DAMPING SYSTEMIC RISK.
THE ROLE OF COOPERATIVE BANKS

VINCENZO PACELLI - Associate Professor at University of Bari "Aldo Moro", via Lago Maggiore, Taranto (Italy), +39.0997720650, vincenzo.pacelli@uniba.it

FRANCESCA PAMPURINI[1] (Corresponding Author) - Associate Professor at Catholic University of Milan, via Emilia Parmense 84, Piacenza (Italy), +39.0523599329, francesca.pampurini@unicatt.it

ANNA GRAZIA QUARANTA - Assistant Professor at University of Macerata, via Crescimbeni 14, Macerata (Italy), +39.07332583201, annagrazia.quaranta@unimc.it

Abstract. This paper focuses on the countercyclical potentialities linked to the bank relational business model. The results support the stream of literature that underlines the importance of local and mutual banks for the stability of the whole banking system We prove that, since cooperative banks are less involved in the mechanisms underlying systemic risk, their presence reveals to be an important cushion able to mitigate the transmission dynamics and the spread of this risk in a financial system. This work offers a new methodological approach to analyse the contribution of each intermediary to the systemic risk propagation dynamics; the most important novel refers to the fact that it can be applied to every kind of bank, regardless of their listing status, because it is based on public data available for every intermediary. An empirical application is proposed, using data referred to the Italian banking system and some variables considered in previous literature as proxies of systemic risk contagion dynamics and propagation speed and proxies of the banks' health status.

Keywords: Systemic Risk; Systemic Risk Propagation; Propagation Speed and Capacity; Cooperative Banks

JEL Code: G21; G32

Prof. Vincenzo Pacelli, Associate Professor of Banking and Finance at the University of Bari "Aldo Moro" (DJSGE), where he teaches Economics of Financial Intermediaries and Financial Portfolio Management. He is also Coordinator and Chairman of the Unified Interclass Council of the Degree Courses in Economics and Business Administration and Business Strategy and Management. He obtained his PhD in Banking and Financial Management at the University of Rome 1 "La Sapienza" and is author of several essays, scientific articles and monographs on banking and finance published by both national and international publishers. He has been a speaker at numerous national and international scientific conferences on Banking and Finance and is a member of the Editorial Board of several international scientific journals. For his scientific research activity he has been awarded several prizes, obtaining both national and international recognition. He carries out training and consulting activities for banks, institutions and companies, is chairman of the board of statutory auditors of companies and board member of the Cooperative Credit Bank Cassa Rurale ed Artigiana di Castellana Grotte - Credito Cooperativo.

[1] Corresponding Author: Francesca Pampurini, francesca.pampurini@unicatt.it. Department of Economic and Social Sciences, Catholic University of Milan, via Emilia Parmense 84, Piacenza (Italy).

Prof. Francesca Pampurini, Associate Professor of Banking and Finance at the Catholic University of Milan, where she teaches Corporate, Investment Banking and Risk Management, Corporate Finance and Financial Intermediation. She is a member of the scientific committee, as well as coordinator, of the Master in Corporate Advisory and Intercultural Resources at the Catholic University of Milan. She obtained her PhD in Financial Markets and Intermediaries at the Catholic University of Milan and is the author of several essays, scientific articles and monographs on banking and finance published by both national and international publishers. She has been a speaker at numerous national and international scientific conferences on Banking and Finance. For her scientific research activity she has been awarded several national and international prizes. She carries out training and consulting activities for banks, institutions and companies. She has been a board member of Aviva Life SpA, Aviva SpA and Aviva Italia SpA.

Prof. Anna Grazia Quaranta, Assistant Professor of Banking and Finance at the Department of Economics and Law of the University of Macerata, where she teaches Economics and Instruments of Financial Intermediaries, Corporate Finance, Financial Risk Management and Economics of Insurance. She obtained the National Scientific Qualification both as Associate Professor and as Full Professor. She obtained her PhD in Economic and Quantitative Methods for Market Analysis at the University of Salento and she is author of several essays, scientific articles and monographs on banking and finance published by national and international publishers. She has been speaker in several national and international scientific conferences on Banking and Finance. She is a member of the Editorial Board of several international scientific journals and carries out consulting activities for banks and companies. She is a board member (as independent) of Banca Macerata SpA.

DAMPING SYSTEMIC RISK.
THE ROLE OF COOPERATIVE BANKS

Abstract. This paper focuses on the countercyclical potentialities linked to the bank relational business model. The results support the stream of literature that underlines the importance of local and mutual banks for the stability of the whole banking system We prove that, since cooperative banks are less involved in the mechanisms underlying systemic risk, their presence reveals to be an important cushion able to mitigate the transmission dynamics and the spread of this risk in a financial system. This work offers a new methodological approach to analyse the contribution of each intermediary to the systemic risk propagation dynamics; the most important novel refers to the fact that it can be applied to every kind of bank, regardless of their listing status, because it is based on public data available for every intermediary. An empirical application is proposed, using data referred to the Italian banking system and some variables considered in previous literature as proxies of systemic risk contagion dynamics and propagation speed and proxies of the banks' health status.

Keywords: Systemic Risk; Systemic Risk Propagation; Propagation Speed and Capacity; Cooperative Banks

JEL Code: G21; G32

1. Introduction

This paper focuses on the countercyclical potentialities linked to the relational business model, which enhances the competitive advantage typical of smaller local cooperative banks related to geographical proximity and therefore to the availability of qualitative and privileged information on customers. An important stream of the literature is inclined to believe that cooperative banks can play a fundamental role in mitigating the mechanisms of systemic risk propagation, as opposed to larger banks characterized by national or international exposure (among others, EACB, 2010 and 2016; Demma, 2015; Barone *et al*., 2016; Berton *et al*., 2017; Pacelli *et al*., 2020).

Alongside studies that acknowledge the ability of cooperative banks to contribute positively to the achievement of greater stability of the entire banking system in which they operate, there is no lack of contributions in the literature that highlight precisely the contrary effects; from these, it emerges how the presence of cooperative banks tends, instead, to aggravate the conditions of fragility of the financial system (among others, Brunner *et al*., 2004; Goodhart, 2004; Fonteyne, 2007).

This study, therefore, is part of an extremely topical debate that is sometimes controversial due to

the presence of contrasting results regarding the effective contribution of mutual banks to the stability of the banking system. To the best of our knowledge, there are no contributions in the literature that use a methodology similar to the one used in this paper to analyse the role played by these banks in the systemic risk transmission process. Therefore, in this paper, an innovative approach is adopted in an attempt to provide empirical evidence to the debate on the countercyclical role of local cooperative banks.

The main purpose is to understand whether these banks are actually less involved than others in the mechanisms underlying the propagation and accentuation of systemic risk, thus verifying whether their presence somehow manages to mitigate the overall magnitude of this risk in a financial system.

Given the difficulties in identifying a single definition of systemic risk, it should be noted that in this study the term refers to the risk that the crisis, the failure or the mere perception by the market of the risk of insolvency of one or more major players in an economic system - essentially, large companies, financial intermediaries or governments - may lead to generalized phenomena of crisis, insolvency or chain failures of other operators in the same economic system. Therefore, systemic risk will be considered as the risk associated with the manifestation of an event capable of causing, through mechanisms of contagion and propagation of the crisis, structural effects on an entire economic system.

On the basis of this definition, in order to pursue the aim of the research, an innovative methodological approach is proposed, with relative empirical application, aimed at operating the clustering of a group of banks that adopt different business models, starting from the values assumed by some variables considered as proxies both of the speed and capacity of propagation of the systemic risk and of the state of managerial health of the banks analysed.

As is shown later in the discussion, the variables used for the clustering of the banks analysed will be ten and deduced from the most authoritative literature that has dealt with systemic risk over the years.

The methodology proposed in this paper is, therefore, substantially different from what is currently

found in the literature in relation to the methods of measuring systemic risk.

In fact, the study focuses on variables, however chosen on the basis of the criteria most widely used in the literature, which have the advantage of being available for all categories of banking intermediaries (and therefore not only for the systemic ones); these variables are also able to provide information on risk propagation dynamics rather than exclusively on the valuation of the risk itself.

Finally, in order to guarantee homogeneity in the empirical analysis, only the Italian banking system is analysed, since it is characterised by a massive presence of cooperative credit banks and, more generally, of small local banks that, as is known, are particularly focused on their territory needs.

The paper is structured as follows: In Section 2 a Literature Review. Section 3 presents the description of the dataset used and of the methodology employed. Section 4 presents the results obtained and their discussion, while Section 5 concludes.

2. Literature Review

For several years, a wide strand of literature highlighted the fundamental role played by local banks with mutualistic nature in promoting local development as well as the growth of the national economy (Boscia *et al*., 2010; EACB, 2010; Bülbül *et al*., 2013; Fiordelisi and Mare, 2013; Chiaramonte *et al*., 2015; Demma, 2015; Clark *et al*., 2018; Pacelli *et al*. 2019). These studies highlight how the historical success of cooperative banks does not derive exclusively from their specific business model, but also from their peculiar and distinctive governance model. These characteristics have arguably allowed local banks to bear the financial crisis negative effects and to play the countercyclical role that the predominant literature acknowledges to them and that enabled the financing of local economies in the years of the crisis characterized by credit restriction (EACB, 2010). So, these banks were able to strengthen their roots and their local commitment based on trust, reputation and mutualistic values and, therefore, to enhance their competitive information advantage. This fact allows them to benefit from quantitative and qualitative information on customers and local operators thanks to sedimented relationships grown up over time.

Considering, therefore, the countercyclical potential linked to the relational business model, a large part of the literature agrees that local banks can play a fundamental role in mitigating the mechanisms of systemic risk propagation thanks to their countercyclical potential deriving from their specific relational business model.

The strong attention paid by researchers and international supervisory authorities on banks is justified by the fact that they represent the main vehicle for the propagation of a systemic crisis due to their role as financial intermediaries in an economic system (Iyer *et al.*, 2013). In fact, it is well known that two channels for the propagation of a systemic crisis operate through banks. The first takes the form of a domino effect that comes from the direct relationships that characterise the interbank market or the banks' sovereign exposures. The second is an information channel, as banks are a key information provider for the financial markets.

For several years, the literature has focused on the study of the systemic impact of large international banks, analysing the interconnections between the banking system and the other microcosms that populate the economic system, both from a microprudential and macroeconomic perspective (Acharya, 2011; Hanson *et al*., 2011; Claessens *et al*., 2014). These studies highlight the strong systemic impact that large banks exert on markets due to their interconnections, both in terms of value and frequency, with other economic players (Beirne *et al*., 2013; De Bruyckere *et al*., 2013; Buch, 2016; Constâncio, 2017).

A large part of these studies focuses on the construction of a quantitative model able to provide a measurement of the level of systemic risk both with reference to the whole economic system and to the contribution of each systemic bank and this is based on a series of economic-financial variables. All these works, based on advanced mathematical-statistical models, require many inputs based on market variables, therefore they can only be used in the case of listed banks.

The present work focuses, instead, on variables available for all categories of banking intermediaries (not only listed ones) that are able to provide information on the dynamics of risk propagation rather than on the evaluation of the risk level itself. These variables have been chosen on

the basis of the criteria most widely used in the literature; in particular, a study by the International Monetary Fund (Blancher *et al*. 2013) proposes to use the financial statements of intermediaries, especially balance sheets, from which it is possible to deduce a series of information (the so-called Financial Soundness Indicators) useful for analysing the health of banks and their interaction dynamics with the system. The variables suggested by this study and by several other empirical contributions concern capital adequacy and risk coverage as measured by the Tier 1 ratio (Hoque *et al*, 2015), the weight of non-performing loans on total credit exposures, profitability, liquidity, the degree of interconnectedness with the system, measured through the value of loans and debts to other intermediaries (Acharya, 2011; Blundell-Wignall, 2012; Glasserman and Young, 2015) and the weight of sovereign risk measured through the value of public securities held in the portfolio (Blundell- Wignall, 2012). Another variable that is particularly popular in the systemic risk literature, the z-score, which is an indicator of distance-to-default, (Acharya 2011; Blundell- Wignall, 2012; Blancher *et al*., 2013; Hoque *et al*., 2015), i.e. how close (or far) the intermediary under scrutiny is from a financial situation that may portend imminent failure, has also been used.

As well illustrated by the International Monetary Fund (Blancher *et al*., 2013), systemic risk tends to arise through sequential events that start from one or more economic/financial shocks and then propagate with a chain effect.

The initial shocks that can generate a propagation mechanism and, therefore, lead to the onset of a systemic crisis are different and are classified by the literature as follows:

- a crisis of one or more financial intermediaries (Nelson and Katzenstein, 2014) or of a government (Beirne and Fratzscher, 2013), or the mere perception of the insolvency risk of these players;
- fall in the price of specific real or financial assets, including – in particular – residential real estate properties (Cerutti *et al*., 2017);
- liquidity crisis in financial markets followed by deleveraging, which fuels the fall of financial and real assets prices. This phenomenon triggers the deflationary spiral that, through the depreciation of collaterals, feeds the vicious circle of credit rationing (Reinhart and Rogoff, 2013).

The causes that, according to the literature, can foster the propagation of an initial shock to an entire economic system are:

- high interconnection between the main players of the economic and financial system, in particular high exposure of banks to sovereign debt and to interbank markets (Blundell-Wignall, 2012; Hoque *et al*., 2015);
- savers confidence crisis and, in the most severe cases panic, leading to a domino effect characterised by generalised sales, fall in prices, credit rationing, bankruptcy and bank runs (Calvo, 2012);
- strong information asymmetries in financial markets due to the increasing complexity of financial engineering, the information scarcity and the limited financial culture (Flannery *et al*., 2013);
- high level of indebtedness and, therefore, high dependence of borrowers on creditors, which enhances system vulnerability in times of crisis.

Above all, it is important to underline that starting from 2008, after the burst of the financial crisis, studies on systemic risk have overall increased significantly, together with the growing attention of international supervisory authorities and governments, mainly focused on strengthening the capital solidity of financial intermediaries to ensure the stability of an economic system (Acharya *et al*., 2009; Bengtsson, 2013; Lane, 2012; Brunnermeier, 2009; Brunnermeier *et al*., 2013).

3. Data and Methodology

3.1 Description of the dataset

The dataset used for the analysis is composed of banks characterised by different business models, specifically, the set of cooperative banks, commercial banks, savings banks and investment banks active in Italy in the period 2015-2019. The data regarding the balance sheets of each intermediary come from Orbis Bank Focus of the provider Bureau Van Dijk.

The dataset only includes those intermediaries for whom it was possible to find the values of all ten variables that are described below, as they are considered fundamental for the purposes of the

study; this is because the results of the multivariate analysis, in particular those related to the grouping techniques employed, are significant only in the absence of missing data.

The number of the considered banks varies from year to year, not only due to the elimination of missing data, but also due to the Merger and Acquisition (M&A) operations that have affected the financial sector, as well as the exit of several banks from the market.

Table 1 shows the composition of the dataset[2] during the period analysed.

[Insert here Table 1]

It is clear from Table 1 that cooperative banks represent the largest group in the dataset analysed. Table 2 shows the subdivision of banks analysed in the various years that make up the period under investigation, with reference to Total Assets. The data presented in this table offers a clear vision of the structural tendencies underway in the Italian banking system, which see a progressive reduction in the volume of activity of cooperative banks compared to the residual category of commercial banks together with a substantial resizing of the weight of investment banks.

[Insert here Table 2]

Before proceeding with the construction of the indices necessary for grouping the banks belonging to the dataset, it is opportune to observe with even greater attention its composition in order to offer some micro-economic considerations on the peculiar characteristics of the units that are analysed. This focus also makes it possible to better illustrate the variables which are considered fundamental for the study of the contagion propagation dynamics and systemic risk within the banking sector considered as a whole. Table 3 therefore shows the main descriptive statistics of some variables which are useful for the qualitative framing of the units under investigation.

[Insert here Table 3]

The heterogeneity of the considered group of banks in terms of size is particularly evident: in fact, the value assumed by the variability indices referring to Total Assets and Capital is very high. This

[2] In the discussion, reference is always made to the dataset under analysis, avoiding the definition of "sample" since, as it is known, from a statistical point of view, a "sample" is such when it is constructed following particular probabilistic procedures, while in our case, the data simply refers to the universe of all banking intermediaries for which it was possible to obtain the values of the variables that act as a proxy for the speed and capacity of propagation of systemic risk and the state of health of a bank.

is quite normal, given that the dataset includes both local banks of smaller dimensions and large intermediaries operating at an international level. The presence of banks of various sizes and characterised by business models that are very different from one another is particularly useful for the purposes of our investigation in that it allows us to offer various considerations on the aptitude of each banking model to amplify or, on the contrary, mitigate the propagation of systemic phenomena within the financial sector.

3.2 Methodology

In order to analyse the contribution of each intermediary to the systemic risk propagation dynamics, it was necessary to group banks into homogeneous clusters starting from the values given by ten variables which, according to the literature on systemic risk, are capable of (i) providing information on the attitude of each bank to contribute, more or less quickly, to the phenomena propagation mechanisms that generate systemic risk (the first three variables) and (ii) providing a multidimensional representation of each bank's health status (the remaining seven variables).

The ten variables used for clustering the banks analysed were deduced from the most authoritative literature that has dealt with systemic risk over the years. These variables are - as already mentioned - divided according to their informative power into two groups. The first group is made up of three indicators, which quantify amounts of deposits and interbank loans and amounts of government securities held by each bank. These variables are widely used in the literature (Blancher et al. 2013; Acharya 2011; Blundell-Wignall, 2012; Glasserman et al., 2015) to assess the degree of interconnectedness of each bank with the rest of the banking sector and with the public sector. In fact, these variables, respectively, manage to determine the risk of potential contagion arising from each individual bank's greater or lesser exposure in the interbank market and each bank's greater or lesser interconnectedness with the public sector, and thus its exposure to country risk.

The second group of variables consists of seven indicators that provide a multidimensional representation of each bank's health status (Acharya 2011; Blundell-Wignall, 2012; Blancher et al.,

2013; Hoque et al., 2015). The information provided by these variables is, like the information provided by the variables in the first group, very important for this study, as it is assumed that a bank in good health can exert a braking effect against the propagation of a systemic crisis, and thus represent a stabilising factor for a financial system.

From the methodological point of view, after having divided the banks under observation into an adequate number of groups, we proceeded to analyse the composition and characteristics of each of them in terms of specialisation and business model.

The aim of this second analysis is, in fact, to verify whether the presence of cooperative banks is actually greater in those groups for which the indicators of speed and capacity for the propagation of systemic risk and those that explain a bank's status of health assume better values.

The methodology of analysis proposed in this paper is, therefore, substantially different from what is currently found in the literature in relation to the methods of measuring systemic risk.

In fact, this work focuses on variables, however chosen on the basis of the criteria most widely used in the literature, which have the advantage of being available for all categories of banking intermediaries (and therefore not only for those considered systemic) while providing information on the dynamics of risk propagation rather than exclusively on the evaluation of the risk itself.

The choice of analyzing Italian banks was dictated – as stated – for reasons of homogeneity of the analysis as well as the fact that the Italian banking system has a particular morphology and structure characterised by a massive presence of cooperative credit banks and, more generally, of small local banks that are particularly focused on their territory needs.

Among the indicators that are considered most useful for studying the ability of financial intermediaries to contribute to the systemic risk propagation, there is the percentage incidence of total loans granted to public and governmental bodies on the total activity carried out by each bank. Unfortunately, none of the providers currently available is able to give this information, especially in the case of banks not listed on regulated markets which, as already pointed out, represent almost all of the dataset being studied. This is the reason why this information was excluded from the analysis.

Table 4 shows the main descriptive statistics of the ten variables on which the initial part of the analysis is based.

[Insert here Table 4]

As mentioned earlier, the first three indicators (I1, I2 and I3) provide useful information on the degree of interconnection of each intermediary analysed, in that they measure the absolute and relative transactions of each bank in the interbank market and the banks' exposure to the public sector (government securities and sovereign debt). The quantities used as proxies (compared to Total Assets in order to be able to compare intermediaries of different sizes) are the value of loans to the interbank system (I1), the value of deposits on the interbank market (I2) and the value of government securities held in the portfolio (I3). The Orbis Bank Focus Provider defines these indicators respectively as: Net Loans & Advances to Banks (I1), Deposits from Banks (I2) and Government Securities (I3). As already argued above and in line with what has been supported by the prevailing literature on the subject, it is believed that these variables are able to provide particularly significant information on the attitude of banks towards contributing to the propagation mechanisms of the problems that lead to systemic risk. In particular, lower values of these variables lead to the belief that the bank in question is less exposed and interconnected and, therefore, can contribute only marginally to increasing the level of systemic risk. In fact, it is well known that the more limited the active and passive relationships with the interbank market, the less likely it is that a bank can be infected by particularly critical situations involving other banks in the system and, likewise, the less likely it is that the bank itself can, in turn, be a vehicle for contagion, and therefore for the worsening of the overall level of systemic risk, due to its own specific problems. It is also well known that the smaller the value of government securities present in the portfolio of an intermediary, the less likely it is to suffer the negative effects deriving from the default, or simple downgrading, of a sovereign State and, therefore, the less likely it is to contribute to amplifying the effects of systemic risk.

The other seven indicators shown in Table 4 and used for the construction of the homogeneous groups of banks are the Tier1 Ratio (I4), the Non-Performing Loans Ratio (I5), the Liquidity Ratio

(I6), the ROAE (I7), the ROAA (I8), the Cost to Income Ratio (I9) and finally the Z-score (I10). These variables correspond, respectively, to the following data provided by the Provider: Common Equity / Core Tier 1 Ratio, Impaired Loans / Gross Customer Loans & Advances, Liquid Assets / Deposits & Short-Term Funding, Return on Average Equity, Return on Average Assets and Cost to Income Ratio. Finally, as is well known, the Z-score is a risk variable commonly used in the literature to indicate by how many standard deviations a bank's return must fall from its average value for the value of capital to be zero. As per usual practice, it was calculated by dividing the sum of ROAA and equity by the standard deviation of ROAA itself (referring to the last three years).

As already mentioned, these seven indicators are considered useful in providing information on the health status of each bank since they represent a good proxy, respectively, for the level of capitalisation, the quality of the credit portfolio, liquidity, profitability, the level of operating efficiency and the risk of insolvency (and therefore of instability).

From a purely theoretical point of view, a healthy intermediary does not contribute to aggravating the overall level of systemic risk in the banking sector (or, at most, it could contribute to a very limited extent and certainly dependent on other causes); therefore, banks that present somewhat contained levels of indicators I5 and I9, as well as relatively high levels of indicators I4, I6, I7, I8 and I10, should be characterised by a lower probability of acting as amplifiers of the systemic risk propagation effects in the financial sector.

As noted above, the generally high values of all the relative variability indices are justified by the presence in the dataset of banks of very different sizes, some extremely large and others particularly small.

Before proceeding to the clustering of the dataset units, the classic preliminary operations with respect to the implementation of the procedures of multivariate analysis were carried out, that is, the check for lack of outliers and for any collinearity between the variables as well as the standardisation of all the values. In particular, the multi-collinearity analysis not only included the study of the values contained in the variance-covariance matrix (and therefore of correlation), but also the calculation of

the tolerance index and of the VIF (Variance Inflation Factor). In the latter case, however, reference was made to a particularly cautious threshold of 5.

Different cluster analyses (Everitt et al., 2011) of both hierarchical and non-hierarchical type (K-means) were implemented for each year considered. With reference to the hierarchical methods, various combinations of clustering algorithms and distance measures were tested. The clusters obtained with the different approaches adopted were shown to be scarcely overlapping; their composition appeared dissimilar and strongly dependent on the type of procedure used. Therefore, the groups of banks thus obtained showed such differences that no valid conclusions can be drawn in a general sense.

To overcome this problem, the aggregations between banks were carried out referring to some criteria deriving from the evidence common to the various cluster analysis approaches implemented and, therefore, taking into account results that are more robust from a methodological point of view. First of all, it was deduced that the correct number of clusters to be considered is six; this evidence is based on the results from the hierarchical method dendrograms as well as from the tests relating to them. Secondly, it emerged that all the clustering methods assigned greater importance to the first three variables (I1, I2 and I3). Therefore, separately for each year, the banks were first divided into three groups, taking into account those of the first three indicators that presented a value lower than their respective median (calculated considering all the units in the dataset). The choice of the median (rather than the average) as the threshold for discriminating between sets of units was made since the variables value distributions were strongly skewed. Applying this criterion, the first group of banks was identified, including all the units for which at least two indicators (one of which necessarily had to be I3) had a value lower than the respective median. The second group was identified by aggregating those units for which only one of the indicators showed a value lower than the median. Finally, the third group was obtained by aggregating the remaining units, that is, all the banks for which none of the three indicators showed a value lower than the median.

Subsequently, each of the three groups previously identified was divided into two parts based on

the values of the other seven indicators previously mentioned. In particular, the first subset was formed by aggregating the units for which at least four of the remaining seven indicators (I4, I5, I6, I7, I8, I9 and I10) had a value better than their median value. By difference, units for which fewer than four indicators were better than their median were grouped together in the second subset.

4. Empirical Results

Table 5 shows, separately for each group, the main descriptive statistics of the ten indicators that drove the clusterisation procedure. To further increase the robustness of the procedure adopted to divide the units into six homogeneous groups, the differences between the mean value assumed by each of the ten variables in each of the different clusters were analysed with an ANOVA test and were found to be robust and statistically significant.

[Insert here Table 5]

As already pointed out, the empirical investigation conducted aims to answer the research question introduced in Section 1, that is, to understand whether cooperative banks are really less involved than other types of banks in the mechanisms underlying the propagation and accentuation of systemic risk and, therefore, indirectly, this study seeks to verify whether their presence can prove useful in mitigating contagion phenomena and, therefore, the spread of systemic risk in a financial system.

In order to answer this question, we distinguished the different banks in the dataset on the basis of their propensity to generate and/or spread systemic risk within the market. Subsequently, a second analysis was conducted to verify whether or not the presence of cooperative banks is homogeneous within the various groups identified. If the cooperative banks were evenly distributed among the groups, this would mean that they do not differ in any way from other types of banks; therefore, it would not be possible to draw any conclusions about their ability to contribute, positively or negatively, to systemic risk propagation. The situation would be different if the cooperative banks were actually more numerous in those groups for which the indicators of systemic risk propagation speed and capacity as well as the indicators representing the bank's health status assume, respectively,

more limited and better values. Indeed, in this case it would be possible to conclude that the presence of cooperative banks constitutes an important shock absorber capable of hindering (or, at least, braking) the spread of systemic risk phenomena within the banking market.

Tables 6A to 6E show, therefore, for each year analysed, the presence of the various categories of banks within the nine groups previously identified.

The values represented in the first part of each Table 6 (Group 1, Group 2 and Group 3) refer to the subdivision of the banks into three homogeneous categories on the basis of the values assumed by indicators I1 I2 and I3. It should be noted that these indicators provide information on the degree of interconnectedness of each bank, that is, the exposure of the banks analysed to the interbank market and to sovereign debt.

Moving from Group 1 to Group 3, it is possible to find banks for which the above indicators take on progressively worse values, thus indicating a more pronounced inclination to contribute significantly to the transmission of systemic problems among market participants.

[Insert here Table 6A]

[Insert here Table 6B]

[Insert here Table 6C]

[Insert here Table 6D]

[Insert here Table 6E]

From Tables 6A-6E it emerges that the probability of finding a cooperative bank within the groups decreases significantly when moving from Group 1 to Group 3. In particular, with reference to the most recent data (Table 6E), this probability goes from 89% for Group 1 to 85% for Group 2, reducing to 62% for Group 3. This dynamic, that shows a progressive and marked reduction, is confirmed in each of the years considered in the analysis (Figure 1). This means that most of the cooperative banks in the dataset are characterised by a lower relative exposure to the interbank market and to the public

sector and, therefore, are less interconnected with the other nodes in the financial network[3]. This is in line with the main peculiarities of cooperative banks, namely their small size and their marked attention to local needs, which leads them to concentrate almost all of their funding and financing activity on customers belonging to the local community in which they operate.

[Insert here Figure 1]

The values represented in the second part of each Table 6 (Group 1.1 and 1.2, Group 2.1 and 2.2 and, finally, Group 3.1 and 3.2) refer to the subsequent subdivision of the first three groups into two sub-groups on the basis of the values assumed by indicators from I4 to I10. These indicators provide information on each bank's health status as they refer to capitalisation level, loan portfolio, quality, liquidity level, profitability, degree of operating efficiency, and insolvency and instability risk.

Moving from Group 1.1 to Group 3.2, it is possible to find banks whose situation is increasingly problematic with reference to one or more of the aforementioned indicators and, therefore, banks characterised by an ever-increasing probability of acting as systemic risk propagators in the financial sector, due to their precarious managerial conditions and, therefore, their intrinsic instability.

Specifically, Group 1.1 includes those banks that can contribute most to containing the overall entity of systemic risk in the financial sector; indeed, they are intermediaries characterised by a particularly positive health status from a managerial point of view and therefore by a low probability of transmitting problematic situations in the economic-financial system, due to their intrinsic solidity. For these banks, the overall probability of contributing to the spread and generation of systemic risk is the lowest ever. In this group there is a massive presence of cooperative banks which (numerically) represent, on average, about 94% of the total.

Group 1.2 assembles those banks which, albeit to a very slight degree, could possibly contribute to systemic risk in the financial sector since, despite their modest participation in the propagation process, they show a relatively problematic situation from a managerial point of view, making them

[3] It should be noted that I1, I2 and I3 are expressed as percentages of total assets and therefore the values referring to banks of different sizes are directly comparable.

more dangerous than the banks in Group 1.1. Consequently, although their probability of contributing to the development and spread of systemic problems is still low overall, it is nonetheless higher than that of the previous group. Even in this group, the number of cooperative banks remains relatively high at an average of 83%, which is lower than in Group 1.1.

Applying the same interpretative criteria, we observe that Group 2.1 includes those types of banks that seem to offer an average contribution to the spread of systemic phenomena. In this case, the number of cooperative banks is further reduced with respect to the cases highlighted above, reaching 78% in the last period considered.

Group 2.2 includes those banks that are thought to contribute significantly to the systemic risk propagation in the sector, since they are characterised both by problems of a managerial nature and by a consistent propensity to act as a driving force in the diffusion of the negative effects caused, precisely, by systemic phenomena within the sector. In this Group, the percentage of cooperative banks is significantly reduced, settling at an average level of 69%.

Group 3.1 consists of those banks for which the probability of contributing to the generation and spread of systemic risk is rather high. In this group, the number of cooperative banks decreases to an average level of 67%.

Finally, Group 3.2 is made up of those intermediaries that undoubtedly play a decisive role in the dynamics of the propagation of systemic risk in the financial system. These are, in fact, banks in management disequilibrium and therefore characterised by a marked propensity to amplify the contagion dynamics and diffusion of their own difficulties as well as those of other banks. In this last group, the presence of cooperative banks is drastically reduced and reaches minimum levels, on average less than 58%.

The results of our empirical analysis with reference to the Italian banking market therefore allow us to answer our research question and, in particular, confirm the countercyclical and mitigating role of cooperative banks in systemic risk. In fact, as highlighted above, moving towards groups of banks characterised by a greater probability of contributing significantly to the transmission process of

systemic problems, and therefore towards groups of banks characterised by a greater aptitude to act as amplifiers of systemic risk, the presence of cooperative banks is significantly reduced.

5. Conclusions

The events of the last decades have highlighted how we live in a "small world", in which everything is connected to everything else and often in different ways that are variable and not easy for human rationality to understand.

It is also evident that the "Achilles' heel" of a "small world", and therefore of real networks, is represented by the vulnerability due to interconnection. An isolated shock can create chain reactions that destabilise an entire economic system, and the probability that an isolated shock will undermine an entire system is higher if the affected nodes are the most interconnected.

While not yielding to the initial temptation to believe that the systemic propagation of crisis situations is exclusively due to the difficulties caused by large institutions (since the systemic value of the various intermediaries depends not only on their size, but above all, on the degree of riskiness and correlation with others), one cannot fail to consider the fundamental anti-cyclical role played by cooperative credit banks. These banks have the intrinsic potential to interrupt the vicious circle that fuels the propagation of a systemic crisis. And this intrinsic potential is due to the granularity of their relationships, to their peculiar governance model, as well as to their characteristic business model based on mutuality, long-term relationships, commitment to local development, in-depth knowledge of their customers, and greater consideration of qualitative information in the credit process.

The results of the empirical investigation, with specific reference to the Italian banking system, support the initial hypothesis at the basis of the work and allow us to answer the research question of this paper. In particular, the empirical results of our analysis confirm the countercyclical and mitigating role of cooperative banks, which are actually less involved than other categories of intermediaries in contagion phenomena deriving from the spread of systemic risk.

As the empirical analysis shows, moving towards groups of banks that are more likely to contribute

significantly to systemic problem transmission, and thus towards groups of banks that are more likely to act as systemic risk amplifiers, the presence of cooperative banks is significantly reduced.

The results obtained from this study thus enrich the existing debate on the *raison d'être* of cooperative banks, which is fundamentally focused on the idea that they have withstood the various recent crises thanks to a business model that is by no means anachronistic but, on the contrary, is still capable of satisfying the needs of their customers, while also fulfilling a fundamental function of mitigating systemic risk.

The data used in this work derives exclusively from public sources, mainly financial statements, and represents the only information accessible to external researchers interested in analysing companies and the system in which they operate. Such information, however, can only partially capture actual individual banks' health status and real systemic risk propagation dynamics.

In view of this, the methodological approach presented in this paper could prove particularly useful to the authorities and policymakers for the purposes of evaluating and monitoring systemic risk, both at a national and international level. What is more, the proposed methodology could easily be enriched with all the classified and sensitive information which was not available to this contribution, but which would certainly be useful (if not essential) for the purpose of obtaining an even more complete and up-to-date picture of the equilibrium conditions of the international banking system.

Finally, it should be pointed out that the variety and complexity (and, moreover, often lack of transparency) of financial relations between the different nodes in a network tend to increase the complexity of financial systems; this circumstance produces information asymmetries, moral hazard risks and, therefore, opacity and consequences in the processes of systemic risk propagation. This complexity in the relationships between the economic agents of a financial system has been fed since the early years of the new millennium by the evolution (often uncontrolled) of financial engineering, which has made the economic-financial systems more interconnected, and therefore complex, linking operators with each other in multiple ways, and often unconsciously. In addition, network science teaches us that the mechanisms of "growth" and "preferential connection" lead the "hubs" (i.e., the

largest nodes) to expand in phases of network expansion and thus encompass smaller nodes. This phenomenon, otherwise known as globalisation, leads, however, to the risk of extinction of smaller economic operators, such as local banks; their disappearance, or even their simple competitive downsizing, would lead, over time, to the loss of the extraordinary intangible and relational patrimony of these intermediaries. This situation could also lead to the financial system impoverishment and to the exposure, as demonstrated in this paper, to greater systemic risks too.

In addition, the events of the last fifteen years have exhaustively highlighted all the risks of a highly interconnected financial system that is disconnected from the real economy, which has grown over the years to a hypertrophic extent thanks to financial engineering and has therefore become excessively complex and exposed to human greed. This is especially true if it is left free to expand, where there is a lack of adequate controls and forms of protection and guarantee as well as alternative models of intermediaries less systemic and more linked to the territory and the real economy.

Therefore, to toy with some of the paradigmatic expressions that have been in vogue for some years now, that is, since the subprime mortgage crisis in the USA in 2008, what emerges from the proposed empirical analysis should probably contribute to inducing the international supervisory authorities to shift their attention from the paradigms of "Too Big to Fail" or "Too Central (Interconnected) to Fail" to the notion of "Too Useful to Fail".

Indeed, in light of the results of our empirical analysis, the utility of local cooperative banks with a mutual vocation is enriched with an important connotation referring to the counter-cyclical and mitigating dimension of the contagion mechanisms deriving from systemic risk propagation. In other words, it seems evident that a model of intermediation characterised by such varied levels of utility deserves adequate and specific attention and protection from the authorities.

REFERENCES

Acharya, V.V., Richardson, M. (2009). *Restoring Financial Stability: How to Repair a Failed System*. New York: John Wiley & Sons.

Acharya, V.V., (2011). Systemic Risk and Macro-Prudential Regulation, *unpublished working paper*.

Barone, G., De Blasio, G. and Mocetti, S. (2016). The real effects of credit crunch in the Great Recession: evidence from Italian provinces, *Temi di Discussione della Banca d'Italia*, n. 1057.

Bengtsson, E. (2013). Shadow banking and financial stability: European money market funds in the global financial crisis. *Journal of International Money and Finance*, 32, 579-594.

Beirne, J., Fratzscher, M. (2013). The pricing of sovereign risk and contagion during the European sovereign debt crisis. *Journal of International Money and Finance*, 34, 60-82.

Bengtsson E. (2013). Shadow banking and financial stability: European money market funds in the global financial crisis, *Journal of International Money and Finance*, 32, 579-594.

Berton, F., Mocetti, S., Presbitero, A., and Ricchiardi, M., (2017). Banks, Firms, and Jobs, *IMF working paper* 17/38.

Blancher, M. N. R., Mitra, M. S., Morsy, M. H., Otani, M. A., Severo, T., and Valderrama, M. L., (2013). *Systemic Risk Monitoring ("SysMo") Toolkit—A User Guide*. International Monetary Fund.

Blundell-Wignall, A., (2012). Solving the financial and sovereign debt crisis in Europe. *OECD Journal: Financial Market Trends*, 2011(2), 201-224.

Boscia, V., Carretta, A., Schwizer, P. (2010). *Co-operative Banking in Europe: Case Studies*. UK: Palgrave Macmillan Publisher.

Brunner, A., Decressin, J., Hardy, D., Kudela, B. (2004). Germany's Three-pillar Banking System – Cross-country Perspectives in Europe, in IMF Occasional Paper 233, *International Monetary Fund*, Washington, DC.

Brunnermeier, M. K. (2009). Deciphering the liquidity and credit crunch 2007-2008. *Journal of Economic Perspectives*, *23*(1), 77-100.

Brunnermeier, M. K., Oehmke, M. (2013). Bubbles, financial crises, and systemic risk. *Handbook of the Economics of Finance*, 2, 1221-1288.

Buch, C. M., Goldberg, L. (2016). Cross-border prudential policy spillovers: How much? How important? Evidence from the international banking research network, *National Bureau of Economic Research*, w22874.

Bülbül D., Schmidt, R. H., Schüwe, R. U. (2013). Savings Banks and Co-operative Banks in Europe. *SAFE Policy Papers*, White Paper Series 5.

Calvo, G. (2012). Financial crises and liquidity shocks a bank-run perspective. *European*

Economic Review, 56(3), 317-326.

Cerutti, E., Dagher, J., Dell'Ariccia, G. (2017). Housing finance and real-estate booms: A cross-country perspective. *Journal of Housing Economics*, 38, 1-13.

Chiaramonte, L., Poli, F., Oriani, M.E. (2015). Are Co-operative Banks a lever for promoting Bank stability? Evidence from the Recent Financial Crisis in OECD Countries. *European Financial Management*, 21(3), 491-523.

Claessens S., Ghosh S.R., Mihet M.R. (2014). *Macro-Prudential Policies to Mitigate Financial System Vulnerabilities*, International Monetary Fund, 14-155.

Clark E. A., Mare D., Radić, N. (2018). Co-operative banks: What do we know about competition and risk preferences? *Journal of International Financial Markets, Institutions and Money*, 52, 90–101.

Constâncio, V. (2017). Synergies between banking union and capital markets union, *keynote speech at the joint conference of the European Commission and ECB on European Financial Integration*, Brussels, 19.

Demma, C. (2015). Local banking and the financial crisis, in *Questioni di Economia e Finanza*, Banca d'Italia n. 264.

De Bruyckere, V., Gerhardt, M., Schepens, G., Vander Vennet, R. (2013). Bank/sovereign risk spillovers in the European debt crisis. *Journal of Banking & Finance*, 37(12), 4793-4809.

EACB (2010). *European Co-Operative Banks in the Financial and Economic Turmoil*, First assessments.

EACB (2016). *Corporate Governance in Co-operative Banks*, Key Features, 3 February.

Everitt, B.S., Landau, S., Leese, M. and Stahl, D., (2011). *Cluster analysis* 5th edition Wiley.

Fiordelisi, F., D., Mare, S. (2013). Probability of default and efficiency in co-operative banking, Journal of *International Financial Markets, Institutions and Money*, 26 (C), 30–45.

Flannery, M. J., Kwan, S. H., Nimalendran, M. (2013). The 2007–2009 financial crisis and bank opaqueness. *Journal of Financial Intermediation*, 22(1), 55-84.

Fonteyne W. (2007). "Cooperative Banks in Europe - Policy Issues", in *IMF Working Paper*, n. 7/159.

Glasserman, P. and Young, H.P., (2015). How Likely Is Contagion in FInancial Networks?, *Journal of Banking & Finance*, 50, pp. 383-399.

Goodhart, C.A.E. (2004). *Some new directions for financial stability*. The Per Jacobsson Lecture, Bank for International Settlements, Basel.

Hanson, S. G., Kashyap, A. K., Stein, J. C. (2011). A macroprudential approach to financial regulation, *Journal of Economic Perspectives*, 25(1), 3-28.

Hoque, H., Andriosopoulos, D., Andriosopoulos, K., and Douady, R., (2015). Bank regulation, risk and return: Evidence from the credit and sovereign debt crises, *Journal of Banking & Finance*, 50, 455-474.

Iyer, R., Peydró, J. L., da-Rocha-Lopes, S., Schoar, A. (2013). Interbank liquidity crunch and the firm credit crunch: Evidence from the 2007–2009 crisis, *The Review of Financial Studies*, 27(1), 347-372.

Lane, P. R. (2012). The European sovereign debt crisis. *Journal of Economic Perspectives*, 26(3), 49-68.

Nelson, S. C., Katzenstein, P. J. (2014). Uncertainty, risk, and the financial crisis of 2008. *International Organization*, 68(2), 361-392.

Pacelli, V., Pampurini, F., Sylos Labini, S. (2019). The peculiarity of the co-operative and mutual model: evidence from the European banking sector. *Journal of Financial Management, Markets and Institutions*, 7(1), 1-29.

Pacelli, V., Pampurini, F., and Quaranta, A. G., (2020). Co-operative Banks and Financial Stability. *International Journal of Business and Social Science*, 11(11).

Reinhart, M. C., Rogoff, M. K. (2013). Financial and sovereign debt crises: some lessons learned and those forgotten. *International Monetary Fund*, 13, 266-278.

TABLES AND FIGURES

Table 1. Composition of the dataset in terms of specialisation.

Year	Commercial banks	Cooperative banks	Investment banks	Saving banks	Total
2015	49	280	9	22	**360**
2016	54	288	10	25	**377**
2017	44	242	9	19	**314**
2018	50	238	10	18	**316**
2019	42	225	6	10	**283**

Table 2. Banks distribution in terms of Total Assets (thousands of euros). Years 2015-2019.

Year	Commercial banks	Cooperative banks	Investment banks	Saving banks	Total
2015	2.183.622.330	772.615.633	274.237.451	154.897.985	**3.385.373.399**
	65%	*23%*	*8%*	*5%*	***100%***
2016	2.246.852.556	718.406.567	262.948.343	162.255.249	**3.390.462.715**
	66%	*21%*	*8%*	*5%*	***100%***
2017	2.219.169.750	538.744.877	229.401.202	165.819.633	**3.153.135.462**
	70%	*17%*	*7%*	*5%*	***100%***
2018	2.378.372.257	559.857.998	269.764.478	140.962.547	**3.348.957.280**
	71%	*17%*	*8%*	*4%*	***100%***
2019	2.348.329.189	542.721.504	41.514.600	105.720.918	**3.038.286.211**
	77%	*18%*	*1%*	*3%*	***100%***

Table 3. Descriptive statistics of some characteristic variables. Year 2019.

	Mean	Standard deviation	Asimmetry	Variation coefficient
in thousands of euro:				
Total Assets (thousands)	10.735.993,68	72.005.441,47	10,74	6,71
Equity (thiusands)	776.204,09	5.096.887,55	10,70	6,57
in percentage:				
Equity/Total Assets	9,33	4,23	2,50	0,45
Securities/Total Assets	13,13	10,06	2,46	0,77
Loans/Total Assets	71,81	13,74	-1,99	0,19
Liquidity/Total Assets	23,20	12,81	1,95	0,55
Total liabilities/Total Assets	90,67	4,23	-2,50	0,05

Table 4. Descriptive statistics of the *clustering* variables. Year 2019.

	Mean	Standard deviation	Asimmetry	Variation coefficient
in percentage:				
I1 = Net loans & advances to banks/Total Assets	8,49	6,50	1,71	0,77
I2 = Deposit from banks/Total Assets	14,57	10,17	2,27	0,70
I3 = Government securities/Total Assets	24,58	13,00	0,10	0,53
I4 = Common Equity/Core Tier 1 Ratio	20,13	8,58	2,54	0,43
I5 = NPLs Ratio	7,91	6,78	6,99	0,86
I6 = Liquidity Ratio	36,17	128,37	16,13	3,55
I7 = ROAE	3,61	6,82	-2,32	1,89
I8 = ROAA	0,34	0,54	-1,36	1,60
I9 = Cost to Income Ratio	73,59	14,42	1,36	0,20
I10 = Z-score	131,32	167,45	4,42	1,28

Table 5. Descriptive statistics of the ten indicators with respect to each group of banks. Year 2019.

	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10
GROUP 1										
Mean	10,55	11,54	22,59	22,32	8,17	46,28	3,57	0,37	75,22	116,59
St. Dev.	7,07	7,58	12,93	8,10	8,53	187,95	5,58	0,53	12,72	110,90
Asimmetry	1,47	0,79	0,14	1,74	6,81	11,23	-2,29	-1,28	0,90	2,01
Var. Coeff.	0,67	0,66	0,57	0,36	1,04	4,06	1,56	1,41	0,17	0,95
GROUP 2										
Mean	5,94	13,04	24,87	19,05	8,21	24,11	3,11	0,30	74,18	140,60
St. Dev.	4,88	7,98	13,76	9,77	6,18	13,73	6,03	0,52	15,11	156,06
Asimmetry	1,41	0,73	-0,05	3,93	4,47	1,60	-1,83	0,25	2,18	2,18
Var. Coeff.	0,82	0,61	0,55	0,51	0,75	0,57	1,94	1,72	0,20	1,11
GROUP 3										
Mean	7,31	19,77	27,15	17,79	7,35	30,06	3,99	0,32	70,93	145,66
St. Dev.	5,85	12,33	12,09	7,57	3,63	27,35	8,61	0,57	15,72	227,44
Asimmetry	2,31	2,72	0,30	2,98	1,32	4,97	-2,36	-2,30	1,49	4,51
Var. Coeff.	0,77	0,62	0,45	0,43	0,49	0,91	2,16	1,80	0,22	1,56
GROUP 1.1										
Mean	11,07	11,64	26,71	23,78	7,38	68,89	5,98	0,66	69,85	139,79
St. Dev.	6,43	8,00	12,09	7,44	11,02	271,08	3,07	0,36	11,22	125,00
Asimmetry	0,85	1,08	0,21	1,14	6,64	7,77	0,97	1,43	-0,25	1,53
Var. Coeff.	0,58	0,69	0,45	0,31	1,49	3,93	0,51	0,54	0,16	0,89
GROUP 1.2										
Mean	10,08	11,45	18,90	21,01	8,88	26,00	1,41	0,11	80,04	95,78
St. Dev.	7,58	7,17	12,55	8,44	5,31	15,08	6,38	0,51	12,05	91,64
Asimmetry	1,89	0,43	0,18	2,35	2,48	2,88	-2,24	-2,35	2,06	2,74
Var. Coeff.	0,75	0,63	0,66	0,40	0,60	0,58	4,53	4,67	0,15	0,96
GROUP 2.1										
Mean	7,15	12,77	28,90	22,16	6,43	30,33	6,68	0,65	66,49	151,82
St. Dev.	5,14	8,90	15,14	12,76	3,65	15,22	2,94	0,42	9,80	151,07
Asimmetry	0,81	1,39	-0,34	3,27	1,95	1,41	0,86	2,58	-1,98	2,07
Var. Coeff.	0,72	0,70	0,52	0,58	0,57	0,50	0,44	0,64	0,15	1,00
GROUP 2.2										
Mean	4,98	13,26	21,67	16,58	9,62	19,17	0,28	0,03	80,28	131,69
St. Dev.	4,44	7,16	11,60	5,32	7,31	9,97	6,35	0,42	15,79	159,36
Asimmetry	2,21	-0,21	-0,17	2,27	4,31	1,58	-1,90	-1,33	3,15	2,38
Var. Coeff.	0,89	0,54	0,54	0,32	0,76	0,52	22,69	15,73	0,20	1,21
GROUP 3.1										
Mean	7,37	19,49	27,05	19,51	6,17	36,40	6,89	0,56	64,41	184,56
St. Dev.	6,44	13,59	12,88	9,13	3,84	35,14	5,18	0,37	11,77	285,19
Asimmetry	2,55	2,28	0,00	2,70	1,96	4,11	3,74	3,36	-1,15	3,97
Var. Coeff.	0,87	0,70	0,48	0,47	0,62	0,97	0,75	0,67	0,18	1,55
GROUP 3.2										
Mean	7,26	20,05	27,26	16,04	8,55	23,59	1,02	0,07	77,59	105,92
St. Dev.	4,70	10,89	11,23	4,96	2,93	12,93	10,24	0,63	16,44	135,49
Asimmetry	1,53	3,62	0,77	1,98	1,50	2,44	-2,71	-3,55	2,50	2,94
Var. Coeff.	0,65	0,54	0,41	0,31	0,34	0,55	10,05	9,59	0,21	1,28

Table 6A. Banking group and sub-group composition in terms of business model. Year 2015.

Commercial banks	Investiment banks	Saving banks	Cooperative banks	Total
GROUP 1				
12	2	1	144	159
8%	1%	1%	91%	100%
GROUP 2				
12	2	14	67	95
13%	2%	15%	71%	100%
GROUP 3				
25	5	7	69	106
24%	5%	7%	65%	100%
GROUP 1.1				
3	2	1	100	106
3%	2%	1%	94%	100%
GROUP 1.2				
9	0	0	44	53
17%	0%	0%	83%	100%
GROUP 2.1				
8	1	3	38	50
16%	2%	6%	76%	100%
GROUP 2.2				
4	1	11	29	45
9%	2%	24%	64%	100%
GROUP 3.1				
7	2	1	21	31
23%	6%	3%	68%	100%
GROUP 3.2				
18	3	6	48	75
24%	4%	8%	64%	100%

Table 6B. Banking group and sub-group composition in terms of business model. Year 2016.

Commercial banks	Investiment banks	Saving banks	Cooperative banks	Total
GROUP 1				
11	2	3	142	158
7%	1%	2%	90%	100%
GROUP 2				
14	2	14	82	112
13%	2%	13%	73%	100%
GROUP 3				
29	6	8	64	107
27%	6%	7%	60%	100%
GROUP 1.1				
2	1	1	80	84
2%	1%	1%	95%	100%
GROUP 1.2				
9	1	2	62	74
12%	1%	3%	84%	100%
GROUP 2.1				
9	2	1	43	55
16%	4%	2%	78%	100%
GROUP 2.2				
5	0	13	39	57
9%	0%	23%	68%	100%
GROUP 3.1				
12	2	2	33	49
24%	4%	4%	67%	100%
GROUP 3.2				
17	4	6	31	58
29%	7%	10%	53%	100%

Table 6C. Banking group and sub-group composition in terms of business model. Year 2017.

Commercial banks	Investiment banks	Saving banks	Cooperative banks	Total
GROUP 1				
10	3	2	127	142
7%	2%	1%	89%	100%
GROUP 2				
8	2	9	50	69
12%	3%	13%	72%	100%
GROUP 3				
26	4	8	65	103
25%	4%	8%	63%	100%
GROUP 1.1				
3	1	1	73	78
4%	1%	1%	93%	100%
GROUP 1.2				
7	2	1	54	64
11%	3%	2%	84%	100%
GROUP 2.1				
4	2	1	23	30
13%	7%	3%	77%	100%
GROUP 2.2				
4	0	8	27	39
10%	0%	21%	69%	100%
GROUP 3.1				
9	2	4	28	43
21%	5%	9%	65%	100%
GROUP 3.2				
17	2	4	37	60
28%	3%	7%	62%	100%

Table 6D. Banking group and sub-group composition in terms of business model. Year 2018.

Commercial banks	Investiment banks	Saving banks	Cooperative banks	Total
GROUP 1				
13	2	2	130	47
9%	1%	1%	88%	100%
GROUP 2				
8	3	8	39	58
14%	5%	14%	67%	100%
GROUP 3				
29	5	8	69	111
26%	5%	7%	62%	100%
GROUP 1.1				
2	0	1	77	80
3%	0%	1%	96%	100%
GROUP 1.2				
11	2	1	53	67
16%	3%	1%	79%	100%
GROUP 2.1				
3	2	1	15	21
14%	10%	5%	71%	100%
GROUP 2.2				
5	1	7	24	37
14%	3%	19%	65%	100%
GROUP 3.1				
9	3	4	37	53
17%	6%	8%	70%	100%
GROUP 3.2				
20	2	4	32	58
34%	3%	7%	55%	100%

Table 6E. Banking group and sub-group composition in terms of business model. Year 2019.

Commercial banks	Investiment banks	Saving banks	Cooperative banks	Total
GROUP 1				
11	1	2	115	129
9%	1%	2%	89%	100%
GROUP 2				
6	2	1	52	61
10%	3%	2%	85%	100%
GROUP 3				
25	3	7	58	93
27%	3%	8%	62%	100%
GROUP 1.1				
4	0	1	63	68
6%	0%	1%	93%	100%
GROUP 1.2				
7	1	1	52	61
11%	2%	2%	85%	100%
GROUP 2.1				
3	1	0	30	34
9%	3%	0%	88%	100%
GROUP 2.2				
3	1	1	22	27
11%	4%	4%	81%	100%
GROUP 3.1				
11	2	3	30	46
24%	4%	7%	65%	100%
GROUP 3.2				
14	1	4	28	47
30%	2%	9%	60%	100%

Figure 1. Probability to find a cooperative bank in each group 1, 2 and 3 during the period 2015-2019.