92.58%
Metals and Minerals	30.18%	71.68%	16.30%	36.91%	52.94%	22.53%	16.96%	54.73%	0.18%
Minino	36.69%	69.83%	17.59%	39.68%	79.04%	24.62%	28.83%	44.18%	11.58%
Chemicals	11.08%	47.16%	0.39%	16.48%	28.05%	5.72%	11.45%	48.79%	0.60%
Metal product manufactoring	40.45%	47.79%	10.13%	49.51%	58.76%	18.98%	33.58%	44.12%	26.20%
Machinery manufacturing	17.86%	30.93%	4.45%	10.61%	36.16%	0.47%	23.42%	33.47%	2.73%
Office and high precision machinery manufacturing	47.09%	68.62%	25.08%	45.74%	57.47%	9.04%	35.64%	47.89%	11.27%
Electrics	82.20%	87.45%	66.33%	80.20%	85.74%	71.36%	86.49%	89.14%	80.35%
Transports	60.84%	70.31%	45.73%	44.72%	55.65%	29.07%	70.15%	79.86%	56.08%
Food and drugs	29.49%	38.39%	9.16%	36.37%	45.10%	6.53%	31.42%	85.72%	16.48%
Texitile products	26.83%	42.33%	14.31%	18.96%	55.68%	7.43%	33.80%	56.65%	8.77%
Paper manufacturing	44.48%	51.70%	35.08%	45.13%	75.93%	30.71%	42.52%	57.70%	2.99%
Chemical manufacturing	14.31%	58.77%	0.32%	7.33%	23.87%	0.09%	15.17%	27.11%	4.07%
Other industrial products	22.11%	44.79%	1.13%	22.84%	60.18%	0.09%	26.97%	53.77%	2.80%
Construction	26.11%	37.81%	8.54%	56.34%	80.80%	47.96%	38.09%	61.45%	7.99%
Retail services	36.65%	43.67%	26.20%	31.52%	40.17%	16.82%	36.99%	46.44%	16.24%
Accommodation and public services	95.93%	98.03%	94.39%	93.78%	99.84%	90.87%	83.53%	99.48%	0.31%
Transport service – national	62.13%	84.18%	42.40%	53.51%	95.04%	20.26%	76.97%	88.79%	50.53%
Transport services - air and sea	68.74%	89.90%	19.39%	59.52%	79.82%	35.20%	66.93%	87.78%	4.93%
Transport services	15.96%	52.24%	2.30%	13.99%	69.70%	0.69%	26.03%	46.05%	7.66%
Communication	28.50%	71.14%	0.71%	22.63%	40.28%	7.88%	34.41%	59.30%	1.82%
Other services	65.71%	82.35%	18.66%	67.59%	82.05%	14.68%	65.26%	83.44%	32.56%

Source: Bank of Italy data processed by authors

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